

As per the Latest Board Syllabus
issued on 21st April, 2022

2023
EXAMINATION



OSWAL – GURUKUL

MOST LIKELY

CBSE QUESTION BANK

CHAPTERWISE & CATEGORYWISE

SCIENCE
CLASS X

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In accordance with the latest syllabus prescribed by the
Central Board of Secondary Education, New Delhi



OSWAL – GURUKUL

MOST LIKELY

CBSE QUESTION BANK

CHAPTERWISE & CATEGORYWISE

SCIENCE CLASS X

By

UMESH TIWARI

M.Sc., B.Ed.

St. Josephs College (School Department)
North Point, Darjeeling



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PREFACE

Oswal - Gurukul's Most Likely CBSE Question Bank series is up-to-date with the latest syllabus given by the Central Board of Secondary Education.

This title highlights the knowledge-based and skill-based goals of the Bloom's Taxonomy by acquainting the students with relevant facts and concepts. It also teaches them ways to apply their subjective knowledge to get their best academic results.

In this book, the questions are arranged section-wise so that the students can revise the whole syllabus in less time and develop the ability of prioritising and categorising topics for effective learning. It covers all probable types of questions that can be asked in the exams. The solutions and explanations have been prepared by eminent subject experts. They follow the standard marking scheme of the CBSE Board. Additionally, questions from compartment paper, foreign paper and latest board paper have also been incorporated in the chapters.

The series is an attempt to instil confidence in students to face the board examination. The language used is simple, to the point and questions cover all the important topics as per the weightage given to them by the board.

We hope this book will be a valuable asset for the students. All suggestions towards improving the series are welcome and would be incorporated in the future editions.

—Publisher

SYLLABUS
COURSE STRUCTURE CLASS X
(Annual Examination)

Marks : 80

Unit No.	Unit	Marks
I.	Chemical Substances–Nature and Behaviour	25
II.	World of Living	25
III.	Natural Phenomena	12
IV.	Effects of Current	13
V.	Natural Resources	05
	Total	80
	Internal Assessment	20
	Grand Total	100

Theme : Materials

Unit I : Chemical Substances–Nature and Behaviour

Chemical reactions : Chemical equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions: combination, decomposition, displacement, double displacement, precipitation, endothermic exothermic reactions, oxidation and reduction.

Acids, bases and salts : Their definitions in terms of furnishing of H^+ and OH^- ions, General properties, examples and uses, neutralization, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and

uses of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Metals and nonmetals : Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds; Basic metallurgical processes; Corrosion and its prevention.

Carbon compounds : Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series. Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydro carbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

Theme : The World of the Living

Unit II : World of Living

Life processes : 'Living Being'. Basic concept of nutrition, respiration, transport and excretion in plants and animals.

Control and co-ordination in animals and plants : Tropic movements in plants; Introduction of plant hormones; Control and co-ordination in animals: Nervous system; Voluntary, involuntary and reflex action; Chemical co-ordination: animal hormones.

Reproduction : Reproduction in animals and plants (asexual and sexual) reproductive health - need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Heredity and Evolution : Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination: brief introduction: (topics excluded - evolution; evolution and classification and evolution should not be equated with progress).

Theme : Natural Phenomena

Unit III : Natural Phenomena

Reflection of light by curved surfaces; Images formed by spherical

mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required), magnification.

Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens; Image formed by spherical lenses; Lens formula (Derivation not required); Magnification. Power of a lens.

Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses.

Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life (excluding colour of the sun at sunrise and sunset).

Theme : How Things Work

Unit IV : Effects of Current

Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R.

Magnetic effects of current : Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's Left Hand Rule, Direct current. Alternating current: frequency of AC. Advantage of AC over DC. Domestic electric circuits.

Theme : Natural Resources

Unit V : Natural Resources

Our environment : Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

QUESTION PAPER DESIGN

CLASS X

(Code No. 086)

Maximum Marks : 80 Duration : 3 Hours

Competencies	
Demonstrate Knowledge and Understanding	46%
Application of Knowledge/Concepts	22%
Formulate, Analyze, Evaluate and Create	32%
	100%

Note :

- Typology of Questions: VSA including objective type questions, Assertion – Reasoning type questions; SA; LA; Source-based/ Case-based/ Passage-based/ Integrated assessment questions.
- An internal choice of approximately 33% would be provided.

Internal Assessment (20 Marks)

- Periodic Assessment - 05 marks + 05 marks
- Subject Enrichment (Practical Work) - 05 marks
- Portfolio - 05 marks

Suggestive verbs for various competencies

• Demonstrate Knowledge and Understanding

State, name, list, identify, define, suggest, describe, outline, summarize, etc.

• Application of Knowledge/Concepts

Calculate, illustrate, show, adapt, explain, distinguish, etc.

• Formulate, Analyze, Evaluate and Create

Interpret, analyze, compare, contrast, examine, evaluate, discuss,

construct, etc.

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4. [Carbon and its Compounds](#)
6. [Life Processes](#)
7. [Control and Coordination](#)
8. [How Do Organisms Reproduce ?](#)
9. [Heredity and Evolution](#)
10. [Light : Reflection and Refraction](#)
11. [The Human Eye and Colourful World](#)
12. [Electricity](#)
13. [Magnetic Effects of Electric Current](#)
15. [Our Environment](#)



केन्द्रीय माध्यमिक शिक्षा बोर्ड (शिक्षा विभाग, भारत सरकार के अधीन एक स्वायत्त संगठन) CENTRAL BOARD OF SECONDARY EDUCATION (An Autonomous Organisation under the Ministry of Education, Govt. of India)



CBSE/Acad/ 2022

April 21, 2022
Cir. No. Acad-48/2022

All Heads of Institutions affiliated to CBSE

Subject: Secondary and Senior School Curriculum 2022-23

1. CBSE annually provides curriculum for classes IX to XII containing academic content, syllabus for examinations with learning outcomes, pedagogical practices and assessment guidelines.
2. Considering the feedback of stakeholders and other prevailing conditions, the Board will conduct the annual scheme of assessment at the end of the Academic Session 2022-23 and the curriculum has been designed accordingly. Details are available at the link https://cbseacademic.nic.in/curriculum_2023.html
3. It is important that schools ensure curriculum transaction as per the directions given in the initial pages of the curriculum document. The subjects should be taught as per the curriculum released by the Board with the help of suitable teaching-learning strategies such as Art-Integrated Education, Experiential Learning, and Pedagogical Plans etc. wherever possible.
4. Before making annual pedagogical plan to ensure curriculum transaction for optimal learning, it is desirable that the Head of the School may take a session with all the teachers on the important topics covered in initial pages of the curriculum document as well as the topics covered under subject-wise syllabus.
5. Sample Question Papers with detailed design of the Question Paper will be made available on CBSE's website in due course of time.
6. Schools are requested to share the curriculum available on https://cbseacademic.nic.in/curriculum_2023.html including initial pages to all the teachers and students.

With Best wishes,


Dr. Joseph Emmanuel
Director (Academics)



शिक्षा सदन, 17 राउट अवेंयू, संस्थानिकी इलाका, नई दिल्ली-110002
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Chemical Reactions and Equations

Chapter

1

Summary

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- A chemical equation is a symbolic representation that describes a chemical reaction in terms of symbol and formulae.
- A chemical reaction is the transformation of chemical substance called reactants into another chemical substance called products. In a chemical reaction, only rearrangement of atoms takes place.
- The substances which take part in a chemical reaction are called reactants. The reactants are written on the left hand side. The new substances produced as a result of chemical reaction are called products. The products are written on the right hand side.

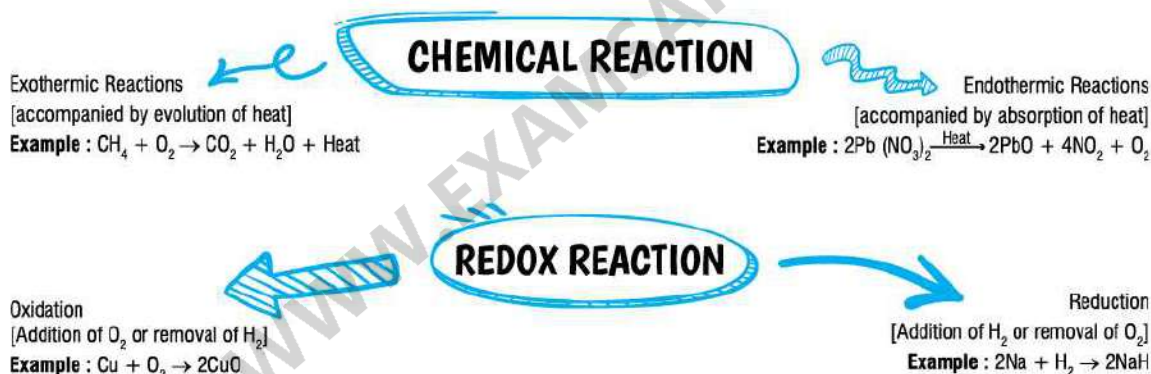
• **Some of the symbols used in a chemical equation are :**

- | | |
|--|---|
| (a) Solids (s) | (b) Liquids (l) |
| (c) Gases (g) | (d) Aqueous solutions (aq) |
| (e) Gas released as a product (\uparrow) | (f) Precipitate formed in the reaction (\downarrow) |
| (g) Direction of reaction (\rightarrow) | (h) Used to separate multiple reactants or products (+) |
| (i) Formula written above the arrow is used as a catalyst in the reaction (Pt) | |
| (j) Triangle indicates that the reaction is being heated (Δ) | |
| (k) Replaces the yield sign for reversible reactions that reach equilibrium (\rightleftharpoons) | |

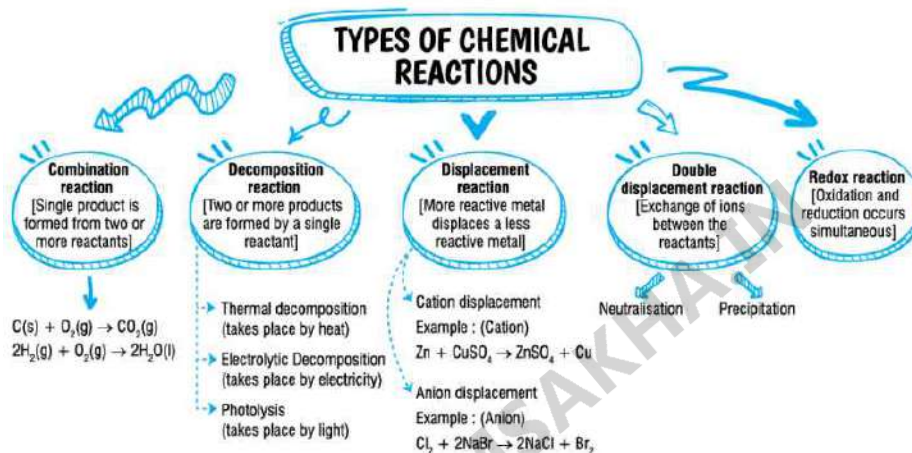
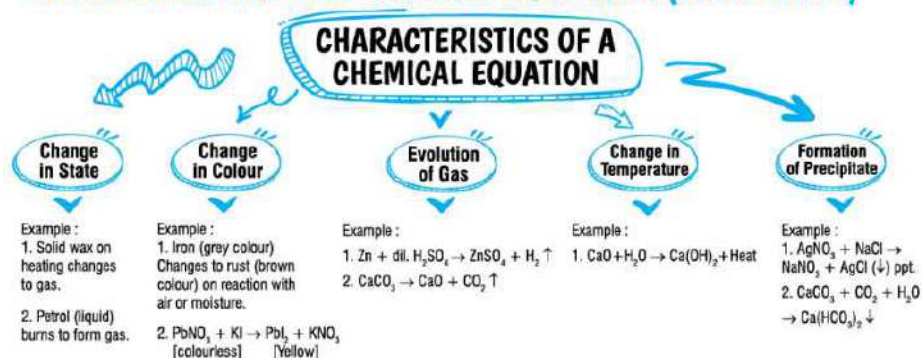
• **Steps to balance a chemical equation :**

- Write word equation.
- Then write skeletal chemical equation.
- Enclose the formula in the boxes.
- List the number of atoms of different elements present in the unbalanced equation.
- Start balancing with the compound that contains the maximum number of atoms.
- Start balancing other atoms.
- Check the correctness of the balanced equation.

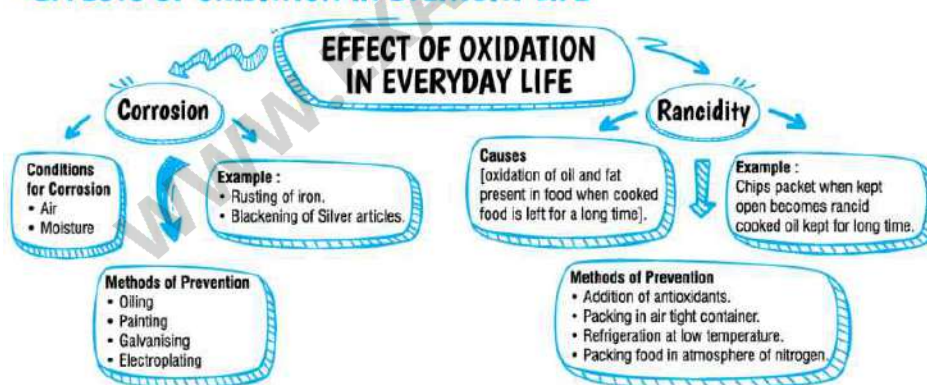
• **Types of chemical equations :**



CHARACTERISTICS OF A CHEMICAL EQUATION : (FLOW CHART)



EFFECTS OF OXIDATION IN EVERYDAY LIFE



Definitions

1. Chemical Reaction: The transformation of chemical substance into another chemical substance is known as chemical reaction.

2. Reactant: A chemical substance that takes part in a chemical reaction and undergoes change during a

reaction.

3. Product: A new chemical substance formed as a result of a chemical reaction.

4. Reactivity series: A new series of metals ranked in order of decreasing reactivity to displace hydrogen gas from water and acid.

5. Oxidation: The reaction in which addition of oxygen or removal of hydrogen takes place.

6. Reduction: The chemical reaction which involves addition of hydrogen or removal of oxygen.

7. Oxidising agent: A substance which helps in oxidation but itself gets reduced.

8. Reducing agent: A substance which helps in reduction but itself gets oxidised.

9. Redox reaction: A chemical reaction in which both oxidation and reduction takes place simultaneously.

10. Antioxidants: These are the substance that inhibits oxidation or inhibits reactions promoted by oxygen.

11. Catalyst: A substance that alters the rate of a chemical reaction without undergoing any change in itself during the reaction.

12. Precipitate: The solid formed as a result of a precipitation reaction.

13. Corrosion: An irreversible damage or destruction of material in which metals are gradually eaten up by the action of air, moisture due to a chemical or electrochemical reaction on the surface of metal.

14. Rancidity: It is the process of complete or incomplete oxidation or hydrolysis of fats and oils when exposed to air, light or moisture or by bacterial action resulting in unpleasant taste and odour.

15. Rusting: The slow conversion of iron into hydrated ferric oxide, in the presence of moisture and air.

16. Rust: A reddish or yellowish-brown flaking coating of iron oxide that is formed on iron or steel by oxidation, especially in the presence of moisture.

Multiple Choice Questions

17. Which of the following reactions is an exothermic reaction ?

- (a) Burning of coal.
- (b) Decomposition of vegetable matter into compost.
- (c) Process of respiration.
- (d) Decomposition of calcium carbonate to form quick lime and carbon dioxide.

Ans. (d) Decomposition of calcium carbonate to form quick lime and carbon dioxide.

Explanation :

Decomposition of calcium carbonate to form quick lime and carbon dioxide is an exothermic reaction since this process absorbs heat from atmosphere.

18. Burning of the candle is a _____ change.

- (a) physical
- (b) chemical
- (c) both (a) and (b)
- (d) none of these

Ans. (c) both (a) and (b)

Explanation :

Burning of the candle is both physical and chemical change. Burning of the candle melts the wax and hence physical state of wax has

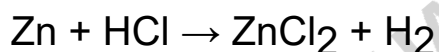
changed from solid to liquid. Again the wax combines with the atmospheric oxygen and changes to carbon dioxide, heat and light. Thus it is both a physical and the chemical change.

19. $\text{Zn} + \text{HCl} \rightarrow \text{ZnCl}_2 + \underline{\hspace{2cm}}$.

- (a) H_2
- (b) Cl_2
- (c) Zn
- (d) None of these

Ans. (a) H_2

Explanation :



Displacement reaction is a chemical reaction in which a more reactive element displaces a less reactive element from its compound. Both metals and non-metals take part in displacement reactions.

**20. Which among the following statement(s) is (are) true?
Exposure of silver chloride to sunlight for a long duration turns grey due to :**

[NCERT Exemplar]

- (i) The formation of silver by decomposition of silver chloride.
 - (ii) Sublimation of silver chloride.
 - (iii) Decomposition of chlorine gas from silver chloride.
 - (iv) Oxidation of silver chloride.
- (a) (i) only
 - (b) (i) and (iii)
 - (c) (ii) and (iii)

(d) (iv) only

Ans. (a) (i) only

Explanation :

Exposure of silver chloride to sunlight for a long duration turns silver chloride grey due to the photolysis reaction in which the decomposition of the silver chloride takes place in the presence of sunlight leading to the formation of silver.

21. The reaction which decomposes after the supply of heat is called ____.

(a) Thermal decomposition

(b) Combination reaction

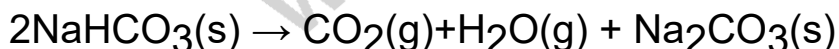
(c) Redox reaction

(d) Displacement reaction

Ans. (a) Thermal decomposition

Explanation :

A thermal decomposition reaction occurs when heat is applied to a compound causing it to decompose (break down) into multiple different chemical substances. An example is when baking soda (sodium bicarbonate) is heated.



22. In a double displacement reaction such as the reaction between sodium sulphate solution and barium chloride solution: [Board Question]

(i) exchange of atoms takes place.

(ii) exchange of ions takes place.

(iii) a precipitate is produced.

(iv) an insoluble salt is produced.

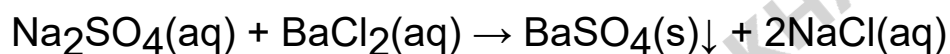
The correct option is :

- (a) (ii) and (iv)
- (b) (i) and (iii)
- (c) only (ii)
- (d) (ii), (iii) and (iv)

Ans. (d) (ii), (iii) and (iv)

Explanation :

In a double displacement reaction such as the reaction between sodium sulphate solution and barium chloride solution, sodium sulphate chemically reacts with barium chloride in the form of their aqueous solution to form an insoluble white precipitate of barium sulphate and sodium chloride.



(insoluble)

Here, exchange of ions takes place.

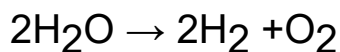
23. Electrolysis of water is a decomposition reaction. The mole ratio of hydrogen and oxygen gases liberated during electrolysis of water is _____. [NCERT Exemplar]

- (a) 1 : 1
- (b) 2 : 1
- (c) 4 : 1
- (d) 1 : 2

Ans. (b) 2 : 1

Explanation :

The mole ratio of hydrogen and oxygen gases liberated during the electrolysis of water is 2:1. Since two atoms of hydrogen and one atom of oxygen is present in the water molecule respectively.



24. What is the colour of the ash formed when a magnesium ribbon is burnt in the air?

- (a) White
- (b) Black
- (c) Yellow
- (d) Pink

Ans. (a) White

Explanation :

When the magnesium ribbon is burned in the air it burns with the white dazzling flame leading to the formation of the white colour ash which is magnesium oxide.

25. Which law should be kept in mind while we balance chemical equations?

- (a) Conservation of momentum
- (b) Conservation of mass
- (c) Conservation of energy
- (d) Conservation of frequency

Ans. (b) Conservation of mass

Explanation :

The law of conservation of mass states that “mass can neither be created nor destroyed.” So, both the sides of the chemical reactions have to be balanced to ensure that this law is followed and thus the number of the reactant and the product molecules remains same on both sides of the equation.

26. In which of the following, the identity of initial substance remains unchanged ? [Board Question]

- (a) Curdling of milk
- (b) Formation of crystals by process of crystallisation
- (c) Fermentation of grapes
- (d) Digestion of food

Ans. (b) Formation of crystals by process of crystallisation

Explanation :

Formation of crystals by process of crystallisation is the reaction in which the original identity of the substance remains as such since on heating the crystals they can again be converted in the powder form and again on cooling they can recrystallise.

27. Which one of the following processes involves a chemical reaction? [NCERT Exemplar]

- (a) Liquification of air
- (b) Heating copper wire in presence of air at high temperature
- (c) Keeping petrol in a china dish in the open
- (d) Storing of oxygen gas under pressure in a gas cylinder

Ans. (b) Heating copper wire in presence of air at high temperature

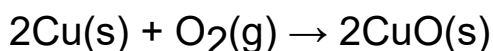
Explanation :

A physical change is the one in which the chemical properties of a substance do not change.

No chemical changes is observed when we store oxygen gas under pressure, or during liquefaction of air or when petrol is kept open in a china dish.

However, when we heat a copper wire in the presence of air, copper oxide is formed.

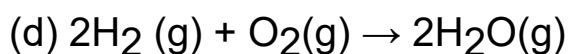
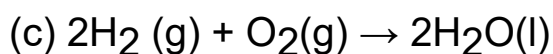
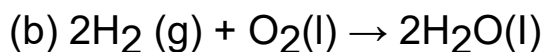
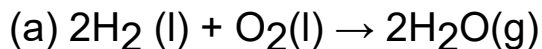
The reaction is as follows:



copper oxygen Heat copper (ii) oxide

Thus, heating of copper wire in presence of air at high temperature is an example of chemical reaction.

28. In which of the following chemical equations, the abbreviations represent the correct states of the reactants and products involved at reaction temperature? [NCERT Exemplar]

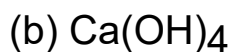
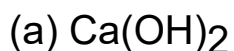


Ans. (c) $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l})$

Explanation :

Hydrogen and oxygen occurs in the gaseous state in nature whereas when they combine to form water the physical state of the matter converts to the liquid state.

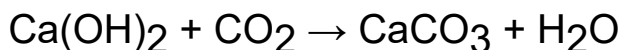
29. Which one of the following precipitates are formed when the carbon dioxide gas is passed through lime water?



Ans. (c) CaCO_3

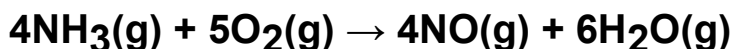
Explanation :

When carbon dioxide is passed through lime water, it turns milky due to formation of white precipitate of calcium carbonate.



30. The following reaction is an example of a:

[NCERT Exemplar]

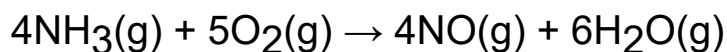


- (i) Displacement reaction
- (ii) Combination reaction
- (iii) Redox reaction
- (iv) Neutralisation reaction
- (a) (i) and (iv)
- (b) (ii) and (iii)
- (c) (i) and (iii)
- (d) (iii) and (iv)

Ans. (c) (i) and (iii)

Explanation :

The given reaction is an example of displacement and redox reaction since oxygen replaces hydrogen from the ammonia molecule leading to the formation of NO similarly O_2 is getting reduced in the reaction and ammonia is getting oxidised thus the redox reaction takes place in this reaction. Therefore, the below reaction is both the displacement and the redox reaction.



31. What does the symbol “↓” represent in a chemical reaction ?

- (a) Gas released
- (b) Solid state
- (c) Precipitate formed
- (d) Direction of reaction

Ans. (c) Precipitate formed

Explanation :

The downward arrow symbol “↓” represents the formation of the precipitate in a chemical reaction.

32. Which of the following reaction is not feasible?

- (a) Aluminium + Copper sulphate
- (b) Zinc + Copper sulphate solution
- (c) Iron + Zinc sulphate solution
- (d) Copper + Zinc sulphate

Ans. (d) Copper + Zinc sulphate

Explanation :

Copper + Zinc sulphate is not the feasible reaction since zinc is more reactive than copper and copper cannot displace it from its salt solution as per the reactivity series of metals.

33. A dilute ferrous sulphate solution was gradually added to the beaker containing acidified potassium permanganate solution. The light purple colour of the solution fades and finally disappears. Which of the following is the correct explanation for the observation ?

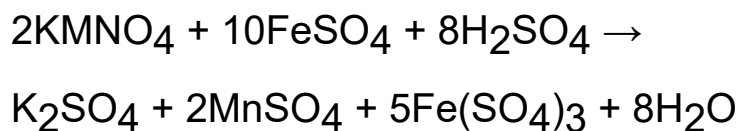
[NCERT Exemplar]

- (a) KMnO_4 is an oxidising agent, it oxidises FeSO_4 .
- (b) FeSO_4 acts as an oxidising agent and oxidises KMnO_4 .
- (c) The colour disappears due to dilution; no reaction is involved.
- (d) KMnO_4 is an unstable compound and decomposes in presence of FeSO_4 to a colourless compound.

Ans. (a) KMnO_4 is an oxidising agent, it oxidises FeSO_4 .

Explanation :

In this reaction, potassium permanganate (KMnO_4) is an oxidizing agent. It oxidises ferrous sulphate to ferric sulphate in the presence of dilute H_2SO_4 .



The solution is coloured purple because of the KMnO_4 and it eventually disappears when all the KMnO_4 in the solution is used.

34. Which of the following gases can be used for storage of fresh sample of an oil for a long time ?

- (a) Carbon dioxide
- (b) Nitrogen
- (c) Hydrogen
- (d) Helium

Ans. (d) Helium

Explanation :

Helium can be used to store the fresh samples of an oil for a long time since it is an inert gas and will not react with the sample of the food keeping its quality intact as such.

35. Shashank was asked to carry out a displacement reaction which would show the following :

- (i) Formation of colourless solution
- (ii) Black deposits

The reactants he should use are :

- (a) $\text{Fe}(\text{s})$ and $\text{Al}_2(\text{SO}_4)_3(\text{aq})$
- (b) $\text{Al}(\text{s})$ and $\text{FeSO}_4(\text{aq})$

(c) Zn(s) and $\text{CuSO}_4\text{(aq)}$

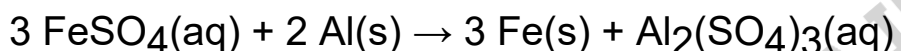
(d) Fe(s) and $\text{ZnSO}_4\text{(aq)}$

Ans. (b) Al(s) and $\text{FeSO}_4\text{(aq)}$

Explanation :

Aluminium being higher in reactivity series displaces iron in ferrous sulphate solution.

When aluminium metal is added to ferrous sulphate (FeSO_4) solution, the green colour of ferrous sulphate solution disappears and colourless solution is formed due to the formation of aluminium sulphate solution and greyish black iron gets deposited.



Green Greyish Colourless

solution black deposit solution

36. The oxidation reaction which produces heat and light is called :

(a) Endothermic

(b) Photochemical

(c) Exothermic

(d) Combustion

Ans. (d) Combustion

Explanation :

A combustion reaction is a kind of chemical reaction in which a reaction between any combustible substance and an oxidiser takes place in order to form an oxidised product accompanied by the evolution of heat and light during the reaction.

37. Heating of ferrous sulphate is a type of :

(a) Decomposition reaction

(b) Combination Reaction

(c) Displacement reaction

(d) All of the above

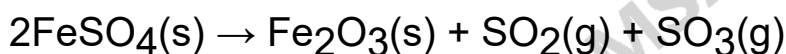
Ans. (a) Decomposition reaction

Explanation :

A decomposition reaction is a reaction in which a compound breaks down into two or more simpler substances. Most decomposition reactions require an input of energy in the form of heat, light, or electricity.

The heating of ferrous sulphate is a decomposition and an endothermic reaction because it involves absorption of heat to form ferric oxide (Fe_2O_3), sulphur dioxide (SO_2) and sulphur trioxide (SO_3). The equation for this reaction can be written as:

heat



38. To balance $\text{Al}(\text{OH})_3 + \text{HNO}_3 \rightarrow \text{Al}(\text{NO}_3)_3 + \text{H}_2\text{O}$, number of HNO_3 molecules required will be :

(a) 2

(b) 4

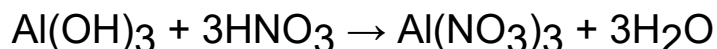
(c) 3

(d) 8

Ans. (c) 3

Explanation :

Three molecules of HNO_3 are required to balance the given chemical reaction and to satisfy the law of conservation of mass.



39. Which metal is displaced when lead is put in the solution of copper chloride ?

- (a) Lead
- (b) Copper
- (c) Chlorine
- (d) All of these

Ans. (b) Copper

Explanation :

Copper will be displaced from the solution since it is less reactive than lead and lead will displace copper from its salt solution because it is more reactive than copper.

40. What is the name of the process where fatty foods become rancid?

- (a) Corrosion
- (b) Oxidation
- (c) Reduction
- (d) Hydrogenation

Ans. (b) Oxidation

Explanation :

Fatty foods become rancid due to the process of Oxidation. Food turns rancid when the fats and oils within them get oxidised and the taste and smell of the food changes. It is produced by aerial oxidation of unsaturated fat present in foods and other products, marked by unpleasant odour or flavour.

41. Rancidity can be prevented by:

- (a) adding antioxidants
- (b) storing food away from light

(c) keeping food in refrigerator

(d) all of the above

Ans. (d) all of the above

Explanation :

Rancidity can be prevented by packing fat and oil-containing foods in nitrogen gas. It can be retarded by keeping food in a refrigerator. It can also be retarded by storing food in air-tight containers and away from light in order to prevent their decomposition.

Assertion and Reasoning Based Questions

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as

(a) Both assertion and reason are correct and reason is the correct explanation of assertion.

(b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

(c) Assertion is true, but reason is false.

(d) Assertion is false, but reason is true.

42. Assertion: Chemical equations should be balanced.

Reason: As per the law of conservation of mass, mass can neither be created nor be destroyed.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

The chemical equations should be balanced because as per the law of conservation of mass—"mass can neither be created nor be destroyed". Therefore number of atoms on both the sides of the equations should be equal. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

43. Assertion: Colour of copper sulphate solution changes when an iron nail is kept immersed in it.

Reason: The colour of copper sulphate solution changes when iron nail is kept immersed in it due to the decomposition reaction taking place between iron and copper leading to formation of iron sulphate.

Ans. (c) Assertion is true, but reason is false.

Explanation :

The colour of copper sulphate solution changes when iron nail is kept immersed in it due to the displacement reaction iron displaces copper from copper sulphate solution leading to the formation of iron sulphate. Thus, assertion is true but reason is false.

44. Assertion: Photosynthesis is considered as an exothermic reaction.

Reason: Photosynthesis is an endothermic reaction because sunlight energy is absorbed by green plants during this process.

Ans. (d) Assertion is false, but reason is true.

Explanation :

Photosynthesis is an endothermic reaction because sunlight energy is absorbed by green plants during this process. Thus, assertion is false but reason is true.

45. Assertion: Silver articles become black after sometime when exposed to sunlight.

Reason: It is because silver reacts with carbonates present in the air.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Silver reacts with sulphur present in the air and forms a layer of silver sulphide, therefore, silver articles get tarnished or become black after sometime when exposed to sunlight. Thus, assertion is true but reason is false.

46. Assertion: Hydrogen peroxide is kept in coloured bottles.

Reason: Hydrogen peroxide is a moderately reactive metal that can react with light or heat slowly to produce water.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Hydrogen peroxide is a highly reactive metal that can react with light or heat to produce water. It decomposes into water and oxygen in the presence of sunlight. To prevent this reaction with light and heat it is stored in coloured bottles so that light cannot pass through it. Thus, assertion is true, but reason is false.

47. Assertion: Silver bromide is kept in the coloured bottles.

Reason: It is because it decomposes in presence of light.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Silver bromide is kept in coloured bottles because it decomposes in presence of light, so as to prevent this decomposition; it is kept in coloured bottles. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

48. Assertion: Hydrogen is not included in the activity series of metals.

Reason: It is because it can lose electrons to form positive ions.

Ans. (d) Assertion is false, but reason is true.

Explanation :

Hydrogen is included in activity series of metals because like metals, hydrogen can also lose electrons to form positive ions. Thus, assertion is false but reason is true.

49. Assertion: Copper vessels get covered with green coating in

rainy season.

Reason: It is because of the formation of copper carbonate.

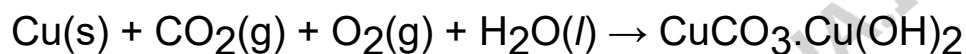
Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Copper vessel gets covered with a green coating in rainy season because when copper vessel is exposed to air in rainy season, the metal reacts with moisture and atmospheric gases to form basic copper carbonate.

Basic copper carbonate – $\text{Cu}_2\text{CO}_3(\text{OH})_2$

(green in colour)



moist air

Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

50. Assertion: Gold and silver do not corrode in moist air.

Reason: It is because they have low reactivity.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Gold and silver lie very low in the activity series of metals. Thus, they have low reactivity and hence do not corrode in moist air. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

51. Assertion: Paint is applied on the iron articles.

Reason: To protect them from rain.

Ans. (c) Assertion is true, but reason is false.

Explanation :

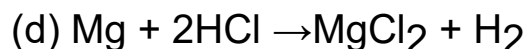
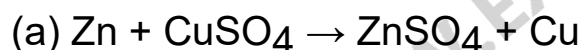
Iron articles are painted to prevent them from rusting. Thus, assertion is true but reason is false.

Case Based Questions

52. Read the passage carefully and answer the following questions from (i) to (v):

Equations must always be balanced. The numbers of atoms of each type involved in a chemical reaction are the same on the reactant and product sides of the equation. In a combination reaction, two or more substances combine to form a new single substance. In a decomposition reaction, a single substance decomposes to give two or more substances. When an element displaces another element from its compound, a displacement reaction occurs. Reactions also involve the gain or loss of oxygen or hydrogen by substances. Oxidation is the gain of oxygen or loss of hydrogen. Reduction is the loss of oxygen or gain of hydrogen.

(i) Which of the following reactions is not correct?



Ans. (b) $2\text{Ag} + \text{Cu}(\text{NO}_3)_2 \rightarrow 2\text{AgNO}_3 + \text{Cu}$

(ii) Which of the following is not a displacement reaction?

(a) Calcium hydroxide + Carbon dioxide \rightarrow Calcium carbonate + Water

(b) Barium chloride + Potassium sulphate \rightarrow Barium sulphate + Potassium chloride

(c) Aluminium + Copper chloride \rightarrow Aluminium chloride + Copper

(d) Potassium bromide(aq) + Barium iodide(aq) \rightarrow Potassium iodide(aq) + Barium bromide(s)

Ans. (a) Calcium hydroxide + Carbon dioxide \rightarrow Calcium carbonate + Water

(iii) Identify the correct chemical reaction.

(a) Hydrogen sulphide gas burns in air to give water and sulphur.

(b) Potassium metal reacts with water to give potassium hydroxide and water.

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(d) Zinc reacts with silver nitrate to form zinc nitrite and silver.

Ans. (c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(iv) Which of the following reaction will evolve hydrogen gas with a pop sound?

(a) Concentrated nitric acid is reacted with sulphur.

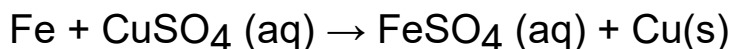
(b) A small piece of zinc is added to dilute hydrochloric acid.

(c) Ammonia is passed over heated copper (II) oxide.

(d) Lead Nitrate is heated strongly in a test tube.

Ans. (b) A small piece of zinc is added to dilute hydrochloric acid.

(v) Identify the type of reaction in the following:



(a) Oxidation Reaction

(b) Redox Reaction

(c) Combustion Reaction

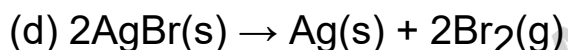
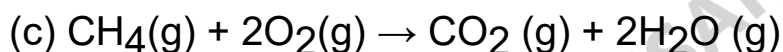
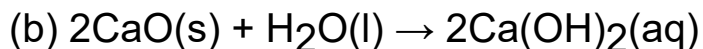
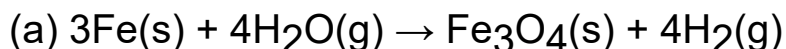
(d) None of these

Ans. (b) Redox reaction

53. Read the passage carefully and answer the following questions from (i) to (v):

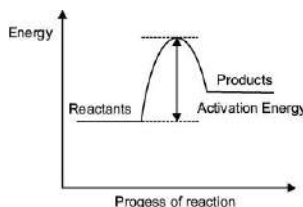
Balanced chemical equation has an equal number of atoms of different elements in the reactants and products. According to law of conservation of mass, matter can neither be created nor be destroyed in a chemical reaction.

(i) Which of the following equation are balanced?



Ans. (a) $3\text{Fe(s)} + 4\text{H}_2\text{O(g)} \rightarrow \text{Fe}_3\text{O}_4\text{(s)} + 4\text{H}_2\text{(g)}$

(ii) The following represent the exothermic reaction. The reactants react to form product, with the release of energy in the form of heat.



Which of the following involve an exothermic reaction?

(a) Respiration

(b) Oxidation

(c) Combustion

(d) All of these

Ans. (d) All of these

(iii) When the powder of a common metal is heated in an open china dish, its colour turns black. However, when hydrogen is passed over the hot black substance so formed, it regains its original colour. What type of chemical reaction takes place in each of the two given steps?

(a) First oxidation reaction then displacement reaction

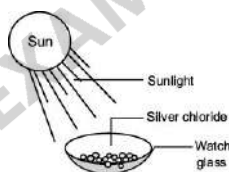
(b) First combustion reaction, then reduction reaction

(c) First oxidation reaction, then redox reaction

(d) First reduction reaction, then redox reaction

Ans. (c) First oxidation reaction, then redox reaction

(iv) Study the given diagram in which white powder of silver chloride was left open in sunlight. After few hours, it was observed that the white powder changed to silvery material. What type of reaction is it?



(a) Displacement reaction

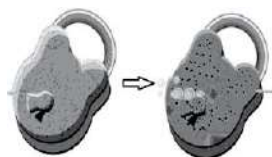
(b) Decomposition reaction

(c) Redox reaction

(d) Corrosion

Ans. (b) Decomposition reaction

(v) After rain, Shreya observed that the iron lock of the main gate of her house had a reddish-brown powdery covering. She cleaned the lock using sandpaper and found the shiny, non-corroded layer beneath. What could she do to prevent such reaction to occur?



- (a) To buy a new similar lock.
- (b) To coat the surface with a layer of paint.
- (c) To clean the lock using sandpaper regularly.
- (d) To buy a gold lock instead of iron lock.

Ans. (b) To coat the surface with a layer of paint.

54. Read the passage carefully and answer the following questions from (i) to (v):

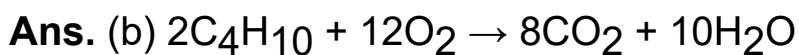
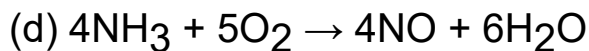
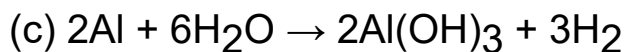
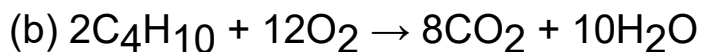
Situations of daily life can be represented by equations in few variables. In the same way, chemical reactions can be represented with the help of symbols of elements and formulae of the substances involved. This method of writing a reaction is known as a chemical equation. The substances which combine to react are known as reactants and new substances produced are known as products. An unbalanced chemical equation needs to be balanced which means that an equal number of atoms of different elements are present in the reactant as well as in the product side. Most importantly, the formulae of the compounds are not altered while balancing the equation.

(i) Chemical equations balancing is in accordance with:

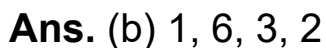
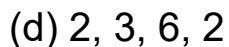
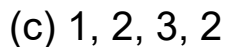
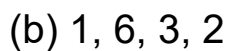
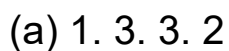
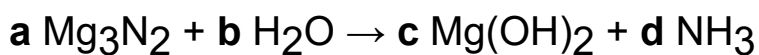
- (a) Law of constant proportions
- (b) Law of combining volumes
- (c) Law of conservation of mass
- (d) Both (a) and (c)

Ans. (c) Law of conservation of mass

(ii) The chemical equation which is unbalanced is:



(iii) In the given balanced equation, the coefficients **a**, **b**, **c**, **d** respectively are:



(iv) Which of the following is not conveyed by a balanced chemical equation?

(a) If a particular reaction is practically feasible or not.

(b) Symbols and formulae of all the reactants.

(c) Number of atoms and molecules of the products formed.

(d) The physical state of reactants and products.

Ans. (a) If a particular reaction is practically feasible or not.

(v) Which of the following is true for an unbalanced chemical equation?

(a) The number of atoms is more on the right side of the equation

(b) The number of atoms is less on the left side of the equation

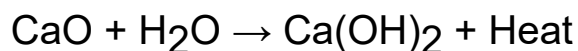
(c) The number of atoms is equal on both sides of the equation

(d) Both (a) and (b)

Ans. (d) Both (a) and (b)

55. Read the passage carefully and answer the following questions from (i) to (v).

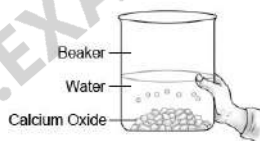
When two or more reactants combine to form a single product, the reaction is named a combination reaction. For example, calcium oxide reacts vigorously with water to form calcium hydroxide. The reaction is highly exothermic in nature. Lot of heat is produced during the reaction.



Calcium Calcium

oxide hydroxide

Solution of calcium hydroxide is used to white-wash walls. It reacts slowly with carbon dioxide present in the air to form a thin layer of carbonate which gives a shiny appearance.



(i) The chemical name of quick lime is:

- (a) Calcium oxide
- (b) Calcium carbonate
- (c) Calcium hydroxide
- (d) Carbon dioxide

Ans. (a) Calcium oxide

(ii) On passing carbon dioxide through lime water:

- (a) Calcium hydroxide is formed
- (b) A white precipitate of CaO is formed

- (c) Lime water turns milky
- (d) Colour of lime water turns green

Ans. (c) Lime water turns milky

(iii) Following observations were recorded when calcium oxide reacts vigorously with water. Identify the incorrect observations:

- I. It is an endothermic reaction
- II. slaked lime is produced
- III. Quick lime is produced
- IV. It is an exothermic reaction

- (a) I and II
- (b) III and IV
- (c) I and III
- (d) II and IV

Ans. (c) I and III

(iv) Quick lime combines vigorously with water to form Y which reacts slowly with carbon dioxide in the air to form Z.

[Y] [Z]

- (a) Calcium carbonate calcium hydroxide
- (b) Calcium hydroxide calcium carbonate
- (c) Calcium calcium bicarbonate
- (d) Calcium bicarbonate calcium metal

Ans. (b) **[Y] [Z]**

Calcium hydroxide calcium carbonate

(v) Which of the following is an endothermic reaction?

- (a) Combination of carbon and oxygen to form carbon monoxide
- (b) Combination of nitrogen and oxygen to form nitrogen monoxide

(c) Combination of glucose and oxygen to form carbon dioxide and water

(d) Combination of zinc and hydrochloric acid to form zinc chloride and hydrogen

Ans. (b) Combination of nitrogen and oxygen to form nitrogen monoxide

56. Read the passage carefully and answer the following questions from (i) to (v).

A decomposition reaction is opposite to a combination reaction. A single reactant breaks down to form two or more products in a decomposition reaction. Thermal decomposition reaction uses the energy in form of heat for decomposition reactants. Electrolytic decomposition reactions involves the use of electrical energy for the breakage of reactant molecules. Photolysis or photochemical decomposition involves the use of light energy.

(i) Name the component of our diet, decomposition of which produces the amino acid.

(a) Starch

(b) Protein

(c) Carbohydrate

(d) Fat

Ans. (b) Protein

(ii) Silver chloride(AgCl) when exposed to sunlight for a long duration turns grey.

Consider the following statements:

I. The formation of silver by decomposition of silver chloride

II. Sublimation of silver chloride

III. Decomposition of chlorine gas from silver chloride

IV. Oxidation of silver chloride

- (a) Only I
- (b) Only I and II
- (c) Only II and III
- (d) Only IV

Ans. (a) Only I

(iii) Which of the following is a decomposition reaction?

- (a) $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- (b) $\text{NH}_4\text{CNO} \rightarrow \text{H}_2\text{NCONH}_2$
- (c) $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$
- (d) $\text{H}_2 + \text{I}_2 \rightarrow 2\text{HI}$

Ans. (c) $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$

(iv) $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + \text{nA} + \text{O}_2$

What is **nA** in the given reaction?

- (a) 4NO
- (b) 4NO_2
- (c) 2PbNO_2
- (d) NO_2

Ans. (b) 4NO_2

(v) When electricity is passed through water what kind of reaction takes place?

- (a) Thermal decomposition
- (b) Electrolytic decomposition
- (c) Photochemical decomposition

(d) Displacement reaction

Ans. (b) Electrolytic decomposition

57. Read the passage carefully and answer the following questions from (i) to (v).

During a chemical reaction, it is possible that one element takes place of another element in a compound. Such reactions are called displacement reactions. Precisely, an element that is high in the reactivity series displaces an element that is lower in the reactivity series. In single displacement reactions, only one element displaces the other element from its compound. The displacement reaction between iron(III) oxide and powdered aluminum produces so much heat that iron gets into its molten state.

(i) Copper displaces which of the following metals from its salt solution?

(a) ZnSO_4

(b) FeSO_4

(c) AgNO_3

(d) NiSO_4

Ans. (c) AgNO_3

(ii) Characteristic of the gas evolved during the reaction of zinc with dilute sulphuric acid is:

(a) Green in colour having a foul smell

(b) Colourless, odourless, and burns with a pop sound

(c) Red in colour having a sweet smell

(d) Colourless, pungent-smelling and burns with a pop sound

Ans. (b) Colourless, odourless and burns with a pop sound

(iii) A reddish-brown residue is obtained when dry hydrogen is

passed over a heated oxide of metal M. This residue could be:

- (a) Lead
- (b) Silver
- (c) Copper
- (d) Zinc

Ans. (c) Copper

(iv) Which among the following is a displacement reaction?

- (a) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$
- (b) $\text{MgCO}_3 \rightarrow \text{Mg} + \text{CO}_2$
- (c) $\text{Mg} + \text{CuSO}_4 \rightarrow \text{MgSO}_4 + \text{Cu}$
- (d) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$

Ans. (c) $\text{Mg} + \text{CuSO}_4 \rightarrow \text{MgSO}_4 + \text{Cu}$

(v) Which is the correct observation for the reaction between granulated zinc and dilute hydrochloric acid?

- (a) The reaction mixture turns milky.
- (b) Greenish-yellow gas is involved.
- (c) The colourless and odourless gas evolves with a pop sound.
- (d) The surface of the metal turns shining.

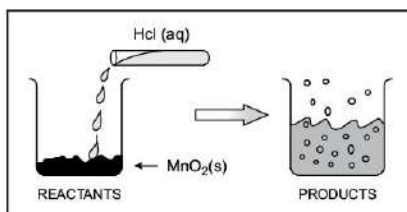
Ans. (c) The colourless and odourless gas evolves with a pop sound.

58. Read the passage carefully and answer the following questions from (i) to (v).

[CBSE Question Bank]

The reaction between MnO_2 with HCl is depicted in the following diagram. It was observed that a gas with bleaching abilities was

released.



(i) The chemical reaction between MnO_2 and HCl is an example of:

- (a) displacement reaction
- (b) combination reaction
- (c) redox reaction
- (d) decomposition reaction

Ans. (c) redox reaction

(ii) Chlorine gas reacts with _____ to form bleaching powder.

- (a) dry Ca(OH)_2
- (b) dil. solution of Ca(OH)_2
- (c) conc. solution of Ca(OH)_2
- (d) dry CaO

Ans. (a) dry Ca(OH)_2

(iii) Identify the correct statement from the following:

- (a) MnO_2 is getting reduced whereas HCl is getting oxidised.
- (b) MnO_2 and HCl both are getting reduced.
- (c) MnO_2 and HCl both are getting oxidised.
- (d) None of the above

Ans. (a) MnO_2 is getting reduced whereas HCl is getting oxidised

(iv) In the above discussed reaction, what is the nature of MnO_2 ?

- (a) Acidic oxide
- (b) Basic oxide
- (c) Neutral oxide
- (d) Amphoteric oxide

Ans. (b) Basic oxide

(v) What will happen if we take dry HCl gas instead of aqueous solution of HCl?

- (a) Reaction will occur faster
- (b) Reaction will not occur
- (c) Reaction rate will be slow
- (d) Reaction rate will remain the same

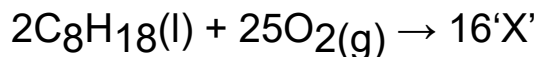
Ans. (b) Reaction will not occur

59. Read the passage carefully and answer the following questions from (i) to (v).

[CBSE Question Bank]

Chemistry in Automobiles:

For an internal combustion engine to move a vehicle down the road, it must convert the energy stored in the fuel into mechanical energy to drive the wheels. In your car, the distributor and battery provide this starting energy by creating an electrical “spark”, which helps in combustion of fuels like gasoline. Below is the reaction depicting complete combustion of gasoline in full supply of air:



(i) Which of the following are the products obtained from the reaction mentioned in the above case?

Product ‘X’ Product ‘Y’

- (a) CO_2 H_2O_2

(b) H_2O CO

(c) CH_3OH H_2O

(d) CO_2 H_2O

Ans. (d) Product 'X' Product 'Y'

CO_2 H_2O

(ii) Identify the types of chemical reaction occurring during the combustion of fuel:

(a) Oxidation and Endothermic reaction

(b) Decomposition and Exothermic reaction

(c) Oxidation and Exothermic reaction

(d) Combination and Endothermic reaction

Ans. (c) Oxidation and Exothermic reaction

(iii) On the basis of evolution/absorption of energy, which of the following processes are similar to combustion of fuel?

I. Photosynthesis in plants

II. Respiration in the human body

III. Decomposition of vegetable matter

IV. Decomposition of ferrous sulphate.

(a) II and III

(b) I and II

(c) III and IV

(d) II and I

Ans. (a) II and III

(iv) 'A student while walking on the road observed that a cloud of black smoke bleached out from the exhaust stack of moving trucks on the road.' Choose the correct reason for the production of black

smoke:

- (a) Limited supply of air leads to incomplete combustion of fuel.
- (b) Rich supply of air leads to complete combustion of fuel.
- (c) Rich supply of air leads to a combination reaction.
- (d) Limited supply of air leads to complete combustion of fuel.

Ans. (a) Limited supply of air leads to incomplete combustion of fuel.

(v) 'Although nitrogen is the most abundant gas in the atmosphere, it does not take part in combustion'. Identify the correct reason for this statement.

- (a) Nitrogen is a reactive gas
- (b) Nitrogen is an inert gas
- (c) Nitrogen is an explosive gas
- (d) Only hydrocarbons can take part in combustion

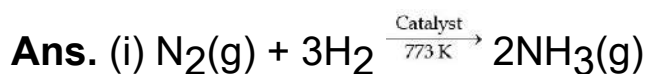
Ans. (b) Nitrogen is an inert gas

Chemical Equations and Reactions

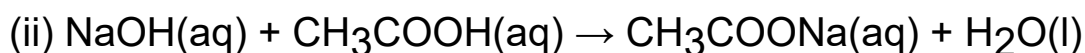
60. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case:

- (i) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773 K to form ammonia gas.
- (ii) Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.
- (iii) Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H_2SO_4 .
- (iv) Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.
- (v) Potassium chloride on mixing with silver nitrate solution, forms an insoluble white substance.

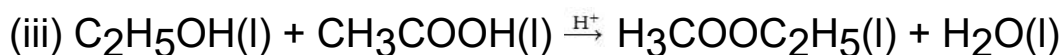
(vi) Ferrous sulphate decomposes with the evolution of a gas having a characteristic odour of burning sulphur.



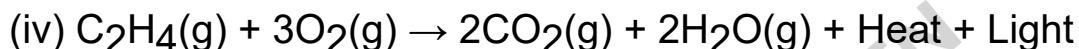
Combination Reaction



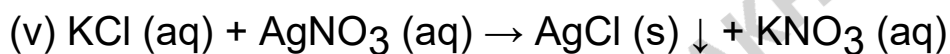
Double displacement reaction or Neutralisation reaction



Double displacement reaction or Esterification reaction



Redox reaction or Combustion reaction



Double displacement and precipitation reaction



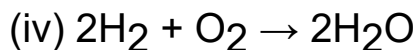
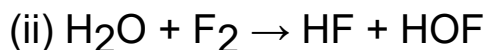
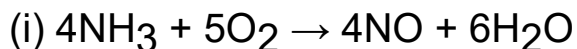
Thermal decomposition reaction

61. Which among the following changes are exothermic or endothermic in nature?

- (i) Decomposition of ferrous sulphate
- (ii) Dilution of sulphuric acid
- (iii) Dissolution of sodium hydroxide in water
- (iv) Dissolution of ammonium chloride in water

Ans. (i) (i) and (iii) are exothermic as heat is released in these changes. (ii) and (iv) are endothermic as heat is absorbed in these changes.

62. Identify the reducing agent in the following reactions:



Ans. (i) Ammonia (NH_3)

(ii) Water (H_2O) as F_2 is getting reduced to HF

(iii) Carbon monoxide (CO)

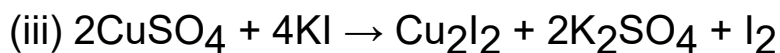
(iv) Hydrogen (H_2)

63. Write the balanced chemical equations for the following reactions :

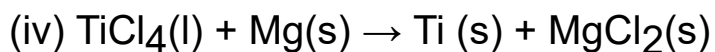
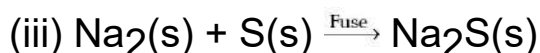
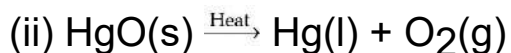
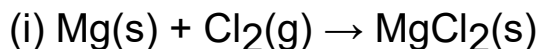
(i) Sodium carbonate reacts with hydrochloric acid in equal molar concentrations.

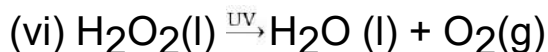
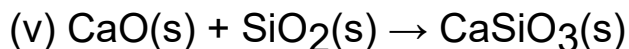
(ii) Sodium hydrogencarbonate reacts with hydrochloric acid.

(iii) Copper sulphate reacts with potassium iodide.

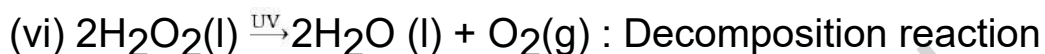
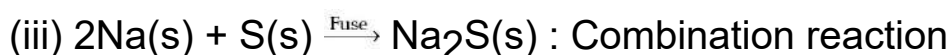
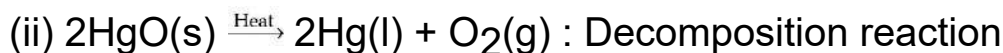


64. Balance the following chemical equations and identify the type of chemical reaction.

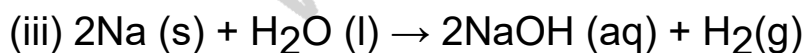
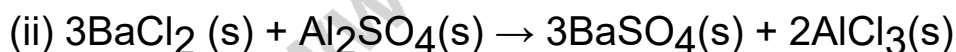
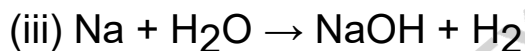
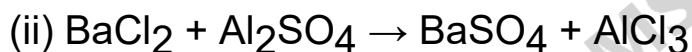
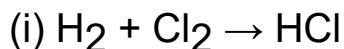




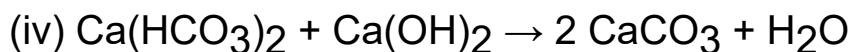
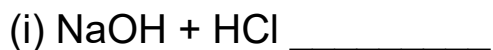
Ans. (i) Balanced : Combination reaction

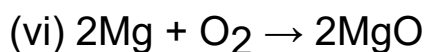
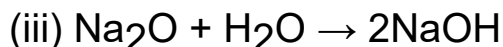
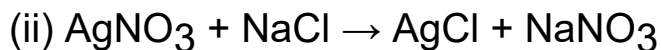
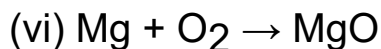


65. Write the balanced equation for the following chemical reactions.



66. Complete the following reaction :





67. Classify the following reactions :

(i) Reaction of magnesium and oxygen to form magnesium oxide.

(ii) Heating of calcium carbonate.

(iii) Reaction of potassium hydroxide and nitric acid to form potassium nitrate and water.

(iv) Reaction of zinc oxide and carbon to form zinc and carbon monoxide.

Ans. (i) Combination reaction

(ii) Decomposition reaction

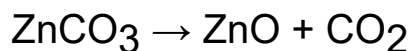
(iii) Neutralisation reaction

(iv) Redox reaction

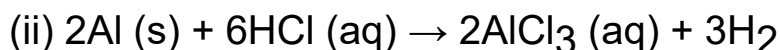
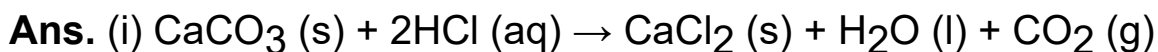
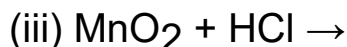
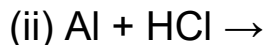
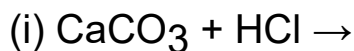
68. What happens when ZnCO_3 is heated in the absence of air ?

Give the relevant equation. [\[Board Question\]](#)

Ans. When ZnCO_3 is heated in the absence of air, zinc oxide (ZnO) and carbon dioxide (CO_2) are formed. The chemical equation can be represented as:



69. Complete and balance the following chemical equation:
[Board Question]



70. Write balanced chemical equation for the following reactions:

Or

Write chemical equation reactions taking place when carried out with the help of:

(i) NaOH solution is heated with zinc granules.

(ii) Excess of carbon dioxide gas is passed through lime water.

(iii) Dilute sulphuric acid reacts with sodium carbonate.

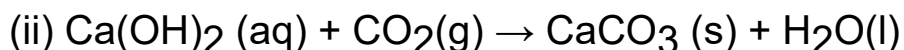
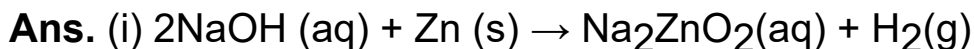
(iv) Egg shells are dropped in hydrochloric acid.

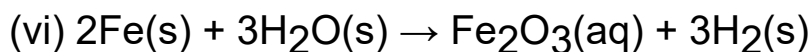
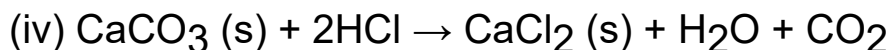
(v) Copper (II) oxide reacts with dilute hydrochloric acid.

(vi) Iron reacts with steam

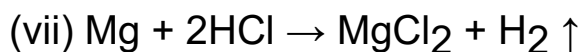
(vii) Magnesium reacts with dil. HCl

(viii) Copper is heated in air. **[Board Question]**





Iron Steam Iron (III) oxide Hydrogen



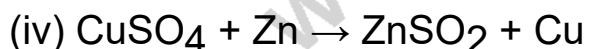
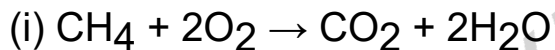
Magnesium Hydrogen Magnesium Hydrogen
chloride chloride gas



Copper Oxygen Copper oxide

71. Identify the type of reaction(s) in the following equations.

[Board Question]



Ans. (i) Combustion reaction and oxidation reaction.

(ii) Double displacement reaction and precipitation reaction.

(iii) Combination reaction.

(iv) Displacement reaction.

72. Identify the type of chemical reaction in the following statements and define each of them.

(i) Digestion of food in the body.

(ii) Rusting of iron.

(iii) Heating of manganese dioxide with aluminium powder.

(iv) Blue colour of copper sulphate solution disappears when iron filings are added to it.

(v) Dilute hydrochloric acid is added to sodium hydroxide solution to form sodium chloride and water.

[Board Question]

Ans. (i) Digestion of food is an example of decomposition reaction because the food we eat mainly contains carbohydrates, proteins, fats. These are decomposed into smaller units such as glucose, amino acids and fatty acids in the presence of enzymes present in the body.

(ii) Rusting of iron is an example of oxidation reaction. In this process, iron reacts with oxygen and moisture present in atmosphere and forms brown layer of iron oxide called rust.

(iii) It is an example of displacement reaction, as more reactive Al metal displaces Mn from its salt solution.

(iv) Blue colour of copper sulphate solution disappears when iron filings are added to it. It is also a displacement reaction. In this reaction, Fe displaces copper from copper sulphate solution as iron is more reactive than copper.

(v) Dilute hydrochloric acid is added to sodium hydroxide solution to form sodium chloride and water. It is an example of neutralisation reaction. In this reaction, an acid and a base react to form salt and water.

73. Write the balanced chemical equations for the following reactions:

(i) Calcium hydroxide + Carbon dioxide \rightarrow Calcium carbonate + Water

(ii) Aluminium + Copper chloride \rightarrow Aluminium chloride + Copper solution

Ans. (iii) $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

(iv) $2\text{Al} + 3\text{CuCl}_2 \rightarrow 2\text{AlCl}_3 + 3\text{Cu}$

Reasoning Based Questions

74. Why should an equation be balanced?

Ans. An equation should be balanced because according to Law of Conservation of Mass, mass can neither be created nor be destroyed. Therefore, the number of atoms on both the sides of equation must be equal.

75. Why it is advisable to show the physical states of substance when writing a chemical equation?

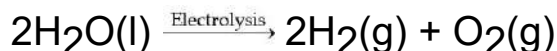
Ans. It is advisable to show the physical state of substance to make it more informative and to emphasise that those reactions occur in that manner only under those conditions. Hence, physical states of reactants and products are mentioned while writing a chemical equation.

76. Why are decomposition reactions called the opposite of combination reactions ? Write equations for these reactions.

[NCERT]

[Board Question]

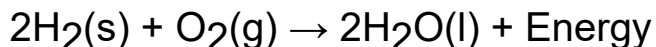
Ans. Decomposition reactions are those in which a compound breaks down to form two or more substances.



These reactions require a source of energy to proceed.

In case of combination reactions, two or more substances combine to give a new substance with the release of energy. Thus, both the

reactions are opposite.



77. Why displacement reaction is also known as single displacement reaction?

Ans. A displacement reaction is also known as single displacement reaction because in this reaction only one metal or ion replaces the other metal or ion.

78. Why is hydrogen peroxide kept in coloured bottles?[Board Question]

Ans. Hydrogen peroxide is a highly reactive metal, it reacts with light or heat and decomposes into water and oxygen. To prevent this reaction with light and heat, it is stored in coloured bottles so that light cannot pass through it.

79. Why silver bromide is kept in coloured bottles?

Ans. Silver bromide (AgBr) is sensitive to sunlight. When exposed to it, the salt decomposes into silver (grey in colour) and bromine. In order to prevent this decomposition, silver bromide is kept in dark coloured bottles so that sunlight may not fall on it.

80. Why do we apply paint on iron articles?[NCERT]

Ans. Iron articles are painted to prevent them from rusting. When iron articles are painted, the contact of iron articles from moisture and air is cut off. Therefore, rusting is prevented.

81. Why should a magnesium ribbon be cleaned before burning in air? [NCERT]

Ans. Magnesium is a very reactive metal, it reacts with oxygen to form a layer of magnesium oxide on its surface when stored. This layer of magnesium oxide is quite stable and prevents further reaction of magnesium with oxygen. Hence, this layer is removed by cleaning magnesium ribbon by sand paper so that the underlying

metal can be exposed into air.

82. Why is respiration considered an exothermic reaction? Explain. [NCERT]

Ans. In human beings, energy is obtained from the food we eat. During digestion of food, large molecules of food like carbohydrates, proteins etc. are broken down into simpler substances such as glucose, amino acids etc. Glucose combines with oxygen in the cells and provides energy. The special name of this combustion reaction is respiration. Since energy is released in the whole process, it is an exothermic process.

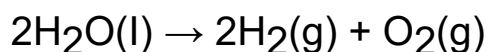
83. Why is photosynthesis considered an endothermic reaction?

Ans. Photosynthesis is an endothermic reaction because sunlight energy is absorbed by green plants during this process and any chemical reactions that absorb heat energy from the surroundings to form products is termed as the endothermic reaction.

84. In electrolysis of water, why is the volume of gas collected over one electrode double that of gas collected over the other electrode ?[NCERT]

[Board Question]

Ans. In electrolysis, water is decomposed in the presence of electricity to its components. The reaction is shown as below:

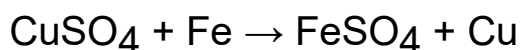


As you can see that water (H_2O) contains two parts hydrogen and one part oxygen. Therefore, the amount of hydrogen and oxygen produced during electrolysis of water is in a 2 : 1 ratio. Since, the number of molecules of hydrogen released is double the number of molecules of oxygen released, Volume occupied by hydrogen gas is double the volume occupied by oxygen gas.

Hence, electrode at which hydrogen gas is collected (Cathode) shows double the volume than the electrode at which oxygen gas is collected (Anode).

85. Why does the colour of copper sulphate solution change when an iron nail is dipped in it? [NCERT]

Ans. When an iron nail is placed in a copper sulphate solution, iron being more reactive displaces copper from copper sulphate solution and forms iron sulphate, which is green in colour. Therefore, the blue colour of copper sulphate solution fades and green colour appears.



Copper Sulphate Iron Iron Sulphate Copper

Blue Colour Green Colour

86. Why copper does not react with dilute sulphuric acid?

Ans. Copper does not react with dilute sulphuric acid because it is less reactive than hydrogen and therefore, cannot displace hydrogen from acids.

87. Why do silver articles becomes black after sometimes when exposed to air? [Board Question]

Ans. Silver reacts with sulphur present in the air and forms a layer of silver sulphide which is black in colour. Therefore, silver article gets tarnished or becomes black when exposed to air:

88. Answer the following questions:

(i) What is meant by corrosion? [Board Question]

(ii) Why do aluminium sheets not corroded easily?

(iii) Why is copper vessel covered within green coating in rainy season?

Ans. (i) Corrosion is defined as the process where materials, usually metals, deteriorate as a result of a chemical reaction with air,

moisture, chemicals, etc. For example, iron, in the presence of moisture, reacts with oxygen to form hydrated iron oxide.

(ii) Aluminium forms a protective covering of its oxide on the surface which protects it from corrosion.

(iii) Copper vessel is covered within green coating in rainy season due to corrosion.

89. Oil and fat containing food items are flushed with nitrogen. Why? [NCERT]

OR

Explain why, food products containing fats and oils (like potato chips) are packaged in nitrogen.

Ans. Oil and fat containing food items are flushed with nitrogen because it is an inert gas and does not easily react with these substances. On the other hand, oxygen reacts with food substances and makes them rancid. Thus, bags used in packing food items are flushed with nitrogen gas to remove oxygen inside the pack. When oxygen is not present inside the pack, rancidity of oil and fat containing food items is avoided.

Very Short Answer Type Questions

90. What is meant by a chemical reaction?

[Board Question]

Ans. The reaction representing a chemical change is called a chemical reaction. In a chemical reaction, the bonds are broken within reactant molecules and new bonds are formed within product molecules in order to form a new substance.

91. What is a chemical equation?

Ans. The representation of a chemical reaction by using symbols and formulae of the reactants and the products is called a chemical

equation.

92. State one basic difference between a physical change and a chemical change. [Board Question]

Ans. The basic difference between a physical change and chemical change is that in a physical change, no new substance(s) formed, whereas in a chemical change, new substance(s) is formed.

93. Name and state the Law which is kept in mind while we balance a chemical reaction?

[Board Question]

OR

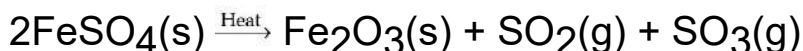
Why should a chemical equation be balanced?

[NCERT]

Ans. The balancing of chemical equation is based on the 'Law of Conservation of Mass'. This law states that, "Mass can neither be created nor be destroyed during a chemical reaction". Thus, the chemical equation should always be balanced.

94. Ferrous sulphate decomposes with the evolution of a gas having a characteristic odour of burning sulphur. Write the chemical reaction involved and identify the type of reaction.

Ans. It is a thermal decomposition reaction:



95. A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed. Write the chemical reaction involved and also mention the type of the chemical reaction?

Ans. $\text{KCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \rightarrow \text{AgCl} \downarrow (\text{s}) + \text{KNO}_3(\text{aq})$

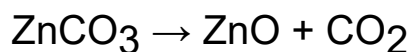
Silver chloride (White ppt.)

It is a double displacement and precipitation reaction.

96. What happens when ZnCO_3 is heated in the absence of air? Give the relevant equation.

[Board Question]

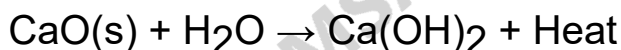
Ans. When ZnCO_3 is heated in the absence of air, Zinc oxide (ZnO) and carbon dioxide (CO_2) are formed. The chemical equation can be represented as :



97. What happens when quick lime is added to the water?

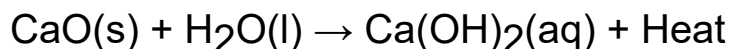
[Board Question]

Ans. When quick lime is added to water, it produce calcium hydroxide (slaked lime) with the evolution of large amount of heat. It can be represented as:

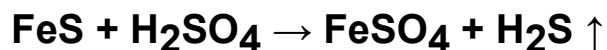


98. A substance X, which is an oxide of a group 2 element, is used intensively in the cement industry. This element is present in bones also. On treatment with water it forms a solution which turns red litmus blue. Identify X and also write the chemical reactions involved.

Ans. A substance X is Calcium oxide



99. $\text{AgNO}_3\text{(aq)} + \text{NaCl(aq)} \rightarrow \text{AgCl(s)} \downarrow + \text{NaNO}_3\text{(aq)}$



Consider the above mentioned two chemical equations with two different kinds of arrows

(\downarrow and \uparrow) along with product. What do these two different arrows indicate?**[Board Question]**

Ans. ↑ shows evolution of gas whereas ↓ shows formation of precipitate.

100. What change in colour is observed when white silver chloride is left exposed to sunlight? State the type of chemical reaction in this change.

[Board Question]

Ans. When white silver chloride is left exposed to sunlight, it becomes grey. It is a photochemical decomposition reaction.

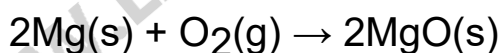
101. When lime stone is heated it decomposes into quick lime and carbon dioxide gas. Write the chemical equation for this reaction.

Ans. $\text{CaCO}_3 (\text{s}) \xrightarrow{\text{Heat}} \text{CaO}(\text{s}) + \text{CO}_2(\text{g})\uparrow$

Lime stone Quick lime Carbon dioxide

102. What happens when magnesium ribbon burns in air?

Ans. When magnesium ribbon burns in air, it combines with the oxygen to form magnesium oxide.



103. State the following:

(i) The type of chemical reaction used for extraction of metals from their naturally occurring chlorides or oxides?

(ii) The type of chemical reaction used for obtaining a metal from its oxide?

(iii) Identify the type of reaction: $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$

(iv) The type of reaction used in photography?

(v) An example of endothermic reaction?

(vi) A reaction that takes place during digestion of food in our body?

- (vii) Quick lime and slaked lime.
- (viii) A gas evolved when Zn reacts with hydrochloric acid?
- (ix) A substance used in white washing.
- (x) An example of double displacement reaction.
- (xi) Is burning a candle a physical change or a Chemical change?
- [Board Question]**

(xii) Which one is a chemical change, rusting of iron or melting of iron?

Ans. (i) Electrolysis

(ii) Reduction reaction

(iii) Displacement reaction

(iv) Photo-decomposition of silver chloride is used in photography.

(v) Photosynthesis is an example of endothermic reaction.

(vi) Decomposition reaction.

(vii) Calcium oxide is quicklime and calcium hydroxide is slaked lime.

(viii) Hydrogen gas is evolved.

(ix) Calcium hydroxide (slaked lime).

(x) $\text{CuSO}_4 + 2\text{NH}_4\text{OH} \rightarrow \text{Cu}(\text{OH})_2 + (\text{NH}_4)_2\text{SO}_4$

(xi) During burning of candle, both physical and chemical change takes place.

(xii) Rusting of iron is a chemical change because a new substance iron oxide is formed in this process.

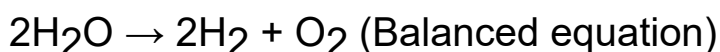
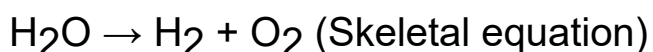
Short Answer Type Questions

104. What is meant by skeletal type chemical equation? What does it represent? Using the equation for electrolytic

decomposition of water, differentiate between a skeletal chemical equation and a balanced chemical equation.

[Board Question]

Ans. A skeletal equation is such a chemical reaction in which, the reactant and products are identified with their chemical formula but their quantity and proportion is not identified since the equation is not balanced. Whereas, a balanced chemical equation shows the number of molecules and atoms of both reactants and products and is balanced.



105. “We need to balance a skeletal chemical equation.” Give reason to justify the statement. [Board Question]

Ans. Skeletal chemical equation are unbalanced. We need to balance chemical equation because according to Law of conservation of mass, 'matter can neither be created nor be destroyed'. Therefore, every chemical equation must be balanced.

106. List four observations that help us to determine whether a chemical reaction has taken place. [Board Question]

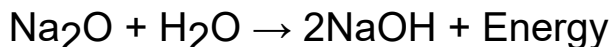
Ans. The observations that help us to determine whether a chemical reaction has taken place are :

1. Evolution of a gas
2. Change in temperature
3. Formation of precipitate
4. Change in colour

107. What does one mean by exothermic and endothermic reactions? Give examples. [NCERT]

Ans. Chemical reactions that release energy in the form of heat,

light, or sound are called exothermic reactions. Combination reactions are exothermic. Example: Sodium oxide dissolves in water to form sodium hydroxide and releases large amount of energy.



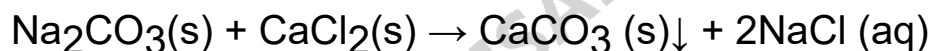
Reactions that absorb energy or require energy in order to proceed are called endothermic reactions.

Example: Combination of nitrogen and oxygen to form nitric oxide.



108. What do you mean by a precipitation reaction? Explain by giving examples. [NCERT]

Ans. A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction. For example :



Sodium carbonate Calcium chloride Calcium Carbonate Sodium chloride

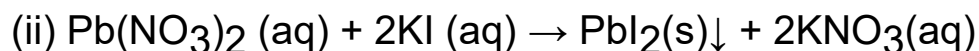
In this reaction, calcium carbonate is obtained as a precipitate. Hence, it is a precipitation reaction.

109. When a solution of potassium iodide is added to a solution of lead nitrate in a test tube, a reaction takes place.

(i) What type of reaction is this?

(ii) Write a balanced chemical equation to represent the above reaction. [Board Question]

Ans. (i) It is a double displacement as well as a precipitation reaction.

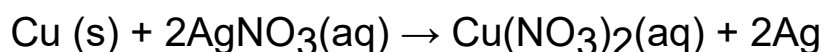


Yellow ppt.

110. Write the chemical equation of the reaction in which the following changes have taken place with an example of each:
[Board Question]

(i) Change in colour, (ii) Change in temperature, (iii) Formation of precipitate.

Ans. (i) Change in colour:



The solution will become blue in colour and shiny silver metal will be deposited.

(ii) Change in temperature:



The temperature will increase because heat will be evolved.

(iii) Formation of precipitate:



(aq Yellow ppt)

Yellow precipitate of PbI_2 will be formed.

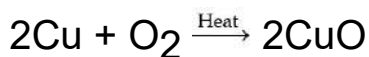
111. Answer the following questions:

(i) A shiny brown-coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

(ii) A student prepares aqueous solution of the following salts; copper sulphate, ferrous sulphate, sodium sulphate, barium sulphate. Write the colour of each solution thus formed. [Board Question]

Ans. (i) A shiny brown coloured element 'X' is copper (Cu) and the

black-coloured compound formed is copper oxide (CuO). The equation of the reaction involved on heating copper is given below.



(Shiny brown in colour) (Black in colour)

(ii) The colour of the solutions are:

Copper sulphate: Blue

Ferrous sulphate: Green

Sodium sulphate: Milky white

Barium sulphate: White

112. Define the term decomposition reaction. Give one example of each of thermal decomposition and electrolytic decomposition. [Board Question]

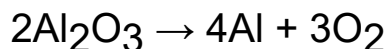
Ans. In a decomposition reaction, a compound is broken into smaller chemical species. These are the reaction in which one reactant gives two or more products after a reaction. These reactions are just opposite of chemical combination reactions.

1. Thermal Decomposition: Decomposition takes place by heat.



Potassium Chlorate Potassium chloride Oxygen

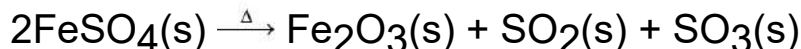
2. Electrolytic decomposition or electrolysis: Decomposition takes place by electricity. Example, electrolysis of aluminium oxide



Aluminium oxide Aluminium Oxygen

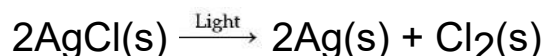
113. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity. [NCERT]

Ans. 1. Thermal decomposition: Energy in the form of heat.



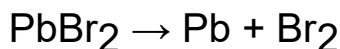
Ferrous sulphate Ferric oxide Sulphur dioxide Sulphur trioxide

2. Decomposition by light: It is known as photolysis.



Silver chloride Silver Chlorine

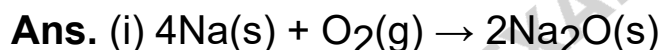
3. Decomposition by electricity: It is also known as electrolysis.
Electrolysis of lead bromide:



114. Explain the following in terms of gain or loss of oxygen with two examples each.

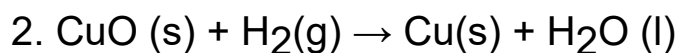
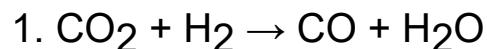
(i) Oxidation

(ii) Reduction **[NCERT]**



In the above examples, both Na and Cu gains oxygen and get oxidised.

(ii) Reduction is loss of oxygen.

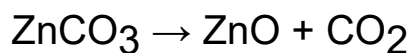


In the above reactions, carbon dioxide and CuO lose oxygen.

115. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.

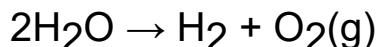
[Board Question]

Ans. Decomposition of zinc carbonate when heat is applied.

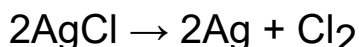


Zinc oxide Carbon dioxide

Decomposition of water in presence of electricity:



Decomposition of silver chloride in presence of light.



White Grey

116. On heating blue coloured powder of copper (II) nitrate in a boiling tube, black copper oxide, O_2 and a brown gas X is formed. [Board Question]

- (i) Identify the type of reaction and the gas X.
- (ii) Write balanced chemical equation of the reaction.
- (iii) Write the pH range of aqueous solution of the gas X.

Ans. (i) Decomposition reaction

The gas X is Nitrogen dioxide (NO_2)



Blue Blue Brown gas

- (iii) Oxides of non-metals are acidic. Therefore, aqueous solution of this gas would be acidic. The pH would be less than 7.

117. During the reaction of some metals with dilute hydrochloric acid, the following observations were made by a student.

[Board Question]

- (i) Silver metal does not show any change.

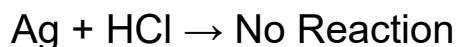
(ii) Some bubbles of a gas are seen when lead is reacted with the acid.

(iii) The reaction of sodium metal is found to be highly explosive.

(iv) The temperature of the reaction mixture rises when aluminium is added to the acid.

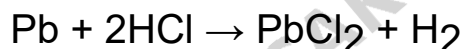
Explain these observations giving appropriate reason.

Ans. (i) Silver is less reactive than hydrogen hence, cannot be displaced.



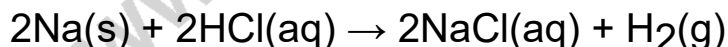
Silver (dil.) Hydrochloric acid

(ii) Bubbles of hydrogen gas are evolved when lead is reacted with the acid.



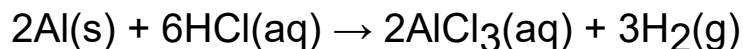
Lead (dil.) Hydrochloric acid Lead Hydrogen

(iii) The reaction of sodium is found to be highly explosive because sodium is very reactive in nature.



Sodium Hydrochloric acid Sodium chloride Hydrogen

(iv) The temperature of the reaction mixture rises when aluminium is added to the acid because the reaction is highly exothermic in nature.



Aluminium Hydrogen chloride Aluminium chloride Hydrogen

118. A white salt on heating decomposes to give brown fumes and a residue is left behind.

(i) Name the salt.

(ii) Write the equation for the decomposition reaction. **[Board Question]**

Ans. (i) The white salt is lead Nitrate.

(ii) Lead nitrate decomposes as:



Brown fumes are of nitrogen dioxide gas.

119. When the powder of a common metal is heated in an open china dish, its colour turns black. However, when hydrogen is passed over the hot black substance so formed, it regains its original colour. Based on the above information, answer the following questions.

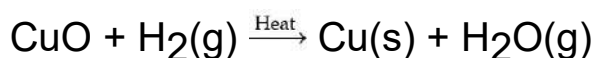
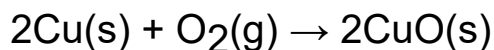
(i) What type of chemical reaction takes place in each of the two given steps?

(ii) Name the metal initially taken in the powder form. Write balanced chemical equations for both reactions.

[Board Question]

Ans. (i) In first step, oxidation takes place whereas in second step, redox reaction takes place.

(ii) Metal initially taken in the powder form is copper.



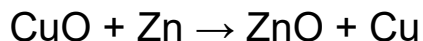
120. Answer the following questions:

(i) Why is respiration considered as an exothermic reaction? **[Board Question]**

(ii) Define the terms oxidation and reduction.

(iii) Identify the substance that is oxidised and reduced in the

following reaction.



Ans. (i) Respiration is considered as an exothermic reaction because during respiration energy is released by oxidation of food.

(ii) Oxidation is a process of addition of O_2 or removal of H_2 or loss of electrons take place. Reduction is a process in which H_2 is added or O_2 is removed or gain of electrons take place.

(iii) Zn is getting oxidised, CuO is getting reduced.

121. The following diagram displays a chemical reaction. Observe carefully and answer the following questions:

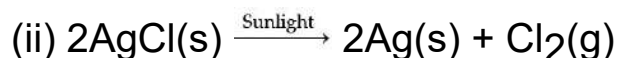


(i) Identify the type of chemical reaction that will take place and define it. How will the colour of the salt change?

(ii) Write the chemical equation of the reaction that takes place.

(iii) Mention one commercial use of this salt. **[Board Question]**

Ans. (i) Photochemical decomposition reaction is taking place. The reactions in which a compound breaks down into simple substances in presence of light are called photochemical decomposition reaction. The colour of salt will change from white to grey.

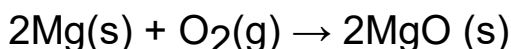


(iii) Silver chloride is used in photography.

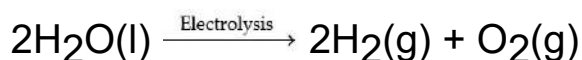
122. State the type of chemical reactions and chemical equations that take place in the following:

- (i) Magnesium wire is burnt in air.
- (ii) Electric current is passed through water.
- (iii) Ammonia and hydrogen chloride gases are mixed. **[Board Question]**

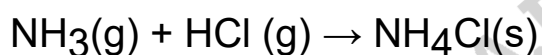
Ans. (i) It is combination reaction.



- (ii) It is an electrolytic decomposition reaction.

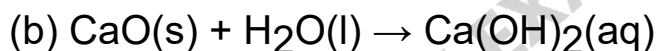
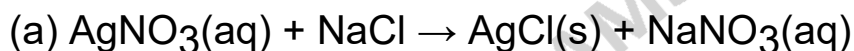


- (iii) It is a combination reaction.



123. Answer the following questions:

- (i) Classify the following reactions into different types.



- (ii) Which of the above reaction(s) is/are precipitation reaction(s)? Why is a reaction called precipitation reaction? **[Board Question]**

- (iii) Give reactions of calcium and magnesium with dilute nitric acid. **[Board Question]**

Ans. (i) (a) Precipitation reaction (double displacement reaction)

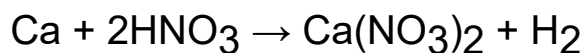
(b) Combination reaction

(c) Decomposition reaction

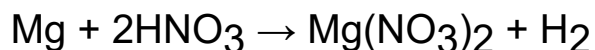
- (ii) Reaction (i) is a precipitation reaction because in the first

reaction, precipitate of AgCl is formed.

(iii) Reaction of calcium with nitric acid:



Reaction of magnesium with nitric acid



(very-very dilute)

124. Identify the type of reactions taking place in each of the following cases and write the balanced chemical equation for the reactions. [Board Question]

(i) Zinc reacts with silver nitrate to produce zinc nitrate and silver.

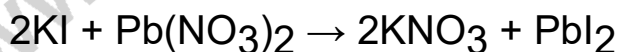
(ii) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide.

Ans. (i) The given reaction is a displacement reaction.



(s) (aq) (aq) (s)

(ii) The given reaction is a double displacement reaction.

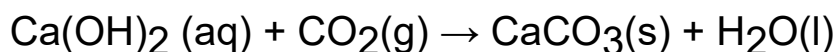


(aq) (aq) (aq) (s)

125. What is observed when carbon dioxide gas is passed through lime water. [Board Question]

(i) For a short duration (ii) For a long duration

Ans. (i) When carbon dioxide gas is passed through lime water for a short duration, lime water turns milky. The milkiness is due to the formation of white precipitate of calcium carbonate which is insoluble in water. The reaction can be given as:



(ii) When carbon dioxide gas is passed through lime water for a long duration, a clear solution is obtained. It is due to the fact that when carbon dioxide is passed for long duration, calcium bicarbonate is formed which is soluble in water.



excess

126. 2 g of ferrous sulphate crystals are heated in a dry boiling tube. [Board Question] (i) List any two observations.

(ii) Name the type of chemical reaction taking place.

(iii) Write the chemical equation for the reaction.

Ans. (i) The two observations are:

1. Green colour of FeSO_4 disappears and reddish brown solid is formed.
2. Smell of burning sulphur.

(ii) It is an example of decomposition reaction.

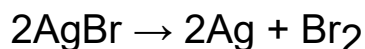


Ferrous Ferric Sulphur Sulphur

Sulphate Oxide Dioxide Trioxide

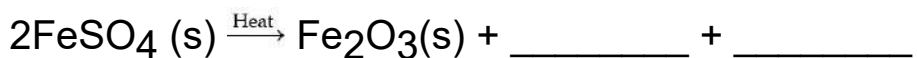
127. Answer the following questions:

(i) Write the essential condition for the following reaction to take place:



Write one application of this reaction. [Board Question]

(ii) Complete the following chemical equation of a chemical reaction.



(iii) What happens when water is added to quick lime ? Write chemical equation.

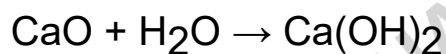
Ans. (i) The reaction takes place in the presence of light. This reaction is used in photography.



Ferrous Ferric Sulphur Sulphur

Sulphate Oxide Dioxide Trioxide

(iii) Slaked lime is formed with hissing sound and lot of heat is evolved.



Calcium hydroxide (slaked lime)

128. Identify the type of each of the following reactions. Also write the balanced chemical equation involved.

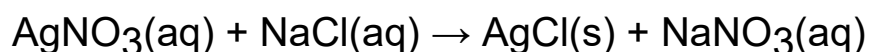
(i) The reaction mixture becomes warm.

(ii) An insoluble substance is formed. **[Board Question]**

Ans. (i) It is an exothermic reaction. In exothermic reaction, energy is released due to which reaction mixture becomes warm. Example:



(ii) In a precipitation reaction, an insoluble substance called precipitate is formed. For example, on mixing aqueous solutions of silver nitrate and sodium chloride, a white curdy precipitate of silver chloride is formed.



129. Write the chemical equation involved in the following chemical reactions:

(i) White washing

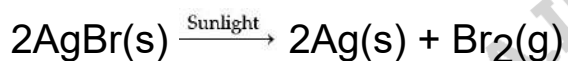
(ii) Black and White photography. [\[Board Question\]](#)

Ans. (i) In white washing, following reaction occurs:



In the above reaction, calcium oxide (quick lime) reacts with water to form calcium hydroxide (slaked lime) and large amount of energy is released.

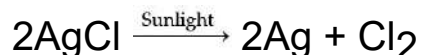
(ii) In black and white photography, photolysis of silver bromide takes place. Silver bromide decomposes in the presence of sunlight to give silver and bromine.



Light yellow Grey

130. 2 g of silver chloride is taken in a china dish and the china dish is placed in sunlight for sometime. What will be your observation in this case? Write the chemical reaction involved in the form of a balanced chemical equation. Identify the type of chemical reaction. [\[Board Question\]](#)

Ans. Initially the colour of silver chloride is white but when it is kept in sunlight it breaks down to give silver and chlorine. Hence, the colour changes to grey.



It is an example of Photo-chemical decomposition.

131. When articles made of silver, copper and iron get colour coating over them when they are exposed to air. Identify the colour and chemical name of the substance of coating in each case. [\[Board Question\]](#)

Ans. The observations are:

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Article	Colour	Chemical Name
Silver	Black	Silver sulphide
Copper	Green	Copper oxide
Iron	Reddish brown	Ferric oxide

132. State the reason for the following:

- (i) Potato chips manufacturers fill the packet of chips with nitrogen gas.
- (ii) Iron articles are shining new, but get coated with a reddish brown powder, when left for sometime.

[Board Question]

Ans. (i) Potato chips packet are filled with nitrogen gas to prevent oxidation of oils and fats present in the chips and thereby preventing its rancidity.

(ii) When iron comes in contact with moist air, it reacts with oxygen in presence of moisture and forms rust (hydrated oxide of iron) which is reddish brown in colour. This process is commonly known as rusting of iron and it is due to this process shining new iron articles get coated with a reddish brown powder when left for sometime.

133. Answer the following questions:

- (i) Name two metals which do not corrode easily. **[Board Question]**
- (ii) Corrosion of some metals is an advantage, given an example to support that.
- (iii) Corrosion of metal is a serious problem, give an example to support that.

Ans. (i) Gold and platinum do not corrode easily.

(ii) Aluminium form a layer of aluminium oxide on its surface due to

corrosion which makes the metal passive and protects it from further corrosion.

(iii) Corrosion of iron is a serious problem, every year a lot of iron is being wasted and damaged due to corrosion and a lot of money is spent to repair that the damaged iron and steel structures.

134. Metallic oxides of zinc, magnesium and copper were heated with the following metals. In which case, will you find displacement reactions taking place? [NCERT]

Metal	Zinc	Magnesium	Copper
Zinc Oxide			
Magnesium Oxide			
Copper Oxide			

Ans. Magnesium is the most reactive among these three metals and Zinc is more reactive than Copper. So, Magnesium will displace Zinc oxide and Copper oxide whereas Zinc will displace Copper oxide only.

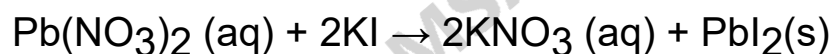
Metal	Zinc	Magnesium	Copper
Zinc Oxide	No Reaction	Displacement Reaction	No Reaction
Magnesium Oxide	No Reaction	No Reaction	No Reaction
Copper Oxide	Displacement Reaction	Displacement Reaction	No Reaction

135. Define a chemical reaction. State four observations which help us to determine that a chemical reaction has taken place. Write one example of each of the observations with a balanced chemical equation.

[Board Question]

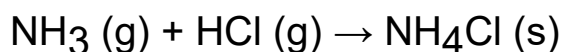
Ans. Chemical reaction is the transformation of chemical substance into another chemical substance. Only a rearrangement of atoms takes place in a chemical reaction. Old bonds are broken and new bonds are formed. Some of the characteristics of chemical reactions are:

1. Change in colour: In some reactions, there is change in colour after the reaction. For example, chemical reaction the chemical reaction between potassium iodide solution and lead nitrate solution is characterised by the change in colour from colourless to the appearance of yellow colour due to the formation of lead iodide.

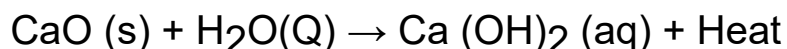


Colourless Yellow

2. Change in state: In some reactions, change of state takes place during the reaction. The reaction might start with gaseous or liquid reactants but it will end up with a solid product and vice-versa. For example: Ammonia gas reacts with hydrogen chloride gas to produce solid ammonium chloride.

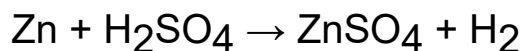


3. Change in temperature: Temperature change is the characteristic of many reactions. For example, the chemical reaction between quicklime and water to form slaked lime. In this reaction, temperature of the reaction is increased due to the evolution of heat.



4. Evolution of gas: Some reactions are characterised by evolution

of gas as a result of chemical reaction. For example, the chemical reaction between zinc and dilute sulphuric acid is characterised by the evolution of hydrogen gas.



(s) (aq)

136. Answer the following questions:

(i) Define a balanced chemical equation. Why should an equation be balanced? **[NCERT]**

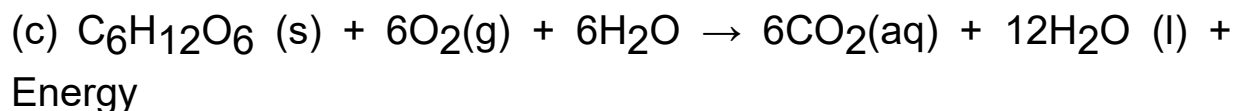
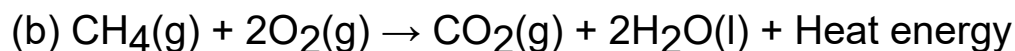
(ii) Write the balanced chemical equation for the following reaction:

(a) Phosphorus burns in presence of chlorine to form phosphorus penta chloride.

(b) Burning of natural gas.

(c) The process of respiration. **[Board Question]**

Ans. (i) Balanced chemical equation is one in which there are equal number of atoms of different elements in the reactants and products. According to law of conservation of mass, matter can neither be created nor be destroyed in a chemical reaction. Therefore, number of atoms for each element on reactants and products formed after the reaction should be equal.



137. State one characteristic each of the chemical reaction which takes place when:

(i) Dilute hydrochloric acid is added to sodium carbonate.

(ii) Lemon juice is added gradually to potassium permanganate

solution.

(iii) Dilute sulphuric acid is added to barium chloride solution.

(iv) Quick lime is treated with water.

(v) Wax is burned in the form of a candle.

Ans. (i) Evolution of carbondioxide gas.

(ii) Change in colour from purple to colourless.

(iii) Formation of white precipitate of barium sulphate.

(iv) Change in temperature.

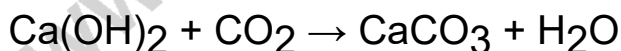
(v) Change in state from solid to liquid and gas.

138. Give the characteristic tests for the following gases:

(i) CO₂, (ii) SO₂, (iii) O₂, (iv) H₂.

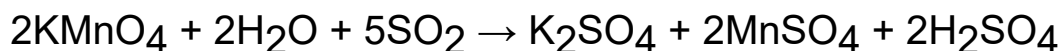
Ans. The characteristic test for:

(i) Carbon dioxide (CO₂): This gas turns lime water milky when passed through it due to the formation of insoluble calcium carbonate.



Limewater Carbon dioxide Calcium
carbonate

(ii) Sulphur dioxide (SO₂): This gas when passed through acidic potassium permanganate solution (purple in colour) turns it colourless because SO₂ is a strong reducing agent



Potassium permanganate Potassium Manganese
(Purple) sulphate sulphate

(colourless) (colourless)

(iii) Oxygen (O₂): The evolution of oxygen (O₂) gas during a reaction can be confirmed by bringing a burning candle near the mouth of the test tube containing the reaction mixture. The intensity of the flame increases because oxygen supports burning.

(iv) Hydrogen (H₂): This gas burns with a pop sound when a burning candle is brought near it.

139. On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide, O₂, and a brown gas X is formed.

[Board Question]

- (i) Identify the type of reaction and the gas X.
- (ii) Write balanced chemical equation of the reaction.
- (iii) Write the pH range of aqueous solution of the gas X.

Ans. (i) Decomposition Reaction:

The gas X is Nitrogen dioxide (NO₂)



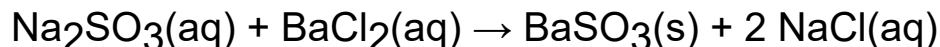
Blue Black Brown gas

(iii) Oxides of non-metals are acidic. Therefore, aqueous solution of this gas would be acidic. The pH would be less than 7 or 6-9.

140. On adding a drop of barium chloride solution to an aqueous solution of sodium sulphite, white precipitate is obtained.

- (i) Write a balanced chemical equation of the reaction involved.
- (ii) What other name can be given to this precipitation reaction?
- (iii) On adding dilute hydrochloric acid to the reaction mixture, white precipitate disappears. Why?

Ans. (i) Balanced chemical equation

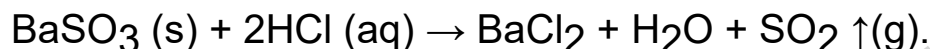


Sodium Barium Barium Sodium

Sulphite Chloride Sulphite Chloride

(ii) This reaction is also known as double displacement reaction.

(iii) BaSO_3 is a salt of a weak acid (H_2SO_3), therefore dilute acid such as HCl decomposes barium sulphite to produce sulphur dioxide gas which has the smell of burning sulphur.



BaCl_2 is soluble in water, hence white precipitate disappears.

141. Answer the following questions:

(i) Solid calcium oxide was taken in a container and water is added slowly to it.

(a) Write the observation.

(b) Write the chemical formula of the product formed.

(ii) What happens when carbon dioxide gas is bubbled through lime water?

(a) In small amount

(b) In excess

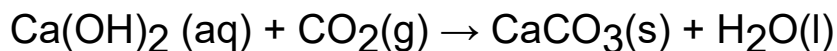
(iii) Why do we apply paint on iron articles? **[Board Question]**

Ans. (i) (a) When water is added slowly to solid calcium oxide, it reacts vigorously with water with release of large amount of energy.

(b) The compound formed is calcium hydroxide (Slaked lime). Its chemical formula is $\text{Ca}(\text{OH})_2$.

(ii) (a) When carbon dioxide gas is passed through lime water for a

small amount, lime water turns milky. The milkiness is due to the formation of white precipitate of calcium carbonate which is insoluble in water. The reaction can be given as:



(b) When carbon dioxide gas is passed through lime water in excess, a clear solution is obtained. It is due to the fact that when carbon dioxide is passed in excess, calcium bicarbonate is formed which is soluble in water.



(iii) Iron articles are painted to protect it from getting corroded. By painting, a layer is formed between the air and iron article which prevents the formation of iron oxide.

142. Answer the following questions:

- (i) Define corrosion. **[Board Question]**
- (ii) What is corrosion of iron called?
- (iii) How will you recognise the corrosion of silver?
- (iv) Why corrosion of iron is a serious problem?
- (v) How can we prevent corrosion of iron?

Ans. (i) The gradual destruction of pure metals by the action of air, moisture or a chemical (such as an acid) on their surface is called corrosion.

(ii) Corrosion of iron is called rust.

(iii) The corrosion of silver can be recognised by black layer on the surface of silver articles.

(iv) Corrosion of iron is serious problem because it causes a large damage to iron and money.

(v) The corrosion of iron can be prevented by painting or oiling,

galvanizing and electroplating.

143. Answer the following questions:

(i) Explain two ways by which food industries prevent rancidity.

[Board Question]

(ii) Discuss the importance of decomposition reaction in metal industry with three points.

Ans. (i) 1. By adding antioxidants to food containing fat and oil, e.g.; butylated hydroxy anisole is added to butter as antioxidant.

2. By packaging fat and oil containing foods in nitrogen gas.

(ii) Importance of decomposition reaction:

1. In metallurgy for refining of metals.

2. Extracting high reactive metals from their molten chlorides.(
Molten sodium chloride)

3. Electrolysis of water gives on large scale production of hydrogen gas and oxygen gas.

144. Identify the type of chemical reaction in the following statements and define each of them.

(i) Digestion of food in the body.

(ii) Rusting of iron.

(iii) Heating of manganese dioxide with aluminium powder.

(iv) Blue colour of copper sulphate solution disappears when iron filings are added to it.

(v) Dilute hydrochloric acid is added to sodium hydroxide solution to form sodium chloride and water.

[Board Question]

Ans. (i) Digestion of food is an example of decomposition reaction

because the food we eat mainly contains carbohydrates, proteins, fats. These are decomposed into smaller units such as glucose, amino acids and fatty acids in the presence of enzymes in the body.

(ii) Rusting of iron is an example of oxidation reaction. In this process, iron react with oxygen and moisture present in atmosphere and forms brown layer of iron oxide called rust.

(iii) Heating of manganese dioxide with aluminium powder is an example of displacement reaction, as more reactive metal Al displaces Mn from its solution.

(iv) Blue colour of copper sulphate solution disappears when iron filings are added to it. It is also a displacement reaction. In this reaction, Fe displaces copper from copper sulphate solution as iron is more reactive than copper.

(v) Dilute hydrochloric acid is added to sodium hydroxide solution to form sodium chloride and water. It is an example of neutralization reaction (double displacement reaction). In this reaction, an acid and a base react to form salt and water.

Differentiate Between

145. Write the differences between a physical and a chemical change.

Ans. The differences between a physical and a chemical change are as follows:

	Physical Change	Chemical Change
1.	It is a temporary change and easily reversible.	It is a permanent change and sometimes reversible.
2.	It does not form a new product.	It forms a new product.

3.	This change involves the change in the physical states of the substance.	This change involves the change in the chemical composition of the substance.
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146. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

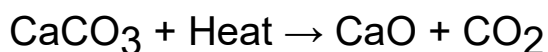
Ans.	Displacement Reaction	Double Displacement Reaction
1.	It is a chemical reaction in which a more reactive element displaces a less reactive element from its compound.	It is a chemical reaction in which two different atoms or groups of atoms (ions) are displaced by other atoms or groups of atoms (ions).
2.	It is a slow reaction and in this reaction, there is a change of colour with no precipitate formed.	It is a fast reaction and in this reaction, precipitate formation takes place.
3.	<p>When chlorine is added to the solution of sodium bromide, chlorine displaces bromine from sodium bromide, and acquires its place due to which the solutions turn blue.</p> $\text{Cl}_2(\text{aq}) + 2\text{NaBr}(\text{aq}) \rightarrow 2\text{NaCl}(\text{aq}) + \text{Br}_2(\text{aq})$	<p>The reaction between silver nitrate and sodium chloride is a double displacement reaction. The silver trades its nitrate ion for the sodium's chloride ion, causing the sodium to pick up the nitrate anion.</p> $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$

147. Differentiate between exothermic and endothermic reactions. Write one example of each of these reactions in the

form of balanced chemical equation. [Board Question]

Ans. The reaction in which energy is absorbed from its surrounding in the form of heat is called as endothermic reaction.

For Example : When calcium carbonate is heated for example, it decomposes into calcium oxide and carbon dioxide.



(Calcium carbonate) (Calcium oxide) (Carbon dioxide)

The reaction in which energy is released from the system in the form of heat is called as exothermic reaction.

For Example : Methane is the major component of natural gas. When natural gas is burned in the presence of oxygen in the air, carbon dioxide and water vapour are produced. There is also a significant amount of thermal energy produced.

148. What is the difference between combination reaction and decomposition reaction?

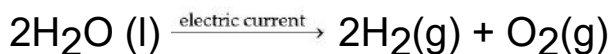
Ans. The difference between combination reaction and decomposition reaction is:

	Combination Reaction	Decomposition Reaction
1.	In this reaction, two reactants combine to form a single product.	In this reaction, a compound breaks to form two or more single substances.
2.	These are generally exothermic.	These are generally endothermic.
3.	Example, $2 \text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$	Example, $2\text{NaCl} \rightarrow 2\text{Na} + \text{Cl}_2$

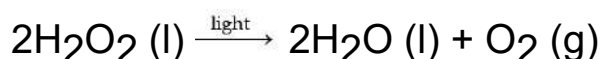
149. Write the difference between photodecomposition and

electrolytic decomposition reaction.

Ans. Electrolytic decomposition may result when electric current is passed through an aqueous solution of a compound. A good example is the electrolysis of water.



When decomposition takes place in the presence of light, it is called photo decomposition. For example, in the presence of light, hydrogen peroxide decomposes into water and oxygen.

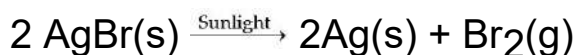


150. What is the difference between thermal decomposition and photo decomposition reaction.

Ans. Thermal decomposition is a chemical reaction where a single substance breaks into two or more simple substances when heated. The reaction is usually endothermic because heat is required to break the bonds present in the substance.



When decomposition takes place in the presence of light, it is called photodecomposition. For example, photo decomposition of silver bromide.



light yellow grey

151. Differentiate between oxidation and reduction reaction with examples.

Ans.	Oxidation	Reduction
1.	Addition of oxygen or removal of hydrogen.	Addition of hydrogen or removal of oxygen.

2.	Generally occurs in reducing agents.	Generally occurs in oxidising agents.
3.	Example, $2 \text{ Mg} + \text{O}_2 \rightarrow 2\text{MgO}$	Example, $\text{CuO} \rightarrow \text{Cu} + \text{O}_2$

Analysis and Evaluation Based Questions

152. When two or more substances react and form some new substance, it is called a chemical reaction. As we know, all chemical reaction obeys law of chemical combination. Therefore, chemical reactions need to be balanced. It is done by hit and trial method. The chemical reactions can be classified into different types such as combination reaction, decomposition reaction, displacement reaction, double displacement reaction. The reactions take place in solution is precipitation reactions and neutralization reactions.



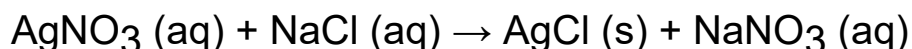
- (i) Define a chemical reaction.
- (ii) Which law is followed by all chemical reactions?
- (iii) Name four types of chemical reactions.
- (iv) Give example of precipitation reactions.

Ans. (i) A chemical reaction is defined as the reaction in which two or more substances react to form a new substance.

(ii) The law of chemical combination is followed by all chemical reactions.

(iii) Combination reactions, displacement reactions, double displacement reactions and decomposition reactions are four types of chemical reactions.

(iv) The reaction between silver nitrate and sodium chloride that forms precipitate of silver chloride and sodium nitrate is an example of precipitation reactions.



Silver chloride

(ppt.)

153. When metal P is treated with a dilute acid Q, then a gas G is evolved which burns readily by making a little explosion.

(i) Name any two metals which can behave like metal P.

(ii) Name any two acids which can behave like acid Q.

(iii) Name the gas G.

(iv) Is the gas G lighter than or heavier than air?

(v) Is the reaction between metal P and dilute acid Q exothermic or endothermic?

Ans. (i) Zinc and Iron.

(ii) Dilute hydrochloric acid and dilute sulphuric acid.

(iii) Hydrogen

(iv) Lighter than air

(v) Exothermic

154. A metal X forms a salt XSO_4 . The salt XSO_4 forms a clear solution in water which reacts with sodium hydroxide solution to form a blue precipitate Y. Metal X is used in making electric wires and alloys like brass.

- (i) What do you think metal X could be?
- (ii) Write the name, formula and colour of salt XSO_4 .
- (iii) What is the blue precipitate Y?
- (iv) Write a chemical equation of the reaction which takes place when salt XSO_4 reacts with sodium hydroxide solution. Give the state symbols of all the reactants and products which occur in the above equation.

Ans. (i) Copper, Cu.

(ii) Copper sulphate, CuSO_4 , blue colour.

(iii) Copper hydroxide, $\text{Cu}(\text{OH})_2$

(iv) $\text{CuSO}_4(\text{aq}) + 2\text{NaOH}(\text{aq}) \rightarrow$

$\text{Cu}(\text{OH})_2(\text{s}) + \text{Na}_2\text{SO}_4(\text{aq})$

155. A silvery-white metal X taken in the form of ribbon, when ignited, burns in air with a dazzling white flame to form a white powder Y. When water is added to powder Y, it dissolves partially to form another substance Z.

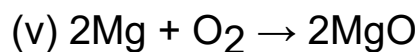
- (i) What could metal X be?
- (ii) What is powder Y?
- (iii) With which substance metal X combines to form powder Y?
- (iv) What is substance Z? Name one domestic use of substance Z.
- (v) Write a balanced chemical equation of the reaction which takes place when metal X burns in air to form powder Y.

Ans. (i) Magnesium, Mg.

(ii) Magnesium oxide, MgO .

(iii) Oxygen (of air), O_2

(iv) Magnesium hydroxide, $\text{Mg}(\text{OH})_2$; used as antacid to relieve indigestion.



156. When the solution of substance A is added to a solution of potassium iodide, then a yellow solid separates out from the solution.

(i) What do you think substance A would be?

(ii) Name the yellow substance which separates out.

(iii) Write the characteristic of chemical reactions which is illustrated by this example.

(iv) Write a balanced chemical equation for the reaction which takes place. Mention the physical states of all the reactants and products involved in the chemical equation.

Ans. (i) Substance A would be lead nitrate.

(ii) Yellow substance which separates out is lead iodide.

(iii) Formation of a precipitate.



157. Explain how the following metals are obtained from their compounds by reduction process:

(i) Metal X which is lower in reactivity series.

(ii) Metal Y which is in middle of reactivity series.

(iii) Metal Z which is high in the reactivity series.

[Board Question]

Ans. (i) Metals low in reactivity series are obtained by the method of heating their oxides with carbon.

(ii) Y is in the middle of the series, it can be obtained by heating with

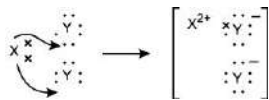
a reducing agent like carbon or highly reactive metals like Na, Ca, Al.

(iii) Metal Z is high up in the reactivity series. It can be obtained by electrolytic reduction.

158. In the formation of a compound XY_2 , atom X donates one electron to each Y atom. Show the electron dot structure of X and Y and the formation of XY_2 . What is the nature of bond in XY_2 ? Write any three properties of XY_2 . The electronic configuration of two elements X and Y are as follows:

X = 2, 8, 2 Y = 2, 7 [Board Question]

Ans. X = 2, 8, 2 Y = 2, 7



The bond formed is ionic in nature.

The three properties of XY_2 are as follows :

1. They have high melting and boiling points.
2. They are hard and crystalline solids.
3. They are good conductors of electricity.

159. The substance which we use for white-washing our houses is calcium oxide. We put calcium oxide in a drum and add water to it slowly. Calcium oxide reacts with water vigorously to form a white solid called slaked lime with the evolution of heat. More water is then added to get slaked lime solution. This slaked lime solution is then applied to the walls of the house with the brush. Since, this process gives a white, shiny appearance to the walls of a house, it is called white-washing and gives a shiny finish to the walls.



- (i) What is the chemical formula of slaked lime?
- (ii) Name the chemical reaction resulting to form slaked lime.
- (iii) Give the chemical equation for the formation of slaked lime.
- (iv) What is the reason behind shining appearance of walls after white washing?

Ans. (i) The Chemical formula of slaked lime is $\text{Ca}(\text{OH})_2$.

(ii) The reaction is named as combination reaction.

(iii) $\text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca}(\text{OH})_2$

Slaked lime

(iv) When white washing is done, slaked lime (calcium hydroxide) slowly reacts with carbon dioxide in air to form a thin layer of calcium carbonate on walls that gives a shiny appearance on walls.

160. A metal X left in moist air for longer time, loses its shiny brown surface and gains a green coat. Why has this happened? Name and give the chemical formula of given coloured compound and identify the metal. List two ways to prevent this process.

[Board Question]

Ans. This has happened because of corrosion of metal on being exposed to moist air. Green coloured compound is basic copper carbonate. Its chemical formula is $[(\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2)]$. The metal is copper. **Two ways to prevent corrosion are:**

1. Painting and oiling

2. Electroplating

161. You might have observed a green coating on coins or statues made of copper. This happens because the metal undergoes a process called corrosion. Also, you have observed a bad smell emanating from food containing fats or oils due to rancidity.



(i) Which of the following is not a method of preventing corrosion of metals?

- (a) Galvanization
- (b) Exposure to moisture
- (c) Painting the metal surface
- (d) Oiling the metal surface

(ii) What is the reason for foul smell in food items?

(iii) Give the formulation for rusting of iron.

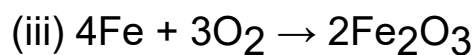
(iv) Corrosion and rancidity are both due to which type of chemical reaction?

- (a) Decomposition
- (b) Reduction
- (c) Oxidation
- (d) Displacement

Ans. (i) (b) Exposure to moisture.

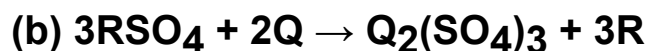
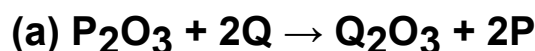
(ii) Food turns rancid when the fats and oils within them get oxidized and the taste and smell of the food changes. Oxidation of fats

generates highly reactive molecules in the rancid food which is responsible for the unpleasant odour and flavour.



(iv) (c) Oxidation.

162. P, Q and R are three elements which undergo chemical reactions according to the following equations:[Board Question]



Answer the following:

- (i) Which element is more reactive?
- (ii) Which element is least reactive?
- (iii) State the type of reaction listed above.

Ans. (i) Most reactive element is Q.

(ii) R is least reactive.

(iii) Displacement reaction.

Practical Based Questions

163. Answer the following questions:

- (i) While studying the combination reaction on adding water to quicklime, name the product formed and write its colour.
- (ii) While studying the decomposition reaction by heating ferrous sulphate crystals in a test tube, a product is formed in the test tube. Name the product and write its colour.

Ans. (i) Calcium oxide (quick lime) reacts with water to form calcium

hydroxide (slaked lime) which is white in colour.

(ii) When green coloured ferrous sulphate crystals are heated, the residue of ferric oxide is formed which is reddish brown black in colour.

164. Answer the following questions:

(i) When magnesium ribbon burns in air or oxygen, a product is formed. State the type of chemical reaction and name the product formed in the reaction.

(ii) Magnesium is heated in flame for some time before it catches fire and burns to form magnesium oxide with the release of large amount of heat and light energy. Is the reaction exothermic or endothermic? Explain your answer. **[Board Question]**

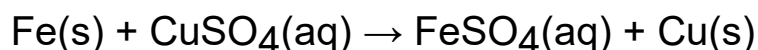
Ans. (i) The given reaction is combination reaction. It is also an oxidation reaction and when magnesium and oxygen combine the product formed is magnesium oxide.

(ii) Burning of magnesium wire is an exothermic reaction as during the reaction there is release of energy in the form of heat and light.

165. Why does the colour of copper sulphate solution change when an iron nail is dipped in it? Write two observations and the type of this reaction.

[Board Question]

Ans. When an iron nail is immersed in the solution of copper sulphate then iron displaces copper from the solution of copper sulphate because iron is more reactive than copper. Therefore copper sulphate solution colour changes from blue to pale green and then iron nail acquires a brownish look. The equation can be given as:



It is an example of the displacement reaction.

166. Answer the following questions:

- (i) What is the colour of ferrous sulphate solution?
- (ii) What happens when ferrous sulphate solution is heated strongly?
- (iii) Name the type of reaction. **[Board Question]**

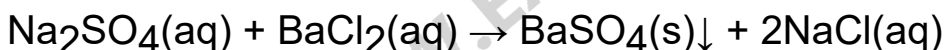
Ans. (i) Green colour

(ii) It decomposes into ferric oxide, sulphur dioxide and sulphur trioxide.

(iii) Decomposition reaction.

167. Barium chloride solution and sodium sulphate solution are mixed together? What is the colour of precipitate? Write the chemical reaction. Name the type of reaction.

Ans. When barium chloride solution and sodium sulphate solution are mixed together, a precipitate of barium sulphate is formed which is white in colour. It is an example of double displacement reaction because the reaction takes place in aqueous solution in which the ions precipitate and there is an exchange of ions.



Sodium sulphate Barium chloride Barium sulphate Sodium chloride

168. Solutions of ferrous sulphate, zinc sulphate, copper sulphate and aluminium sulphate were separately taken in four test tubes and some iron nails were placed in each of the solutions. The colour of which of the above solution changes? **[Board Question]**

Ans. The colour of copper sulphate solution only changes. Rest will be same because iron is more reactive than copper but less reactive than zinc and aluminium.

169. You want to study a decomposition reaction by taking ferrous sulphate crystals in a boiling tube. List two precautions

you would follow while doing the experiment. **[Board Question]**

Ans. (a) Take a dry test tube.

(b) Always keep the mouth of test tube away from yourself.

170. While performing an experiment a student observes that when he heat some green crystals in a boiling tube, the colour of the crystals changes to brown and a gas evolves which smells like burning sulphur. Interpret the observations and results. [Board Question]

Ans. Observations: The colour of ferrous sulphate crystals changes from green to brownish black ferric oxide with a smell of burning sulphur.

Results: Heating of ferrous sulphate is a thermal decomposition reaction because ferrous sulphate breaks down into simpler compounds- Fe_2O_3 , SO_2 and SO_3 .



Creating Based Questions

171. S. No. Chemical Reactions

1.	Formation of magnesium oxide.
2.	Formation of silver from silver bromide.
3.	Formation of ammonium chloride.
4.	Formation of hydrogen from water.

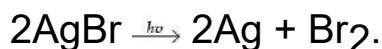
(i) Give the reaction involved in formation of silver from silver bromide.

(ii) Name the type of reaction involved in formation of ammonium chloride.

(iii) Name the type of reaction involved in formation of silver from silver bromide.

(iv) Name the type of reaction involved in formation of hydrogen from water.

Ans. (i) The reaction involved in formation of silver from silver bromide is as follows:



(ii) The formation of ammonium chloride from ammonia and chlorine is an example of combination reaction.

(iii) The formation of silver from silver bromide is an example of decomposition reaction.

(iv) The formation of hydrogen from water is an example of electrolysis reaction.

172. Write a balanced chemical equation with state symbols for the following reactions:

(i) Glucose molecule ($\text{C}_6\text{H}_{12}\text{O}_6$) reacts with oxygen molecule to give carbon dioxide gas and gaseous water.

(ii) Iron dust reacts with gaseous water to give iron oxide (Fe_3O_4) precipitate and hydrogen gas.

Ans. (i) $\text{C}_6\text{H}_{12}\text{O}_6(\text{s}) + 6\text{O}_2(\text{g}) \longrightarrow 6\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}$

(ii) $3\text{Fe}(\text{s}) + 4\text{H}_2\text{O}(\text{g}) \xrightarrow{\text{Steam}} \text{Fe}_3\text{O}_4(\text{s}) + 4\text{H}_2(\text{g})$

173. Annie was happy to see her small house getting cleaned and whitewashed. She observed that the workers dissolved some pale white powdery material called quick lime into water (a vigorous reaction takes place while mixing) left it for some time and applied the white suspension obtained to the walls. At first the wall looked pale white and watery but in 2-3 days the walls became shiny bright white in colour. How can you

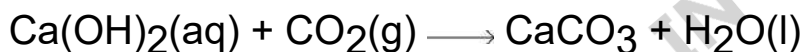
describe what she observed through chemical equations?

Ans. Quick lime is chemically known as calcium oxide. It reacts vigorously with water to produce slaked lime (calcium hydroxide), releasing a large amount of heat.



Quick lime Slaked lime

The slaked lime after application to wall reacts slowly with carbon dioxide present in atmosphere, to give a thin layer of calcium carbonate on the walls after 2-3 days giving the walls a shiny bright white colour.



Slaked lime Calcium carbonate

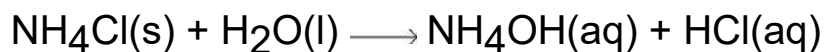
174. Give reason and name the type of chemical reaction taking place in each case :

(i) Dissolution of ammonium chloride in water leads to cooling of the glass apparatus used for dissolutions.

(ii) Silver chloride powder which is white in colour, turns grey when kept in sunlight.

(iii) Blue colour of copper sulphate solution fades when an iron nail is dipped inside the solution.

Ans. (i) Dissolution of ammonium chloride in water is an **endothermic reaction** where heat is absorbed from surroundings hence making the surrounding cooler than before :



Ammonium Ammonium Hydrochloric

chloride hydroxide acid

(ii) Silver chloride undergoes decomposition reaction in sunlight to

give silver metal and chlorine :



Silver chloride Silver metal

(White) (Grey)

(iii) Iron displaces copper from its solution, hence the colour of copper sulphate solution becomes less blue or fades. This is an example of **displacement reaction** :



Copper sulphate Ferrous sulphate

(Blue)

Self-Assessment

175. Zinc and aluminium do not corrode because:

- (a) They do not react with moist air.
- (b) They react with moist air to form a very thin layer of oxides which is very sticky and hard.
- (c) They are inactive metals.
- (d) None of these

176. What is the formula of rust?

- (a) Silver oxide
- (b) Iron oxide
- (c) Copper oxide
- (d) Platinum oxide

177. The correct order of reactivity is:

- (a) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$

(b) $F_2 < Cl_2 < Br_2 < I_2$

(c) $F_2 < Cl_2 > Br_2 > I_2$

(d) $F_2 > Cl_2 < Br_2 < I_2$

178. What is the colour of the aqueous solution of Barium chloride?

(a) Blue

(b) Green

(c) Colourless

(d) Purple

179. What happens when silver plate is dipped in copper nitrate solution?

(a) Silver replaces copper

(b) Copper metal is deposited

(c) Colour of solution changes

(d) No reaction occurs

180. Assertion: Chemical equations should be balanced.

Reason: As per the law of conservation of mass, mass can neither be created nor be destroyed.

181. What is a combination reaction?

182. A reaction in which two or more reactants combine to form one product is called a reaction.

183. What is the difference between exothermic and endothermic reaction?

184. What is a reactant and a product in a chemical reaction?

185. What do you understand by double displacement reaction?

186. Balance the equation for the reaction between sodium hydroxide and sulphuric acid to form sodium sulphate and water.

187. Give an example of a reaction which is a displacement reaction as well as redox reaction.

188. Define rusting.

189. Define : (i) Corrosion (ii) Combination reaction.

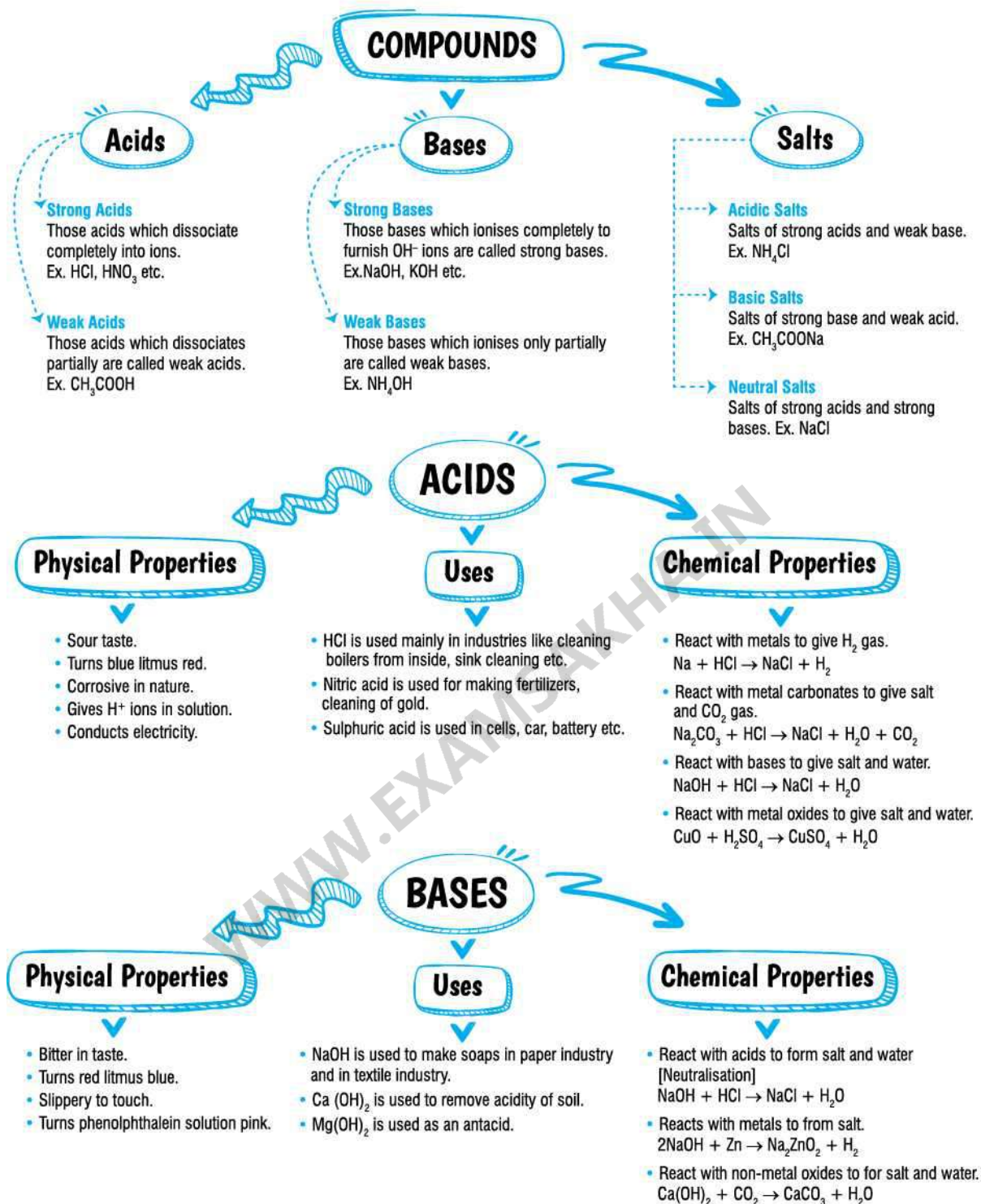
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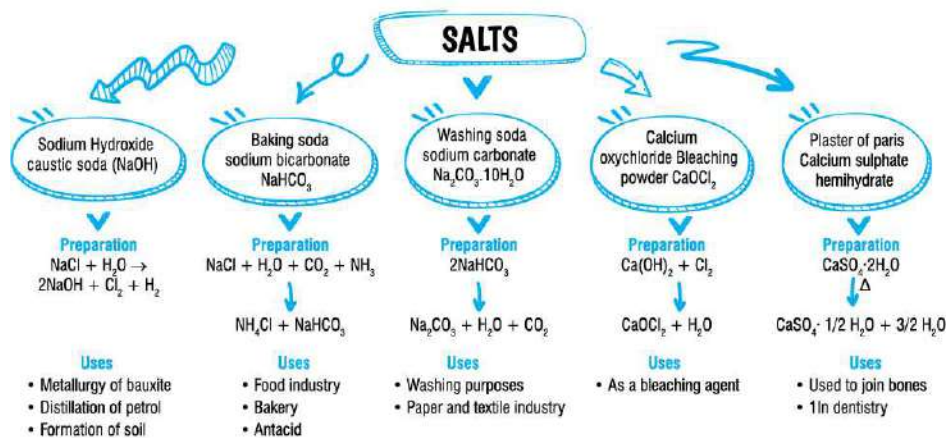
Acid, Bases and Salts

Chapter 2

Summary

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Families of Salts

Sodium Salts — NaCl , NaNO_3 , Na_2SO_4 , Na_2CO_3 , CH_3COONa etc.
 Potassium Salts — KCl , KNO_3 , K_2SO_4 , KBr , K_2CO_3
 Ammonium Salts — NH_4Cl , NH_4NO_3 , NH_4Br
 Magnesium Salts — MgCl_2 , MgSO_4 , MgCO_3
 Calcium Salts — CaCl_2 , Ca(COO)_2 , etc.

Chloride Salts

Formula	Name of Salt	Base Involved
NaCl	Sodium chloride	NaOH
KCl	Potassium chloride	KOH
NH_4Cl	Ammonium chloride	NH_4OH
BaCl_2	Barium chloride	Ba(OH)_2
MgCl_2	Magnesium chloride	Mg(OH)_2

Nitrate Salts

Formula	Name of Salt	Base Involved
NaNO_3	Sodium nitrate	NaOH
KNO_3	Potassium nitrate	KOH
$\text{Ca(NO}_3)_2$	Calcium nitrate	Ca(OH)_2

Sulphate Salts

Formula	Name of Salt	Base Involved
Na_2SO_4	Sodium sulphate	NaOH
K_2SO_4	Potassium sulphate	KOH
MgSO_4	Magnesium sulphate	Mg(OH)_2

Carbonate Salts

Formula	Name of Salt	Base Involved
Na_2CO_3	Sodium Carbonate	NaOH
K_2CO_3	Potassium Carbonate	KOH
CaCO_3	Calcium Carbonate	Ca(OH)_2

Definitions

1. Acid: An acid is any hydrogen-containing substance that is capable of donating a proton (hydrogen ion) to another substance. They are known to turn blue litmus paper to red.

2. Base: A base is a molecule which is able to accept a hydrogen

ion from an acid. They are known to turn red litmus paper to blue.

3. Ion: An atom or molecule with a net electric charge due to the loss or gain of one or more electrons.

4. Ionisation: The process of forming ions in aqueous solution is called ionisation.

5. Salt: The compound formed by reaction of an acid with a base, e.g., NaCl.

6. Strong acid: An acid which dissociate completely when dissolved in water furnishing is called as H^+ ions strong acid.

7. Strong base: A base which dissociates completely in aqueous solution furnishing OH^- ions is called as strong base.

8. Weak acid: A weak acid is one which does not ionise fully, when it is dissolved in water.

9. Weak base: A weak base is one which does not ionise fully, when it is dissolved in water.

10. Alkali: An alkali is a substance that produces OH^- ions in water.

11. Indicators: Indicators are weak acids or weak bases that show a change in colour as the concentration of Hydrogen ions in a solution changes or the pH of a solution changes. The indicators dissociate slightly in the water to form ions. Some examples of indicators are Litmus, turmeric, phenolphthalein, etc.

12. pH: pH measures the strength of acid and bases. pH stands for the potential of Hydrogen, and is approximately the negative of the base 10 log of molar concentration of H^+ ions.

13. Universal Indicator: Universal indicator is defined as the mixture of different indicators that gives different colours at different pH levels of the entire scale. It helps to interpret the acidic or basic

nature of a substance. It exhibits several colour changes over a pH value range from 0 to 14 to indicate the acidity or alkalinity of solutions, where pH value 7 indicates neutral, pH value below 7 indicates acidity and pH value above 7 indicates alkalinity or basicity of a solution.

14. Hydrogenation: A chemical reaction between molecular hydrogen and another compound or element, usually in the presence of a catalyst such as nickel, palladium or platinum.

15. Antacid: The substance which neutralizes acidity (especially in the stomach).

16. Aqua regia: It is a mixture of concentrated hydrochloric acid (HCl) and concentrated nitric acid (HNO₃) at a ratio of either 3 : 1.

17. Enamel: This tough shell is the hardest tissue in the human body and it covers the crown which is the part of the tooth that is visible outside of the gums.

18. Hard water: Water that contains mineral salts (as calcium and magnesium ions) which limits the formation of lather with soap.

19. Amphoteric substance: The substance having property of both acid as well as base.

Multiple Choice Questions

20. What is the nature of the new product which is formed by the action of water on quick lime ?

- (a) Neutral
- (b) Acidic
- (c) Amphoteric
- (d) Basic

Ans. (d) Basic

Explanation :

When quick lime is added to water, it reacts to form slaked lime (Ca(OH)_2). Slaked lime or calcium hydroxide is basic in nature because it dissociates into OH^- ions when dissolved in aqueous solution.

21. The pH range most conducive for life of fresh water plants and animals is :

- (a) 6.5–7.5
- (b) 2.0–3.5
- (c) 3.5–5.0
- (d) 9.0–10.5

Ans. (a) 6.5–7.5

Explanation :

A neutral pH is most conducive for life of fresh water plants and animals and the pH range 6.5-7.5 is almost neutral.

22. Phenolphthalein turns acids to _____ solution.

- (a) colourful
- (b) colourless
- (c) pink
- (d) orange

Ans. (b) colourless

Explanation :

Phenolphthalein is used as an indicator in acid–base titrations. For this application, it turn acids to colourless solutions and bases to pink solutions.

23. Which one of the following is acidic in nature?

- (a) Gastric juice
- (b) Sodium hydroxide solution

- (c) Lime water
- (d) Blood plasma

Ans. (a) Gastric juice

Explanation :

Gastric juice is acidic in nature because its pH ranges from 1.5-3.5.

24. An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. The following statement is true for solution 'A' and 'B'.

- (a) A is strongly basic and B is a weak base.
- (b) A is strongly acidic and B is a weak acid.
- (c) A has pH greater than 7 and B has pH less than 7.
- (d) A has pH less than 7 and B has pH greater than 7.

Ans. (c) A has pH greater than 7 and B has pH less than 7.

Explanation :

Phenolphthalein solution turns pink in basic solutions. Hence, solution A lies in the pH range of above 7. On adding solution B the pink colour disappears hence it has a pH less than 7.

25. To protect tooth decay we are advised to brush our teeth regularly. The nature of the tooth paste commonly used is :

[NCERT Exemplar]

- (a) Acidic
- (b) Neutral
- (c) Basic
- (d) Corrosive

Ans. (c) Basic

Explanation :

When we consume acidic food or drinks, the pH of the mouth falls to 5.5 due to which tooth decay occurs. This lowering of pH within the mouth can lead to dental plaque. To protect this, doctors advise to brush the teeth with the toothpaste which are basic in nature as it neutralises the acidic condition inside the mouth. Hence, the nature of the toothpaste should be basic.

26. Which one of these acid-base indicators is used by a visually impaired student?

- (a) Litmus
- (b) Turmeric
- (c) Vanilla
- (d) Phenolphthalein

Ans. (c) Vanilla

Explanation :

Vanilla essence is used as an acid-base indicator because of its smell which helps visually challenged people to realise the change in pH.

27. When you add a few drops of acetic acid to a test-tube containing sodium bicarbonate powder, which one of the following is your observation ?

- (a) No reaction takes place
- (b) A colourless gas with pungent smell is released with brisk effervescence
- (c) A brown coloured gas is released with brisk effervescence.
- (d) Formation of bubbles of a colourless and odourless gas.

Ans. (d) Formation of bubbles of a colourless and odourless gas.

Explanation :

When a few drops of acetic acid is added to the test tube containing

sodium bicarbonate powder, sodium acetate is formed along with the release of colourless and odourless CO_2 gas which can be observed as the bubbles in the test tube.

28. A student puts a drop of reaction mixture of a saponification reaction first on a blue litmus paper and then on a red litmus paper. He may observe that :

- (a) There is no change in the blue litmus paper and the red litmus paper turns white.
- (b) There is no change in the red litmus paper and the blue litmus paper turns red.
- (c) There is no change in the blue litmus paper and the red litmus paper turns blue.
- (d) No change in colour is observed in both the litmus papers.

Ans. (c) There is no change in the blue litmus paper and the red litmus paper turns blue.

Explanation :

Saponification is the alkaline hydrolysis of the fatty acid esters. Hence, the solution is basic, bases with blue litmus gives no colour change. Whereas, on dipping red litmus paper in a mixture of saponification reaction it turns blue.

29. The pH value of a sample of hydrochloric acid is 2. pH value of this sample when diluted by adding water will be :

- (a) less than 2 but more than 0
- (b) more than 2 but less than 7
- (c) more than 7
- (d) no change in pH

Ans. (b) more than 2 but less than 7

Explanation :

When we add water to the solution of hydrochloric acid ($\text{pH} = 2$) the pH will increase till 7 but it will be less than 7 as it contains more hydrogen ions

(H^+ ions) as compared to hydroxide ions (OH^- ions). So, the pH on dilution will be more than 2 but less than 7.

30. While preparing soap a small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide. Which one of the following may be the purpose of adding common salt?

- (a) To reduce the basic nature of the soap
- (b) To make the soap neutral
- (c) To enhance the cleansing power of the soap
- (d) To favour the precipitation of the soap

Ans. (d) To favour the precipitation of the soap

Explanation :

A small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide to favour the precipitation of the soap because by adding salt to the suspension mixture, soap is precipitated as solid. This process is called salting out of soap.

31. When a small amount of acid is added to water, the phenomena which occur are :

[Board Question]

- (A) Dilution
- (B) Neutralisation
- (C) Formation of H_3O^+ ions
- (D) Salt formation

The correct statements are :

- (a) (A) and (C)
- (b) (B) and (D)
- (c) (A) and (B)
- (d) (C) and (D)

Ans. (a) (A) and (C)

Explanation :

When a small amount of acid is added to water, the phenomena which occur are dilution and formation of H_3O^+ ions. When water is added, a concentrated acid is turned into a dilute acid. This process is called dilution of acid. A dilute acid is an aqueous solution in which acid undergoes ionisation and releases hydronium ions (H_3O^+).

32. If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done? [NCERT Exemplar]

- (a) Wash the hand with saline solution.
- (b) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogencarbonate.
- (c) After washing with plenty of water apply solution of sodium hydroxide on the hand.
- (d) Neutralise the acid with a strong alkali.

Ans. (b) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogencarbonate.

Explanation :

If a few drops of a concentrated acid accidentally spills over the hand of a student then he should wash his hands immediately with plenty of water as it will dilute the acid and wash it out. Any remaining acid should be neutralised by applying the paste of sodium hydrogencarbonate.

33. Which one of the following types of medicines is used for treating indigestion?[NCERT]

- (a) Antibiotic
- (b) Analgesic
- (c) Antacid
- (d) Antiseptic

Ans. (c) Antacid

Explanation :

Antacids such as sodium bicarbonate and magnesium hydroxide etc are used in treating indigestion. They are basic in nature and reacts with excess acid present in the stomach and neutralises it.

34. Which of the following is used for dissolution of gold?
[NCERT Exemplar]

- (a) Hydrochloric acid
- (b) Sulphuric acid
- (c) Nitric acid
- (d) Aqua regia

Ans. (d) Aqua regia

Explanation :

Aqua regia is a mixture of hydrochloric acid and nitric acid in the ratio 3 : 1 and it can dissolve **noble metals** such as gold, palladium, and platinum, which however, not **soluble** in either of the acids alone.

35. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to:[NCERT & NCERT Exemplar]

- (a) Absorb the evolved gas

- (b) Moisten the gas
- (c) Absorb moisture from the gas
- (d) Absorb Cl^- ions from the evolved gas

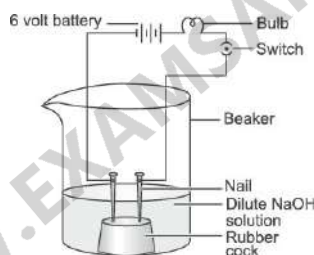
Ans. (c) Absorb moisture from the gas

Explanation :

Calcium chloride is used as an absorbent in the guard tube during the preparation of hydrogen chloride gas on a humid day as it absorbs the moisture present in the air and gives out white fumes on reacting with moisture.

36. In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus was set up. Which among the following statement(s) is(are) correct ?

[NCERT Exemplar]



- (a) Bulb will not glow because electrolyte is not acidic.
 - (b) Bulb will glow because NaOH is a strong base and furnishes ions for conduction.
 - (c) Bulb will not glow because circuit is incomplete.
 - (d) Bulb will not glow because it depends upon the type of electrolytic solution.
- (a) (i) and (iii)
 - (b) (ii) and (iv)
 - (c) (ii) only
 - (d) (iv) only

Ans. (b) Bulb will glow because NaOH is a strong base and furnishes ions for conduction.

Explanation :

Bulb will glow because NaOH is a strong base that dissociates completely in water into Na^+ ions and OH^- ions which are responsible for electrical conductivity.

37. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount of HCl solution (the same solution as before) required to neutralise it will be:

[NCERT]

(a) 4 mL

(b) 8 mL

(c) 12 mL

(d) 16 mL

Ans. (d) 16 mL

Explanation :

Given: 10 ml of NaOH requires 8 mL of HCl.

Let X be the amount of HCl required to neutralise the 20 ml of NaOH.

20 ml of NaOH require = XHCl.

$$X = (20 \times 8)/10$$

$$X = 16 \text{ ml}$$

38. Generally metals react with acids to give salt and hydrogen gas. Which of the following acids does not give hydrogen gas on reacting with metals (except Mn and Mg) ?

(a) H_2SO_4

- (b) HCl
- (c) HNO_3
- (d) All of these

Ans. (c) HNO_3

Explanation :

Nitric acid (HNO_3) does not give hydrogen gas on reacting with metals (except Mg and Mn) because it is a strong oxidising agent and oxidises the evolved H_2 gas to water and itself get reduced to the oxides of nitrogen. Whereas metals such as magnesium and manganese react with very dilute HNO_3 to evolve H_2 gas.

39. Identify the basic salt from the following salts.

- (a) Na_2CO_3
- (b) NH_4Cl
- (c) NaNO_3
- (d) KCl

Ans. (a) Na_2CO_3

Explanation :

Out of the given options, Na_2CO_3 is basic salt because it is formed by the reaction between strong base (sodium hydroxide, NaOH) and weak acid (carbonic acid, H_2CO_3)

Other options: NH_4Cl : Acidic salt as it is a salt of a strong acid (hydrochloric acid, HCl) and a weak base (ammonium hydroxide, NH_4OH)

KCl: Neutral salt as it is a salt of strong acid (hydrochloric acid, HCl) and a strong base (potassium hydroxide, KOH)

NaNO_3 : Neutral salt as it is a salt of strong base

(sodium hydroxide, NaOH) and a strong acid(nitric acid, HNO₃).

40. Which of the following salts do not contain water of crystallisation?

- (a) Blue vitriol
- (b) Baking soda
- (c) Washing soda
- (d) Gypsum

Ans. (b) Baking soda

Explanation :

Baking soda is sodium bicarbonate (NaHCO₃) in anhydrous form without any water of crystallisation.

Other options: Blue Vitriol: It is hydrated salt of copper sulphate containing 5 molecules of water of crystallisation (CuSO₄. 5H₂O).

Washing soda: It is hydrated salt of sodium carbonate containing 10 molecules of water of crystallisation (Na₂CO₃. 10H₂O)

Gypsum: It is hydrated salt of calcium sulphate containing 2 molecules of water of crystallisation (CaSO₄. 2H₂O).

41. The chemical formula for plaster of Paris is :

[Board Question]

- (a) CaSO₄. 2H₂O
- (b) CaSO₄. H₂O
- (c) CaSO₄.1/2 H₂O
- (d) 2CaSO₄.H₂O

Ans. (c) CaSO₄.1/2 H₂O

Explanation :

The chemical formula of plaster of paris is $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$. The half a molecule of water in the formula means that two molecules of CaSO_4 share one molecule of water so that the effective water of crystallisation for one CaSO_4 unit comes to half molecule of water.

42. Baking soda is a mixture of : [Board Question]

- (a) Sodium carbonate and acetic acid
- (b) Sodium carbonate and tartaric acid
- (c) Sodium hydrogen carbonate and tartaric acid
- (d) Sodium hydrogen carbonate and acetic acid

Ans. (c) Sodium hydrogen carbonate and tartaric acid

Explanation :

Baking soda is a mixture of sodium hydrogen carbonate (NaHCO_3) and mild edible tartaric acid.

43. Sodium hydrogencarbonate when added to acetic acid evolves a gas. Which of the following statements are true about the gas evolved ? [NCERT Exemplar]

- (i) It turns lime water milky.
 - (ii) It extinguishes a burning splinter.
 - (iii) It dissolves in a solution of sodium hydroxide.
 - (iv) It has a pungent odour.
- (a) (i) and (ii)
 - (b) (i), (ii) and (iii)
 - (c) (ii), (iii) and (iv)
 - (d) (i) and (iv)

Ans. (b) (i), (ii) and (iii)

Explanation :

The gas evolved is carbon dioxide gas and it has the property to extinguish burning splinter. It can turn lime water milky and gets dissolved in a solution of sodium hydroxide to form sodium carbonate. It is an odourless gas, hence the statement (iv) is false.

44. Match the chemical substances given in Column (A) with their appropriate application given in Column (B) : [NCERT Exemplar]

Column 'A'	Column 'B'
(A) Bleaching Powder	(i) Preparation of glass
(B) Baking soda	(ii) Production of H_2 and Cl_2
(C) Washing soda	(iii) Decolourisation
(D) Sodium chloride	(iv) Antacid

(a) A–(ii) B–(i) C–(iv) D–(iii)

(b) A–(iii) B–(ii) C–(iv) D–(i)

(c) A–(iii) B–(iv) C–(i) D–(ii)

(d) A–(ii) B–(iv) C–(i) D–(iii)

Ans. (c) A–(iii) B–(iv) C–(i) D–(ii)

Explanation :

Bleaching powder ($CaOCl_2$) : It is used for bleaching or decolourisation of clothes., Bleaching powder on reaction with water decomposes and releases chlorine, which acts as a oxidising, bleaching and disinfecting agent.

Baking soda ($NaHCO_3$): It is used as an antacid for relieving stomach acidity. They react with excess acid in the stomach and neutralises it.

Washing soda (Na_2CO_3): It is used in preparation of glass, soap and paper industries.

Sodium chloride (NaCl): Aqueous sodium chloride is used for the production of H_2 and Cl_2 gases on electrolysis.

Assertion and Reasoning Based Questions

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.
- (c) Assertion is true, but reason is false.
- (d) Assertion is false, but reason is true.

45. Assertion: Solutions of compounds like alcohol and glucose do not show acidic character.

Reason: They do not show acidic character because they do not dissociate into ions.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Solutions of compounds like alcohol and glucose do not show acidic character because like acids such as HCl which dissociates into H^+ and Cl^- ion these solutions do not dissociate into ions. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

46. Assertion: Dry HCl gas does not change the colour of the dry litmus paper.

Reason: It is because dry HCl does not contain the OH^- ions.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Colour of the litmus paper is changed by the hydrogen ions. Dry HCl gas does not contain H^+ ions. Acids give hydrogen ions only in the presence of ions. In case of dry litmus paper and dry HCl, water is not present. Therefore, the colour of the litmus paper does not change. Thus, assertion is true but reason is false.

47. Assertion: An aqueous solution of acid conducts electricity.

Reason: It is because in the solution it dissociates into ions.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Acids dissociate in its aqueous solutions to form ions. These ions are responsible for conduction of electricity. Thus, both assertion and reason are correct, and reason is the correct explanation of the assertion.

48. Assertion: Ammonia is acidic in nature.

Reason: Ammonia dissolves in water and forms OH^- .

Ans. (d) Assertion is false, but reason is true.

Explanation :

Ammonia is weak base as it has one pair of electron through which it can accept a proton. Thus, assertion is false, but reason is true.

49. Assertion: Tap water conducts electricity but distill water does not conducts electricity.

Reason: Tap water conducts electricity as it contains ions whereas distilled water does not contain ions.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Tap water conducts electricity as it contains ions whereas distilled water does not contain ions. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

50. Assertion: Curd and sour substances should not be stored in copper vessels.

Reason: Curd and other sour substances should not be kept in brass and copper vessels as they contain acids.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Curd and other sour substances should not be kept in brass and copper vessels as they contain acids. When these substances are kept in brass and copper vessels, the metal reacts with the acid to liberate hydrogen gas and harmful products are obtained due to which the food gets spoiled. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

51. Assertion: Most of the metals do not give hydrogen while reacting with nitric acid.

Reason: Nitric acid is a weak oxidising agent.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because HNO_3 is a strong oxidising agent. It oxidises the H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O , NO , NO_2). Thus, assertion is true but reason is false.

52. Assertion: Plaster of Paris should be stored in dry place.

Reason: To prevent its reaction with moisture.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Plaster of Paris is stored in a dry place because in the presence of water or moisture, it changes to a hard solid mass called gypsum. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

53. Assertion: The aqueous solutions of glucose and alcohol do not show acidic character.

Reason: Aqueous solution of glucose and alcohol do not give H^+ ions.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

The aqueous solution of glucose and alcohol do not dissociate to form the H^+ ions in the solution thus they do not show the acidic character. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

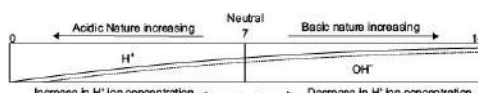
Case Based Questions

54. Read the passage carefully and answer the following questions from (i) to (v):

The use of a universal indicator, which is a mixture of several indicators can be helpful in judging how strong a given acid or base is. The universal indicator shows different colours at different concentrations of hydrogen ions in a solution. Here is a scale for measuring hydrogen ion concentration in a solution, called pH scale. The 'p' in pH stands for 'potenz' in German, meaning power. On the pH scale, we can measure pH from 0 (very acidic) to 14 (very

alkaline). pH should be thought of simply as a number which indicates the acidic or basic nature of a solution. Higher the hydronium ion concentration, lower is the pH value.

The pH of a neutral solution is 7. Values less than 7 on the pH scale represents an acidic solution. As the pH value increases from 7 to 14, it represents an increase in OH^- ion concentration in the solution, that is, increase in the strength of alkali.



(i) When hydrogen chloride gas is prepared on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to:

- (a) absorb the evolved gas
- (b) moisten the gas
- (c) absorb moisture from the gas
- (d) absorb Cl^- ions from the evolved gas

Ans. (c) absorb moisture from the gas.

(ii) Which of the following statements is correct about an aqueous solution of an acid and of a base?

(A) Higher the pH, stronger the acid (C) Lower the pH, stronger the base

(B) Higher the pH, weaker the acid (D) Lower the pH, weaker the base

- (a) (A) and (B)
- (b) (B) and (C)
- (c) (A) and (D)
- (d) (B) and (D)

Ans. (d) (B) and (D)

(iii) An aqueous solution turns red litmus solution blue. Excess addition of which of the following solution would reverse the change?

- (a) Baking powder
- (b) Lime
- (b) Ammonium hydroxide solution
- (d) Hydrochloric acid

Ans. (d) Hydrochloric acid

(iv) The pH of a solution of HCl is 4. This shows that the molarity of the solution is:

- (a) 4.0 M
- (b) 0.4 M
- (c) 0.0001 M
- (d) 0.001 M

Ans. (a) 4.0 M

(v) Two aqueous solutions P and Q have pH of 5 and 13 respectively. The correct inference is that:

- (a) solution P is of HCl and Q is of NH_4OH
- (b) solution P is of CH_3COOH and Q is of $\text{Ca}(\text{OH})_2$
- (c) solution P is of HNO_3 and Q is of NH_4OH
- (d) solution P is of CH_3COOH and Q is of NaOH

Ans. (d) Solution P is of CH_3COOH and Q is of NaOH.

55. Read the passage carefully and answer the following questions from (i) to (v):

Vedanshi and Krati are working in the lab. During the experiment of determining the reactivity of acid and bases, the test tube containing chemical 'X' cracked and the liquid inside produced blisters on the skin of the Krati. The pH strip turned blue to red, with the reaction to the liquid. Vedanshi immediately called her teacher for help, and first aid was provided to Krati.

(i) What could be the possible liquid be present in test tube?

- (a) Boiling water
- (b) Concentrated H_2SO_4
- (c) Vinegar
- (d) Sodium Hydroxide Solution

Ans. (b) Concentrated H_2SO_4

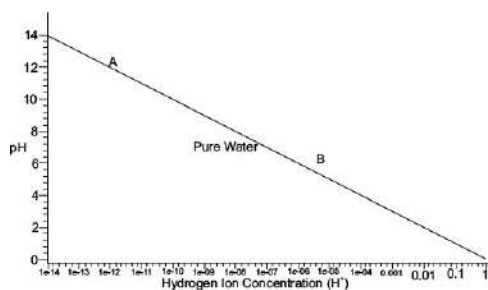
(ii) The following list include the possible first aid for the laboratory accidents.

1. Thoroughly rinse the affected area with water.
2. Having medicines without prescribing the doctor.
3. Consult the doctor immediately
4. To go outside the lab, preferably in an open area.
5. Not telling the teacher and other elders or they might scold you.

- (a) All of the above
- (b) 1, 2 and 3 are correct
- (c) Only 1 is correct
- (d) 1, 3 and 4 are correct

Ans. (d) 1, 3 and 4 are correct

(iii) The given graph below is plotted again pH and H^+ concentration.



In the experiment, Krati and Vedanshi listed the chemicals in list A and B. Which of the following is correct?

	List A	List B
(a)	HCl, Citric Acid, Oxalic Acid, Nitric Acid, Vinegar	Ammonia, Sodium Hydroxide, Baking soda
(b)	Ammonia, Sodium Hydroxide, Baking soda	HCl, Citric Acid, Oxalic Acid, Nitric Acid, Vinegar
(c)	HCl, Citric Acid, Oxalic Acid, Nitric Acid,	Ammonia, Sodium Hydroxide, Baking soda, vinegar
(d)	Ammonia, Sodium Hydroxide, Vinegar	HCl, Citric Acid, Oxalic Acid, Nitric Acid, Baking Soda

Ans. List A List B

(b)	Ammonia, Sodium Hydroxide, Baking soda	HCl, Citric Acid, Oxalic Acid, Nitric Acid, Vinegar
-----	--	---

(iv) Krati detected the pH of four unknown solution A, B, C and D as follows 11, 5, 7 and 2 respectively and note down her results.

1. C is neutral in nature.
2. On reacting A and D, water is liberated.
3. A and C are basic in nature.
4. B and D react to form hydrogen gas

(a) All are correct

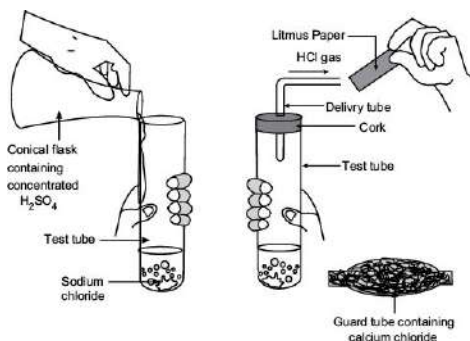
(b) 1 and 2 are correct

(c) 1 and 4 are correct

(d) 1, 2 and 3 are correct.

Ans. (b) 1 and 2 are correct

(v) What does the following activity represent



(a) Production of HCl

(b) Production of H_2SO_4

(c) Production of CO_2

(d) Reaction of calcium chloride with sulphuric acid

Ans. (a) Production of HCl

56. Read the passage carefully and answer the following questions from (i) to (v).

A compound C of sodium forms a white powder. It is a constituent of baking powder and is used in some antacids. When heated it gives a compound D which is anhydrous and absorbs water to become a hydrated salt. When this salt is kept in the open air, it loses water molecules in a process called efflorescence. When dissolved in water, it forms a strong base and a weak acid F.

(i) Which of the following is compound C?

(a) NaHCO_3

(b) Na_2CO_3

(c) NaOH

(d) NaCl

Ans. (a) NaHCO_3

(ii) Which of the following is compound D?

(a) NaHCO_3

(b) Na_2CO_3

(c) $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

(d) NaCl

Ans. (b) Na_2CO_3

(iii) What is the nature of the solution formed by dissolving D in water?

(a) Acidic

(b) Alkaline

(c) Neutral

(d) Insoluble

Ans. (b) Alkaline

(iv) Which among the following is compound F?

(a) CO_2

(b) H_2CO_3

(c) NaOH

(d) H_2O

Ans. (b) H_2CO_3

(v) Sodium carbonate is a basic compound because it is a salt of a:

(a) Strong acid and strong base

- (b) Weak acid and weak base
- (c) Strong acid and weak base
- (d) Weak acid and strong base

Ans. (d) Weak acid and strong base

57. Read the passage carefully and answer the following questions from (i) to (v):

[CBSE Question Bank]

Marble's popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings.

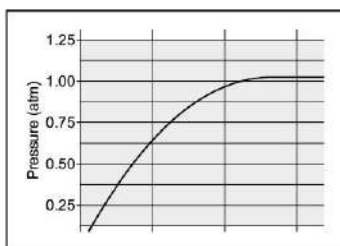


(i) The substance not likely to contain CaCO_3 is:

- (a) Dolomite
- (b) A marble statue
- (c) Calcined gypsum
- (d) Sea shells

Ans. (d) Sea shells

(ii) A student added 10g of calcium carbonate in a rigid container, secured it tightly and started to heat it. After some time, an increase in pressure was observed, the pressure reading was then noted at intervals of 5 mins and plotted against time, in a graph as shown below. During which time interval did maximum decomposition took place?



(a) 15-20 min

(b) 10-15 min

(c) 5-10 min

(d) 0-5 min

Ans. (d) 0-5 min

(iii) Gas A, obtained above is a reactant for a very important biochemical process which occurs in the presence of sunlight. Identify the name of the process:

(a) Respiration

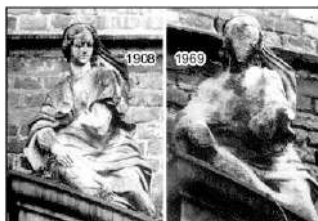
(b) Photosynthesis

(c) Transpiration

(d) Photolysis

Ans. (b) Photosynthesis

(iv) Marble statues are corroded or stained when they repeatedly come into contact with polluted rain water. Identify the main reason.



(a) Decomposition of calcium carbonate to calcium oxide

(b) Polluted water is basic in nature hence it reacts with calcium carbonate

(c) Polluted water is acidic in nature hence it reacts with

calcium carbonate

(d) Calcium carbonate dissolves in water to give calcium hydroxide.

Ans. (c) Polluted water is acidic in nature hence it reacts with calcium carbonate

(v) Calcium oxide can be reduced to calcium, by heating with sodium metal. Which compound would act as an oxidizing agent in the above process?

(a) Sodium

(b) Sodium oxide

(c) Calcium

(d) Calcium oxide

Ans. (d) Calcium oxide

58. Read the passage carefully and answer the following questions from (i) to (v):

Common edible salt, NaCl (Sodium Chloride) obtained from seawater or from lakes contains many impurities such as sulphates of sodium and magnesium along with chlorides of calcium and magnesium. The chlorides of these metals are particularly undesirable being deliquescent in nature. A saturated solution of salt in a minimum quantity of water is prepared and insoluble impurities are filtered off. HCl gas is then passed through the saturated solution and the crystals of pure NaCl separate out. The soluble impurities remain in the solution. Pure crystals of NaCl are filtered, washed and dried.

(i) Choose the correct statement:

(a) Pure NaCl is hygroscopic in nature by itself

(b) Pure NaCl is soluble in alcohol

(c) NaCl shows hygroscopic properties only due to impurities

(d) NaCl is a brown crystalline solid

Ans. (c) NaCl shows hygroscopic properties only due to impurities

(ii) Nature of the aqueous solution of common salt is:

(a) Acidic

(b) Alkaline

(c) Basic

(d) Neutral

Ans. (d) Neutral

(iii) Which of the following compounds is alkaline in an aqueous medium?

(a) Na_2CO_3

(b) NaCl

(c) H_2CO_3

(d) CuSO_4

Ans. (a) Na_2CO_3

(iv) Adding common salt to water will result in:

(a) increase in pH of the water

(b) decrease in pH of the water

(c) no change in pH of the water

(d) Flammability in water

Ans. (c) no change in pH of the water

(v) Examine few statements regarding NaCl.

I- It is prepared by Chlor-alkali process

II- It is a white crystalline substance

III- It also exists in the form of rocks called rock salt

IV- It is a neutral salt with a pH value = 7

- (a) II and III only (b) III and IV only
(c) I and IV only (d) II, III and IV only

Ans. (d) II, III and IV only

59. Read the passage carefully and answer the following questions from (i) to (v):

Reshma broke her leg in an accident. She went to see Dr. Sant Prakash. On examination, Dr. Prakash mixed the white powder in water and applied to her leg along with the cotton and gauze. After a while, it turned into white, solid, hard mass. He said that it would support her fractured bone in the right position.

(i) After treatment, the doctor repacked the white powder back into moisture proof, airtight container. Why?

- (a) The fungus growth will occur in open.
(b) The powder would react to moisture and turn into solid mass.
(c) The powder with react to sunlight and turn into solid mass.
(d) To prevent the stealing of the powder as it is very expensive.

Ans. (b) The powder would react to moisture and turn into solid mass

(ii) What is 'white, solid hard mass' called as?

- (a) Talcum powder
(b) Plaster of Paris
(c) Paris of Plaster
(d) Copper sulphate

Ans. (b) Plaster of Paris

(iii) The reaction involved in the formation of white mass is:

- (a) Combustion

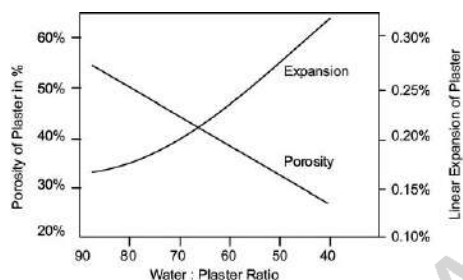
(b) Mineralisation

(c) Oxidation

(d) Crystallisation

Ans. (d) Crystallisation

(iv) The graph shows the porosity and expansion of plaster with respect to water content. At what temperature, the reaction would occur?



(a) 373K

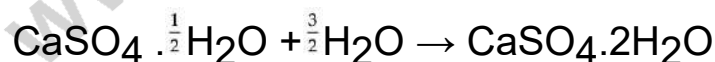
(b) 673K

(c) 273K

(d) 573K

Ans. (a) 373K

(v) Study the following reaction and choose the correct option:



(a) Reactant is calcium hemihydrate, product is gypsum.

(b) Reactant is gypsum, product is calcium hemihydrate.

(c) Reactant is gypsum, product is calcium sulphate hemihydrate.

(d) Reactant is calcium sulphate hemihydrate, product is gypsum.

Ans. (d) Reactant is calcium sulphate hemihydrate, product is gypsum.

60. Read the passage carefully and answer the following questions from (i) to (v):

POP or Plaster of Paris is a calcium sulphate hemihydrate. Hemihydrate contains half molecule of water of crystallisation. It is represented by the formula $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$. This structure of half water molecule means that one water molecule is shared by two formula units of CaSO_4 . The name Plaster of Paris was given to this compound because, for the first time, it was made from gypsum which was mainly found in Paris.

(i) The difference of water molecules in gypsum and Plaster of Paris is:

- (a) $\frac{5}{2}$
- (b) 2
- (c) $\frac{1}{2}$
- (d) $\frac{3}{2}$

Ans. (d) $\frac{3}{2}$

(ii) Plaster of Paris is known for its hardening. It is due to:

- (a) releasing CO_2
- (b) converting into CaCO_3
- (c) combining with water
- (d) losing out water

Ans. (c) combining with water

(iii) Choose the incorrect statement.

- (a) POP is used to ornate designs on walls and ceilings.
- (b) On heating gypsum above 373 K, CaSO_4 is obtained.
- (c) Dead burnt plaster is $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$.
- (d) The setting of plaster is due to its hydration into gypsum.

Ans. (c) Dead burnt plaster is $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

(iv) Choose the incorrect statement related to gypsum.

(a) It is slightly soluble in water

(b) It is also known as alabaster

(c) On heating gypsum at 373 K, it loses water molecules and becomes calcium sulphate hemihydrate

(d) The chemical formula of gypsum is $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

Ans. (d) The chemical formula of gypsum is $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

(v) We can obtain Plaster of Paris by:

(a) Adding water to calcium sulphate.

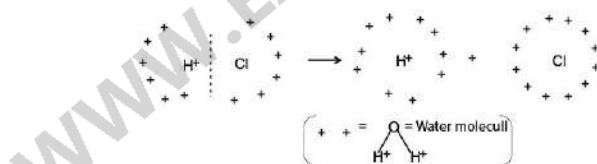
(b) Adding sulphuric acid to calcium hydroxide.

(c) Heating gypsum to a very high temperature.

(d) Heating gypsum to 100°C .

Ans. (d) Heating gypsum to 100°C

61. Read the passage carefully and answer the following questions from (i) to (v):



Acids show their property due to the presence of Hydronium ions in their solutions. They produce hydrogen ions (H^+) in the presence of water. Water weakens the bond between the ions and makes them soluble. This is the reason why acids and bases produce ions in aqueous solutions. In non-polar solvents like benzene and toluene, dry HCl gas or solution does not undergo ionisation. The reason for this split is because the water molecules, being polar, pull the H^+ and Cl^- apart.

(i) A solution with $\text{pH} = 8$ will have the number of H^+ ions:

- (a) 10^8
- (b) 10^{-8}
- (c) 100^8
- (d) $\text{Log}10^8$

Ans. (b) 10^{-8}

(ii) The correct order of acidic strength is:

- (a) Water < Hydrochloric acid < acetic acid
- (b) Hydrochloric acid < Water < acetic acid
- (c) Acetic acid < Hydrochloric acid < Water
- (d) Water < Acetic acid < Hydrochloric acid

Ans. (d) Water < Acetic acid < Hydrochloric acid

(iii) Which of the following compound does not dissociate into H^+ ions in an aqueous solution?

- (a) $\text{C}_2\text{H}_5\text{OH}$
- (b) H_3PO_4
- (c) H_2CO_3
- (d) CH_3COOH

Ans. (a) $\text{C}_2\text{H}_5\text{OH}$

(iv) The pH value of four solutions are:

A = 1 B = 9 C = 3 D = 13

Choose the incorrect statement:

- (a) A has a higher concentration of hydronium ions than solution C
- (b) B has a higher concentration of hydronium ions than solution D
- (c) A and B will turn red litmus solution into blue

(d) A is highly acidic while B is weakly basic

Ans. (a) A has a higher concentration of hydronium ions than solution C

(v) Choose the incorrect statement.

(a) An increase in pH value from 7 to 14 indicates an increase in hydrogen ions

(b) The strength of an acid or base is determined by a universal indicator

(c) $\text{pH} < 7$ indicates that the solution is acidic

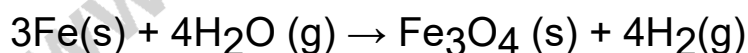
(d) Higher the hydrogen ion concentration, lower the pH value

Ans. (a) An increase in pH value from 7 to 14 indicates an increase in hydrogen ions

Chemical Equations and Reactions

62. Write equation for the reaction of iron with steam. Name the compound of iron obtained.

Ans. Metal react with steam to form metal oxide and hydrogen gas. Here, iron reacts with steam to form iron oxide and hydrogen gas. The reaction of iron with steam can be given as:



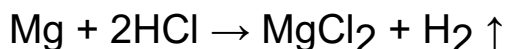
63. Explain the action of dilute hydrochloric acid on the following with chemical equation:

(i) Magnesium ribbon

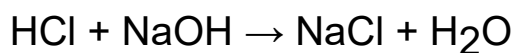
(ii) Sodium hydroxide

(iii) Crushed eggs **[Board Question]**

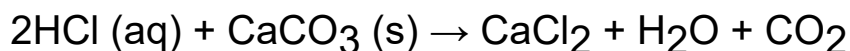
Ans. (i) When dilute HCl react with Mg, magnesium chloride is formed and hydrogen gas is evolved.



(ii) When dilute HCl reacts with NaOH, it gives NaCl and water. This is neutralisation reaction.



(iii) Crushed eggs contain calcium carbonate, when this calcium carbonate reacts with dilute HCl, it gives calcium chloride and carbon dioxide.



64. Explain the following giving equation in each :

[Board Question]

(i) Baking soda is heated.

(ii) Washing soda is heated.

(iii) Gypsum is heated at 373 K.

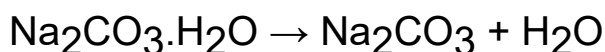
Ans. (i) When baking soda is heated, carbon dioxide gas is evolved and sodium carbonate is formed.



(ii) When washing soda is heated, it loses its water of crystallisation and form a white powder monohydrate.



When this monohydrate is again heated, it gives anhydrous sodium carbonate.



(iii) When gypsum is heated, it loses water of crystallisation and form calcium sulphate hemihydrate $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ or Plaster of paris.



65. Give balanced chemical equation for:

(i) Reaction of acids with metals.

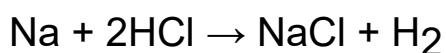
(ii) Reaction of acids with metal carbonate.

(iii) Reaction of acid with hydrogen carbonates (bicarbonates)

(iv) Reaction of acid with bases

Ans. (i) Reaction of acids with metal: Acids give hydrogen gas along with respective salt when they react with a metal.

Metal + Acid \rightarrow Salt + Hydrogen



(ii) Reaction of acids with metal carbonate : Acids when react with metal carbonates give carbon dioxide gas and respective salts along with water.

Metal carbonate + Acid \rightarrow

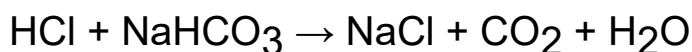
Salt + Carbon dioxide + Water



(iii) Reaction of acid with hydrogen carbonates (bicarbonates): Acids give carbon dioxide gas, respective salt and water when they react with metal hydrogen carbonate.

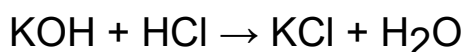
Acid + Metal hydrogen carbonate \rightarrow

Salt + Carbon dioxide + Water



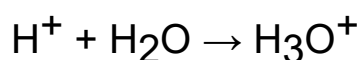
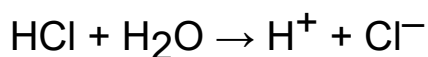
(iv) Acids react with bases to give salt and water. This reaction is called neutralization reaction.

Base + Acid \rightarrow Salt + Water



66. Why do HCl, HNO₃, etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?[NCERT]

Ans. Acids like HCl, HNO₃, etc; dissociate to form hydrogen ions. These hydrogen ions (H⁺) combine with H₂O to form hydronium ion(H₃O⁺). This H⁺ or H₃O⁺ is responsible for acidity. It can be represented as:



Aqueous solutions of glucose and alcohol contain hydrogen, but these cannot dissociate in water to form hydrogen ions. Hence, they do not show acidic character.

67. Why does dry HCl gas not change the colour of the dry litmus paper?[NCERT]

Ans. Dry HCl gas does not contain H⁺ ions. Acids give hydrogen ions only in the aqueous solution. In case of dry litmus paper and dry HCl, water is not present. Therefore, dry HCl will not dissociate into hydrogen ions H⁺ and the colour of the litmus paper does not change.

68. Why does an aqueous solution of an acid conduct electricity?[NCERT]

Ans. When electricity is passed through an aqueous solution of an acid, it dissociates in aqueous solution to form H⁺ and OH⁻ ions. The H⁺ ions reach the cathode and each H⁺ ion picks up one electron from the cathode to form H₂ gas. Because of this reaction, an aqueous solution of acid conducts electricity.

69. Why should curd and sour substances not be kept in brass and copper vessels?

Ans. Curd and other sour substances not be kept in brass and copper vessels as they contain acids. When these substances are kept in brass and copper vessels, the metal reacts with the acid to liberate hydrogen gas and harmful products. As a result, food gets spoiled.

70. Answer the following questions:

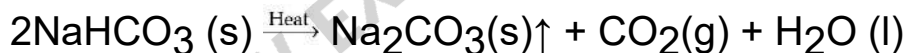
(i) Give the constituents of baking powder :

[Board Question]

(ii) Why cake or bread swells on adding baking powder ? Write chemical equation.

Ans. (i) Baking powder contains sodium hydrogen carbonate and tartaric acid.

(ii) Cake or bread swells on adding baking powder due to production of carbon dioxide gas.



71. Write the chemical name for Plaster of paris. Write the chemical equation of its preparation. Why should Plaster of Paris be stored in a dry place.

[Board Question]

Ans. The chemical name of Plaster of Paris is calcium sulphate hemihydrate. Its chemical formula is $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$. The equation for its preparation is:



Plaster of Paris is stored in a dry place because in the presence of water or moisture, it changes to a hard solid mass called gypsum.

72. State reason for the following statements:

[Board Question]

- (i) Tap water conducts electricity whereas distilled water does not.
- (ii) Dry hydrogen chloride gas does not turn blue litmus red whereas dilute hydrochloric acid does.
- (iii) During summer season, a milk man usually adds a very small amount of baking soda to fresh milk.
- (iv) For a dilution of acid, acid is added into water and not water into acid.
- (v) Ammonia is a base but does not contain hydroxyl group.

Ans. (i) Tap water contains dissolved salts in it. These salts dissociate into ions when electricity is passed through it which are responsible for the electricity conductivity of tap water. But distilled water does not contain any dissolved salts, so it does not conduct electricity.

(ii) Dry hydrogen chloride does not give hydrogen ions so, it does not act as an acid. As a result, it does not turn blue litmus red. On the contrary, hydrogen chloride acid in water gives H^+ ions and turns blue litmus red.

(iii) In the summer season, the growth of lactobacillus bacteria is very rapid in the fresh milk. This growth of bacteria makes the milk slightly acidic due to the formation of lactic acid which can cause curdling. So, in order to avoid the unwanted curdling in the acidic medium a basic medium is used to neutralise it. Therefore, baking soda is used which is a basic medium to neutralise the acidic medium of the milk, in order to prevent the curdling. Hence, very little amount of baking soda is used because excessive baking soda can make the medium excessively basic which is also not preferable.

(iv) The reaction of acid and water is an exothermic reaction since a

lot of heat is liberated during the reaction. This heat changes some water to steam explosively which can splash the acid on our face or clothes and cause acid burns. As a result, adding acid to water is safe, but adding water to acid is not.

(v) Ammonia is a base but it does not contain hydroxyl group because on reacting with water ammonia forms ammonium hydroxide which further on ionization gives ammonium ion and hydroxide ion.

Very Short Answer Type Questions

73. While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid? [NCERT]

Ans. The process of dissolving an acid or a base in water is a highly exothermic in nature. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Hence, it is recommended that the acid should be added to water and not water to the acid.

74. How is the concentration of hydronium ions (H_3O^+) affected when a solution of an acid is diluted? [NCERT]

Ans. When an acid is diluted, the concentration of hydronium ions (H_3O^+) per unit volume decreases. This means that the strength of the acid decreases.

75. What effect does the concentration of $\text{H}^+(\text{aq})$ ions have on the nature of the solution? [NCERT]

Ans. With increase in H^+ ion concentration, the solution becomes more acidic, while a decrease in the concentration of H^+ ion causes an increase in the basicity of the solution.

76. Do basic solutions also have H^+ (aq) ions? If yes, then why are these basic? [NCERT]

Ans. Yes, basic solution also has H^+ (aq) ions. But the concentration of H^+ ions is less as compared to the concentration of OH^- ions that makes the solution basic.

77. How is the concentration of hydroxide ions (OH^-) affected when excess base is dissolved in a solution of sodium hydroxide?

Ans. The concentration of hydroxide ions (OH^-) would increase when excess base is dissolved in a solution of sodium hydroxide.

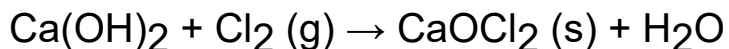
78. How will you test for the gas which is liberated when hydrochloric acid reacts with an active metal? [Board Question]

Ans. Hydrogen gas is released when hydrochloric acid reacts with an active metal. To test the gas released, bring a burning matchstick near the gas. It burns with 'pop' sound showing that it is hydrogen gas.

79. In one of the industrial processes used for manufacture of sodium hydroxide, a gas X is formed as by product. The gas X reacts with lime water to give a compound Y which is used as a bleaching agent in chemical industry. Identify X and Y giving the chemical equation of the reactions involved.

Ans. Two gases namely hydrogen and chlorine are formed as by products in the manufacture of sodium hydroxide. Out of these, chlorine gas (X) when reacts with lime water, it forms Y, calcium oxychloride i.e, bleaching powder. The reactions are :





80. If someone is suffering from the problem of acidity after overeating, which of the following would you suggest as remedy ? Lemon juice, Vinegar, Baking soda solution Give reason for your choice.[NCERT]

Ans. Baking soda solution. The solution being basic in nature, neutralises excess acid in the stomach.

81. How is the neutralisation of a carbonate with an acid different from the neutralisation of an oxide or a hydroxide?[NCERT]

Ans. Neutralisation of a carbonate with an acid produces carbon dioxide gas but not with an oxide or hydroxide.

82. The pH of a sample of vegetable soup was found to be 6.5. How is this soup likely to taste?

[Board Question]

Ans. pH 6.5 indicates that soup is weakly acidic. Therefore, the taste will be slightly sour.

83. Salt commonly used in bakery products on heating gets converted into another salt B which itself is used for removal of hardness of water and a gas C is evolved. The gas C when passed through lime water, turns it milky. Identify A, B and C.

Ans. Salt A is Baking powder (NaHCO_3), which is commonly used in bakery products. On heating it forms sodium carbonate (Na_2CO_3), i.e, salt B and CO_2 gas, C is evolved. When CO_2 gas is passed through lime water it forms calcium carbonate (CaCO_3), which is slightly soluble in water making it milky. Therefore, A is NaHCO_3 , B is Na_2CO_3 and C is CO_2 gas.

84. Plaster of Paris should be stored in a moisture-proof

container. Explain why?

Ans. Plaster of Paris, a powdery mass, is hygroscopic i.e., absorbs water (moisture) to form a hard solid known as gypsum. Therefore, it should be stored in a moisture-proof container.

85. State the following:

- (i) pH value of sodium chloride?
- (ii) When a solution is added to a cloth strip treated with onion extract, then the smell of onion cannot be detected. State whether the given solution contains an acid or a base.
- (iii) One animal and one plant whose stings contain formic acid (or methanoic acid).
- (iv) How is the concentration of hydronium ions affected when a solution of an acid is diluted?
- (v) What is the common name of water soluble bases?
- (vi) What is common in all the water soluble bases (or alkalis)?
- (vii) Which is more acidic a solution of pH = 2 or a solution of pH = 6?
- (viii) What is dead burnt plaster?

Ans. (i) 7

(ii) Base

(iii) Animal that contains formic acid– ant. Plant that contains formic acid–nettle plant.

(iv) The concentration of hydronium ion decreases.

(v) Alkalis

(vi) They all produce hydroxide ions when dissolved in water.

(vii) Solution of pH = 2 is more acidic.

(viii) Dead burnt plaster is anhydrous calcium sulphate

Short Answer Type Questions

86. Classify the following salts as acidic, basic or neutral salts.

[Board Question]

Ans. Potassium sulphate, ammonium chloride, Sodium carbonate, sodium chloride

Neutral – Potassium sulphate, Sodium chloride

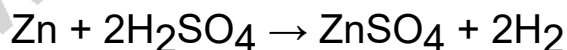
Acidic – Sodium carbonate

Basic – Ammonium chloride

87. Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas? [NCERT]

Ans. Hydrogen gas is usually liberated when an acid reacts with a metal.

Take few pieces of zinc granules and add 5 ml of dilute H_2SO_4 . Shake it and pass the gas produced into a soap solution. The bubbles of the soap solution are formed. These soap bubbles contain hydrogen gas.



Zinc Sulphuric Sodium

acid hydroxide

We can test the evolved hydrogen gas by its burning with a pop sound when a candle is brought near the soap bubbles.

88. Answer the following questions:

(i) What is the action of litmus on : **[Board Question]**

(a) Dry litmus paper

(b) Solution of ammonia gas in water.

(ii) State the observations you would make on adding sodium hydroxide to aqueous solution of:

(a) Ferrous sulphate

(b) Aluminium chloride

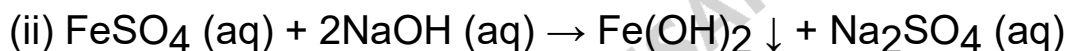
Give balanced chemical equations.

(iii) What colours do the following indicators turn when added to an acid (such as hydrochloric acid)?

(a) litmus, (b) methyl orange.

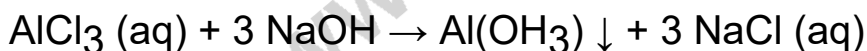
Ans. (i) (a) No change in colour with dry litmus paper.

(b) Red litmus paper will turn blue because ammonia is basic in nature.



Ferrous Sodium Ferrous hydroxide Sodium
sulphate hydroxide (Dirty green ppt) Sulphate

(Pale green)



Aluminium Aluminium hydroxide
chloride (gelatinous white ppt)

(iii) (a) Litmus will turn red in hydrochloric acid.

(b) Methyl orange will turn red in hydrochloric acid.

89. Answer the following questions:

(i) What is the importance of pH in everyday life? **[Board Question]**

(ii) Why does tooth decay start when the pH of mouth is lower than 5.5?

(iii) What is the change in pH value of milk when it changes into curd? Explain. **[Board Question]**

Ans. (i) Our stomach produces hydrochloric acid which helps in digestion of food. It has pH around 1.2. If excess acid is produced, it causes pain and irritation. It can be controlled by taking antacids which controls the pH in the stomach.

(ii) Tooth enamel is the hardest substance in our body. It gets corroded slowly when pH in the mouth is below 5.5. When the pH in the mouth falls below 5.5, tooth decay starts. Bacteria present in the mouth produce acid by degradation of sugar and food particles which remain in the mouth after eating. The acid produced in the mouth attack the enamel thereby, creating tooth decay.

(iii) When milk changes into curd, the pH value will change, the pH value of milk is 6 since it is acidic in nature. When the milk is converted into curd due to the action of bacteria, lactic acid is formed which is more acidic in nature. Therefore, the pH value of the milk is reduced to the pH range 4.5-5.5 as it turns to curd.

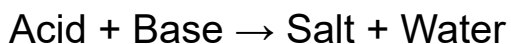
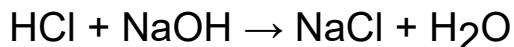
90. Describe an activity to show that the effect of base is nullified by addition of an acid and vice versa. What is the name given to this reaction? Define it. **[Board Question]**

Ans. The steps are:

1. Take about 2 mL of dilute NaOH solution in a test tube and add two drops of phenolphthalein solution.
2. Add dilute HCl solution to the above solution drop by drop.
3. Now add a few drops of NaOH to the above mixture.

Observation: On adding Phenolphthalein to NaOH, the colour becomes pink. On adding dilute HCl solution drop wise, finally the pink colour disappears and solution becomes colourless. On adding NaOH, pink colour again appears because the medium becomes

basic.



The activity shows that the effect of base is nullified by addition of an acid and vice versa and the reaction is known as neutralisation reaction. It can be defined as reaction of an acid and a base to form salt and water.

91. Define water of crystallisation with two examples. How will you prove their existence in the examples given by you?[Board Question]

Ans. Water of crystallisation is the number of water molecules, chemically combined in a definite molecular proportion, with the salt in its crystalline state.

Examples: 1. Washing Soda- $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ it contains 10 molecules of water

2. Plaster of Paris is $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ which contains $\frac{1}{2}$ molecules of water.

Their presence can be proved by heating the salt. When washing soda is heated, it loses its water of crystallisation and form a white powder monohydrate.



92. Answer the following questions:

(i) Define olfactory indicators. Name two substances which can be used as olfactory indicator.

[Board Question]

(ii) Choose strong acids from the following: CH_3COOH , H_2SO_4 , H_2CO_3 , HNO_3 .

Ans. (i) The indicators which gives different smell in both acidic and basic medium are called olfactory indicators. Examples are onion and vanilla.

(ii) H_2SO_4 and HNO_3 are strong acids.

93. Answer the following questions:

(i) Define a universal indicator. Mention one of its use. **[Board Question]**

(ii) Solution A gives pink colour when a drop of phenolphthalein indicator is added to it. Solution B gives red colour when a drop of methyl orange is added to it. What type of solutions are A and B and which one of the solutions A and B will have a higher pH value?

(iii) Name one salt whose solution has pH more than 7 and one salt whose solution has pH less than 7.

Ans. (i) Universal indicator is a mixture of many different indicators which gives different colours at different pH values of the entire pH scale.

It is used to test whether a solution is an acid or a base. It changes its colour according to pH of acidic or basic medium.

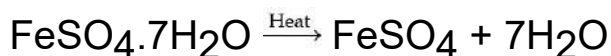
(ii) A is a base and B is an acid. A will have higher pH value because pH of base is more than acids.

(iii) Ammonium chloride (pH less than 7).

Sodium carbonate (pH more than 7).

94. What is the colour of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ crystals? How does this colour change upon heating? Give balanced chemical equation for the changes. **[Board Question]**

Ans. The colour of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ crystals is pale green. It becomes dirty white on heating.



Pale green Dirty white

95. Write the chemical formula of hydrated copper sulphate and anhydrous copper sulphate. Giving an activity to illustrate how these are inter convertible. [\[Board Question\]](#)

Ans. Hydrated Copper sulphate $\Rightarrow \text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Anhydrous Copper Sulphate $\Rightarrow \text{CuSO}_4$

Activity to show they are interconvertible:



(Blue) (White)

When hydrated CuSO_4 is heated in boiling tube, the water of crystallization is lost. The salt turns white.

However, again when crystals are moistened with water the blue color reappears. This is how they are interconvertible.

96. Answer the following questions:

(i) While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid? [\[Board Question\]](#)

(ii) Dry hydrogen chloride gas does not change the colour of dry litmus paper why?

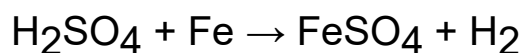
Ans. (i) The process of mixing the concentrated acid with water is highly exothermic. So, when a concentrated acid is added to water then heat is easily absorbed by the large amount of water. Thus it is recommended to add acid to water and not water to the acid.

(ii) Dry hydrogen chloride does not contain any hydrogen ions in it, so it does not show acidic behaviour and thus does not change the colour of dry litmus paper.

97. Illustrate any three chemical properties of acids with examples.[Board Question]

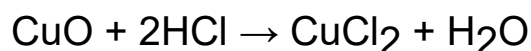
Ans. 1. Reaction with Metals: Acids react with metals to release hydrogen gas.

Acid + Metal \rightarrow Salt + hydrogen



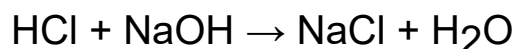
2. Reaction with metal oxides: Acids react with Metal oxides to form salt and water. These are basic in nature.

Metal oxide + Acid \rightarrow Salt + water



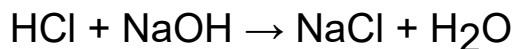
3. The reaction of an acid and base to form salt and water is called Neutralisation reaction.

Acid + Base \rightarrow Salt + water



98. Identify the acid and the base from which sodium chloride is obtained. Which type of salt is it? When is it called rock salt? How is rock salt formed?[Board Question]

Ans. NaCl is made by reacting an acid and a base. The base is NaOH (Sodium hydroxide). So,



It is a neutralization reaction.

It is known as rock salt in crystalline form.

It is the result of the evaporation of ancient oceans millions of years ago. Sometimes pressure from deep inside the Earth forces up large masses of rocks to form salt like domes.

99. A few crystals of copper sulphate are heated in a dry boiling

tube:

- (i) What is the colour before and after heating?
- (ii) What is the reason for the colour change?
- (iii) Can its original colour be restored? How?

Ans. (i) Before heating colour of copper sulphate is blue and after heating the colour becomes white.

(ii) The reason for colour change is the loss of water of crystallisation on heating.

(iii) Yes, original colour can be restored by adding water.

100. Answer the following questions:

(i) A white power is an active ingredient of antacids and is used in preparation of baking powder. Name the compound and explain that how it is manufactured. Give chemical equation.

(ii) Write a chemical equation to show the effect of heat on this compound. **[Board Question]**

(iii) In one of the industrial processes used for manufacture of sodium hydroxide a gas X is formed as a byproduct. The gas X reacts with dry slaked lime to give the compound Y which is used as bleaching agent in textile industry. **[Board Question]**

Ans. (i) The white compound is sodium hydrogen carbonate. It is also known as baking soda. It is manufactured by reacting solution of sodium chloride (brine), ammonia and carbon dioxide.

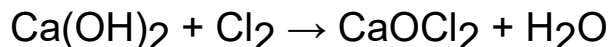


(ii) On heating, baking soda decomposes into sodium carbonate, water and carbon dioxide.

(iii) X is chlorine gas and Y is calcium oxy-chloride.

Chlorine gas reacts with dry slaked lime to give the calcium

oxychloride.



101. Write a chemical equation to describe how baking soda is produced on a large scale. Also, write chemical name of the products obtained. [Board Question]

Ans. The chemical name of baking soda is sodium hydrogen carbonate. It is produced on large scale by reacting solution of sodium chloride (brine), ammonia and carbon dioxide.



The chemical name of products obtained are Baking soda (Sodium hydrogen carbonate) and ammonium chloride.

102. A sanitary worker uses a white chemical having strong smell of chlorine gas to disinfect the water tank:

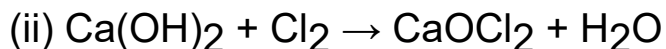
[Board Question]

(i) Identify the chemical compound, write its chemical formula.

(ii) Give chemical equations for its preparation.

(iii) Write its two uses other than disinfection.

Ans. (i) The compound is bleaching powder and its chemical formula is CaOCl_2 .



(iii) (a) It is used as bleaching agent in textile industry.

(b) It is also used in paper industry.

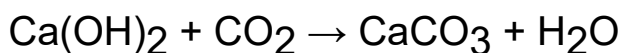
103. A student dropped few pieces of marble in dilute hydrochloric acid, contained in a test-tube. The evolved gas was then passed through lime water. What change would be observed in lime water? What will happen if excess of gas is passed through lime water? With the help of balanced chemical

equations for all the changes explain the observations.[Board Question]

Ans. Marble is chemically calcium carbonate. When dilute HCl is added to calcium carbonate, it forms calcium chloride, water and carbon dioxide. The chemical equation for the reaction is as follows



When this carbon dioxide gas is passed through lime water, lime water turns milky. The chemical equation can be represented as :



milky

If excess of gas is passed through lime water, milky disappears due to formation of calcium hydrogen carbonate which is soluble in water.

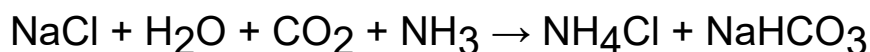


Soluble in water

104. The pH of a salt used to make tasty and crispy pakoras is 14. Identify the salt and write a chemical equation for its formation. List its two uses.[Board Question]

Ans. The salt commonly used to make tasty and crispy pakoras is baking soda *i.e.*, sodium hydrogen carbonate (NaHCO_3).

Chemical equation for its formation:



Uses of Baking Soda:

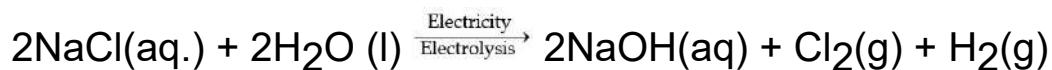
1. It is used in fire extinguisher.
2. It is also used as ingredient of antacid.

105. How is sodium hydroxide manufactured in industries ?

Name the process. In this process a gas X is formed as by-product. This gas reacts with lime water to give a compound Y, which is used as a bleaching agent in the chemical industry. Identify X and Y and write the chemical equation of the reaction involved.

[Board Question]

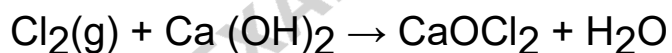
Ans. Sodium hydroxide is manufactured by the electrolysis of concentrated aqueous solution of sodium chloride.



Sodium chloride Water Sodium hydroxide Chloride Hydrogen (Brine)
(Caustic soda)

The process of manufacture of sodium hydroxide by electrolysis process is called chlor-alkali process.

Gas X is chlorine gas and compound Y is calcium oxychloride (Bleaching powder).

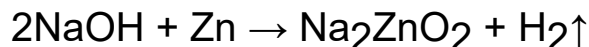


Chlorine gas Lime water Calcium oxychloride

(X) (Y)

106. 2 ml of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the contents are warmed a gas evolves which is bubbled through a soap solution before testing. Write the equation of the chemical reaction involved and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid?**[Board Question]**

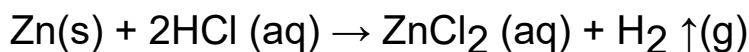
Ans. When zinc is added in sodium solution, sodium zincate (Na_2ZnO_2) is formed along with hydrogen gas.



Sodium zincate Hydrogen gas

When burning splint is held near the evolved gas it continues to burn with pop sound indicating evolution of Hydrogen gas.

When the same zinc metal reacts with dilute solution of strong acid then zinc chloride and hydrogen gas will be evolved.



Zinc chloride

107. Answer the following questions:

(i) State the number of water molecules present in crystals of washing soda and Plaster of Paris. What are these water molecules called as? **[Board Question]**

(ii) Write the chemical name and formula of gypsum. What happens when gypsum is heated to 373 K. Write chemical equation for the reaction. **[Board Question]**

Ans. (i) The chemical formula of washing soda is $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$. It contains 10 molecules of water. The chemical formula of Plaster of Paris is $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$. It contains $\frac{1}{2}$ molecules of water. These water molecules are known as water of Crystallisation.

(ii) Gypsum is calcium sulphate hemihydrate. Its chemical formula is $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. When gypsum is heated, Plaster of Paris is formed.



108. Answer the following questions:

(i) Two solutions X and Y are tested with universal indicator. Solution X turns orange whereas solution Y turns red. Which of the solutions is a stronger acid?

(ii) State the meaning of strong acids and weak acids. Give example

of each. **[Board Question]**

Ans. (i) Solution Y is stronger acid.

(ii) **1. Strong acids:** Those acids which dissociates completely in aqueous solution are strong acids. For example, H_2SO_4 , HNO_3 etc.

2. Weak acid: Those acids which dissociates partially in aqueous solution are known as weak acids. For example;

3. Acetic acid (CH_3COOH), H_2CO_3 etc.

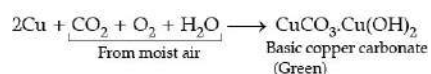
109. Explain why an aqueous solution of sodium sulphate is neutral while an aqueous solution of sodium carbonate is basic in nature. **[Board Question]**

Ans. Salt of strong acid and strong base is neutral. Sodium sulphate is a salt of strong acid (sulphuric acid) and strong base (NaOH). Therefore, it is neutral whereas sodium carbonate is a salt of weak acid (carbonic acid) and strong base (sodium hydroxide). Therefore, it is basic in nature.

110. Lemon is used for restoring the shine of tarnished copper vessels. Why?

Ans. When copper vessels are exposed to moist air, they form a green coating of basic copper carbonate
[$\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$]

The sour substance such as lemon or tamarind juice contain acids. Lemon juice contains citric acid and tamarind contain acid. These acids dissolve the coating of copper oxides or basic copper carbonate present on the surface of tarnished copper vessels and make them shining and make them shining red-brown again.



111. Naman and Raghav performed an experiment in which they mixed concentrated sulphuric acid with water. Naman mixes

water to acid and Raghav mixes acid to water slowly with constant stirring. Mention the suitable reason for selecting the one which you find is a correct method and discarding the one which one is wrong.

[Board Question]

Ans. The correct method for mixing is one which Raghav followed i.e., mixing acid to water slowly with constant stirring. The reason behind this is mixing acid and water is highly exothermic. If water is added in acid, then acid may splash on the face or body. The glass container may also break. But when acid is mixed with water with constant stirring, the heat realised is evenly distributed in the water.

Long Answer Type Questions

112. Write uses of (i) Acids (ii) Bases (iii) Salts.

Ans. (i) Uses of acid:

1. Hydrochloric acid is used in many industries like cleaning boilers from inside, cleaning sink and sanitary etc.
2. Nitric acid is used for making fertilisers, cleansing of ornaments of gold and silver.
3. Sulphuric acid is used in cells, car battery etc. It is known as King of Chemicals.

(ii) Uses of bases:

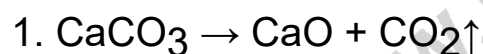
1. Sodium hydroxide is used to make soaps, in paper industry and in textile industry.
2. Calcium hydroxide is used to remove acidity of soil. It is an important constituent of lime and pesticides.
3. Milk of magnesia (Magnesium hydroxide) is used as an antacid.

(iii) Uses of salts:

1. Calcium carbonate is used to make floors.
2. In metallurgy for extraction of iron and in making of cement.
3. Silver nitrate is used in photography, Ammonium nitrate is used as explosive and in making fertilisers.
4. Alum($K_2SO_4 \cdot Al_2SO_4 \cdot 24H_2O$) is used to clean water.

113. A metal carbonate X on reacting with an acid gives a gas which when passed through a solution Y gives the carbonate back. On the other hand, a gas G that is obtained at anode during electrolysis of brine is passed on dry Y, it gives a compound Z, used for disinfecting drinking water. Identity X, Y, G and Z.

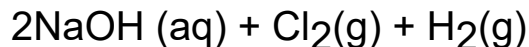
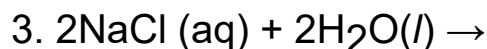
Ans. X is calcium carbonate. It reacts with HCl and produces carbon dioxide gas. This gas when react with slaked lime or Calcium Hydroxide (Y) gives back the carbonate. The gas evolved at anode during electrolysis of brine is chlorine gas (G). When chlorine gas is passed through dry slaked lime (Y), bleaching powder (Z) is produced. It is used for disinfecting drinking water.



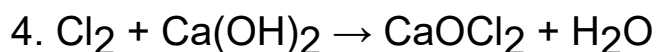
(X) D (Acidic gas)



(Y) (X)



(G)

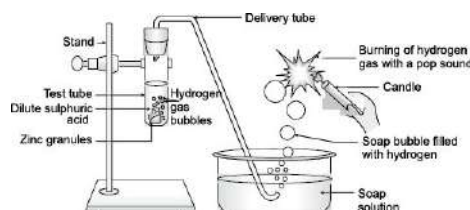


(G) (Dry) (Z)

(Y)

Thus, X is calcium carbonate, Y is calcium hydroxide, G is chlorine gas and Z is bleaching powder.

114. In the following schematic diagram for the preparation of hydrogen gas as shown in figure what would happen if following changes are made?



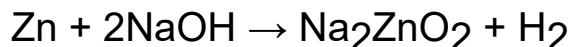
- (i) In place of zinc granules, same amount of zinc dust is taken in the test tube.
- (ii) Instead of dilute sulphuric acid, dilute hydrochloric acid is taken.
- (iii) In place of zinc, copper turnings are taken.
- (iv) Sodium hydroxide is taken in place of dilute sulphuric acid and the tube is heated.

Ans. (i) If in place of zinc granules, same amount of zinc dust is taken, hydrogen gas will evolve with greater speed.

(ii) If instead of dilute sulphuric acid, dilute hydrochloric acid is taken, almost same amount of gas is evolved.

(iii) Hydrogen gas is not evolved.

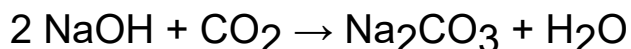
(iv) If sodium hydroxide is taken, sodium zincate is formed and hydrogen gas will be evolved.



115. A dry pellet of a common base B, when kept in open absorbs moisture and turns sticky. The compound is also a by-product of chlor alkali process. Identify B. What type of reaction occurs when B is treated with an acidic oxide? Write a balanced

chemical equation for one such solution.

Ans. Sodium hydroxide (NaOH) is a commonly used base and is hygroscopic, that is, it absorbs moisture from the atmosphere and becomes sticky. Thus, B is sodium hydroxide. The acidic oxides react with base to give salt and water. The reaction between NaOH and CO₂ can be given as



116. Answer the following questions:

(i) Crystals of a substance changed their colour on heating in a closed test tube but regained it after sometime when they were allowed to cool down. Name the substance and write its formula and explain the phenomenon involved. [\[Board Question\]](#)

(ii) Name the compound whose one formula unit is associated with 10 water molecules. How is it prepared? Give equations of related reactions. Give two uses of the compound.

Ans. (i) Crystals of a substance which changed their colour on heating in a closed test tube but regained it after sometime when they were allowed to cool down are copper sulphate or more specifically hydrated copper sulphate.

Its chemical formula is CuSO₄.5H₂O

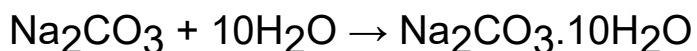
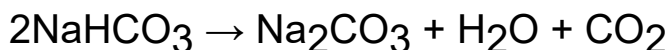
The phenomena involved is due to the presence of molecules of water of crystallization in the molecule. Water of crystallization is the fixed number of water molecules that are present in one formula unit of a salt. When we heat the crystals of hydrated copper sulphate this water is removed and the salt turns white. But when it is allowed to cool down in open air then it regains its lost water of crystallization and hence regains its colour also.

(ii) The compound whose one formula unit is associated with 10 water molecules is sodium carbonate decahydrate (Na₂CO₃.10H₂O)

commonly known as washing soda.

It is prepared by heating baking soda and then recrystallizing the product so obtained.

The equations related to the above reaction is:



Uses: 1. It is used for removing permanent hardness of water.

2. It is used for the manufacture of glass.

117. Account for the following: [Board Question]

- (i) Rain water conducts electricity but distilled water does not.
- (ii) We feel burning sensation in the stomach when we over eat.
- (iii) A tarnished copper vessel regains its shine when rubbed with lemon.
- (iv) The crystals of washing soda change to white powder on exposure to air.
- (v) An aqueous solution of sodium chloride is neutral but an aqueous solution of sodium carbonate is basic.
- (vi) State the relation between hydrogen ion concentration of an aqueous solution and its pH.
- (vii) An aqueous solution has a pH value of 7.0. Is this solution acidic, basic or neutral.
- (viii) Which has a higher pH, 1 M HCl or 1 M NaOH solution?
- (ix) Tooth enamel is one of the hardest substance in our body. How does it undergo damage due to eating chocolates and sweets? What should we do to prevent it?
- (x) How do H^+ ions exist in water?

Ans. (i) Distilled water is a pure form of water. It does not conduct electricity as it has no ions. Rain water is an impure form of water. It contains many ionic species and therefore it conducts electricity.

(ii) Due to overeating, excess acid is produced in stomach. This excess acid causes burning sensation.

(iii) Copper vessel is tarnished due to corrosion. Copper carbonate is formed as a result of corrosion which is basic in nature. Lemon juice contains acid. When it is rubbed on copper vessel, basic copper carbonate gets neutralised by acid present in lemon. As a result, copper vessel regains its shine.

(iv) It is because when heated, washing soda loses water of crystallisation and changes to white solid.

(v) Sodium chloride is a salt of strong acid (sulphuric acid) and strong base (NaOH). Therefore, it is neutral whereas sodium carbonate is a salt of weak acid (carbonic acid) and strong base (sodium hydroxide). Therefore, it is basic in nature.

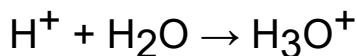
(vi) Hydrogen ion concentration of an aqueous solution is inversely proportional to its pH.

(vii) The solution is neutral.

(viii) 1 M NaOH solution has higher pH because base have higher pH value than acids.

(ix) Tooth enamel gets corroded slowly when pH in the mouth is below 5.5. Acid is produced in mouth due to degradation of food which is partially hydrolysed by saliva. But if excess acid is produced, it causes tooth decay. It can be prevented by using tooth paste which are generally basic.

(x) H^+ ions do not exist independently, it gains the unshared electron pairs on the oxygen in the water molecule to form a hydronium ion



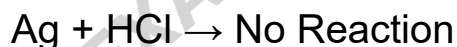
Hence H^+ ions in water are found as hydronium ions.

118. During the reaction of some metals with dilute hydrochloric acid, the following observations were made by a student:[\[Board Question\]](#)

- (i) Silver does not show any change.
- (ii) Some bubbles of a gas are seen when lead is reacted with the acid.
- (iii) The reaction of sodium is found to be highly explosive.
- (iv) The temperature of the reaction mixture rises when aluminium is added to the acid.

Explain these observations giving appropriate reason.

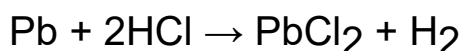
Ans. (i) Silver is covered with a thin layer of silver chloride, so it does not react with dilute hydrochloric acid.



Silver (dil.)

Hydrochloric acid

- (ii) Bubbles of hydrogen gas are evolved when lead is reacted with the acid.



Lead (dil.) Lead Hydrogen

Hydrochloric

acid

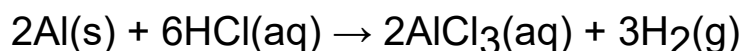
- (iii) The reaction of sodium is found to be highly explosive because sodium is highly reactive metal. It reacts with hydrochloric acid

explosively forming hydrogen gas along with the release of large amount of heat.



Sodium Hydrochloric acid Sodium chloride Hydrogen

(iv) The temperature of the reaction mixture rises when aluminium is added to the acid because the reaction is highly exothermic in nature.



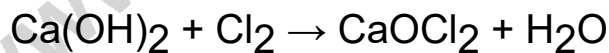
Aluminium Hydrogen chloride Aluminium chloride Hydrogen

119. Write the name, method of preparation and uses of the following:

(i) CaOCl_2 (ii) $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ (iii) NaHCO_3

Ans. (i) CaOCl_2 : Its chemical name is calcium oxychloride. It is also known as bleaching powder.

Preparation: Bleaching powder is produced by the action of chlorine on dry slaked lime.



Uses: It is used as bleaching agent in textile industry.

(ii) **$\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$:** It is calcium sulphate hemihydrate. It is also known as Plaster of Paris.

Plaster of Paris is prepared by heating $\frac{1}{2}$ Gypsum at 373K.



Uses: It is used to join bones, buildings and in dentistry.

(iii) **NaHCO_3 :** Its chemical name is sodium hydrogen carbonate

(NaHCO₃). Also known as baking soda.

Preparation:



Uses: It is used in food industry and bakery, as an antacid and mild antiseptic.

120. (i) State the chemical properties on which the following uses of baking soda are based:

- (a) As an antacid
- (b) As a soda acid fire extinguisher
- (c) To make bread and cake soft and spongy.

[Board Question]

(ii) How is washing soda obtained from baking soda ? Write balanced chemical equation.

Ans. (i) (a) It is weakly basic in nature and neutralise hyperacidity.

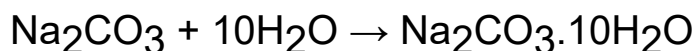
(b) It liberates CO₂ with H₂SO₄, which extinguish fire.

(c) It liberates CO₂ on heating which makes bread and cake soft and sponge.

(ii) Sodium carbonate is obtained by heating baking soda.



Then washing soda is produced by recrystallisation of sodium carbonate.



121. For making cake, baking powder is taken. If at home your mother uses baking soda instead of baking powder in cake.

(i) How will it affect the taste of the cake and why?

(ii) How can baking soda be converted into baking powder?

(iii) What is the role of tartaric acid added to baking soda?

Ans. (i) Baking soda is sodium hydrogen carbonate, On heating, it is converted into sodium carbonate which is bitter to taste. Thus, if baking soda is used, the taste of cake changes.



(ii) Baking powder is a mixture of baking soda, cream of tartar (a dry acid), and sometimes corn starch. Therefore, baking soda can be converted into baking powder by the addition of appropriate amount of tartaric acid to it.

(iii) Tartaric acid is added to neutralise the sodium carbonate formed on heating by the decomposition of NaHCO_3 . If it is not added, the cake would taste bitter due to the presence of sodium carbonate in it. Also, CO_2 produced during the reaction causes cake to rise making them soft and spongy.

Differentiate Between

122. Differentiate between acids and bases.

Ans.	Acids	Bases
	1. Acids are sour in taste.	Bases are bitter in taste.
	2. Acids turns blue litmus to red.	Bases turns red litums to blue.
	3. An acid is a substance which gives H^+ ions in water solution.	A base is a substance which gives OH^- ions in water solution.
	4. The orange colour of Methyl orange Indicator changes to red	The orange colour of Methyl Orange Indicator changes to

in acid medium.	yellow in bases.
5. pH value of acid is less than 7.	pH value of base is greater than 7.
6. When non metallic oxides are dissolved in water to form acids. $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$	When metallic oxides are dissolved in water to form bases. $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$

Analysis and Evaluation Based Questions

123. A white shirt has a yellow stain of curry. When soap is rubbed on this shirt during washing, the yellow stain turns reddish-brown. On rinsing the shirt with plenty of water, the reddish-brown stain turns yellow again.

- Name the natural indicator present in curry stain.
- Explain the changes in colour of this indicator which take place during washing and rinsing the shirt.
- What is the nature of soap (acidic/basic) as shown by the indicator present in curry stain?

Ans. (i) Turmeric

(ii) The yellow stain of curry turns reddish-brown when soap is scrubbed on it because of the fact that soap solution is basic in nature which changes the colour of turmeric in the curry stain to red-brown. This stain turns yellow again when the cloth is rinsed with water because then the basic soap gets removed with water.

(iii) Basic.

124. Solution A turns universal indicator blue to purple whereas solution B turns universal indicator orange to red.

- What will be the action of solution A on litmus?

- (ii) What will be action of solution B on litmus?
- (iii) Name any two substances which can give solutions like A.
- (iv) Name any two substances which can give solutions like B.
- (v) What sort of reaction takes place when solution A reacts with solution B?

Ans. (i) Solution A turns universal indicator blue to purple so it is basic in nature and will turn litmus blue.

(ii) Solution B turns universal indicator orange to red so it is acidic in nature and will turn litmus red.

(iii) Milk of magnesia and sodium hydroxide solution are bases like solution A.

(iv) Lemon juice and hydrochloric acid are acids like solution B.

(v) Neutralisation reaction.

125. Sodium chloride's main source is sea water. It is also exists in the form of rocks and is called rock salt. It is used for preparing sodium hydroxide, baking soda, washing soda etc. Sodium Hydroxide is prepared by passing electricity through an aqueous solution of sodium chloride known as chlor-alkali process. It is white translucent solid. Crystals of sodium hydroxide are readily soluble in water and gives strong alkaline solution. Washing Soda is prepared by heating baking soda. Recrystallisation of sodium carbonate gives a compound, which is used for removing permanent hardness of water.



Plaster of Paris is obtained by heating Gypsum upto 373K. On

treatment with water it is again converted into gypsum and sets as a hard mass. It is used by doctors for setting fractured bones. It is used for making statues, models and other decorative materials.

- (i) What is the chemical formula of plaster of paris?
- (ii) Name the chemical compound obtained by the recrystallization of sodium carbonate.
- (iii) Name the solution that is used to prepare caustic soda.
- (iv) Which of these statements is incorrect?
 - (a) On treatment with water plaster of paris is again converted into gypsum.
 - (b) Crystals of sodium hydroxide are deliquescent.
 - (c) Sodium chloride is known as common salt.
 - (d) Plaster of Paris is calcium sulphate hydrates.

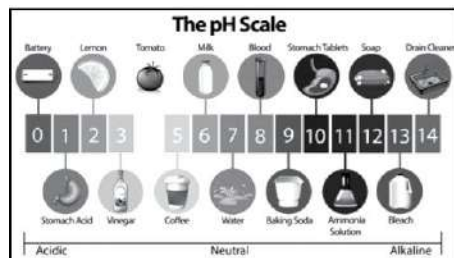
Ans. (i) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$.

- (ii) Recrystallization of sodium carbonate gives washing soda.
- (iii) Brine solution is used to prepare caustic soda.
- (iv) The correct chemical name of plaster of paris is calcium sulphate hemihydrates. Hence, the incorrect option is (d).

126. Bases are bitter in taste, have soapy touch, turn red litmus blue and give hydroxide ions in solution. Chemical properties of bases are reaction with metals where certain metals react with alkali solutions on heating a gas is evolved. The reaction with non-metallic oxides which are generally acidic in nature form salt and water.

pH Scale: The concentration of hydrogen ion in solution is expressed in terms of pH. The pH of a solution is defined as the

negative logarithm of hydrogen ion concentration in moles per liter. pH is equal to $-\log H^+$ ions. For water or neutral solutions, pH = 7; for acidic solutions, pH < 7; for basic solutions, pH > 7.



- (i) What happens when a base reacts with acid?
- (ii) What is the general name of reaction between a base and acid?
- (iii) Which of these statements is incorrect?
 - (a) Bases react with acids to form salt and water.
 - (b) Metals with alkali solutions produce hydrogen gas.
 - (c) Non-metallic oxides are basic in nature.
 - (d) The concentration of hydrogen ion in solution is expressed in terms of pH.
- (iv) What colour change occurs to litmus when it is dipped in basic solution?

Ans. (i) The reaction between acid and base produces salt and water.

(ii) The reaction between a base and acid is known as neutralisation reaction.

(iii) (c) Non-metallic oxides are basic in nature.

(iv) In basic solution, red litmus turns blue.

127. When a piece of limestone reacts with dilute HCl, a gas X is produced. When gas X is passed through lime water then a white precipitate Y is formed. On passing excess of gas X, the

white precipitate dissolves forming a soluble compound Z.

(i) What are X, Y and Z ?

(ii) Write equations for the reactions which take place:

(a) When limestone reacts with dilute HCl.

(b) When gas X reacts with lime water to form white precipitate Y.

(c) When excess of gas X dissolves white precipitate Y to form a soluble compound Z.

Ans. (i) X is carbon dioxide; Y is calcium carbonate; Z is calcium hydrogen carbonate.

(ii) (a) $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$

(b) $\text{Ca(OH)}_2(\text{aq}) + \text{CO}_2(\text{g}) \rightarrow$

$\text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$

(c) $\text{CaCO}_3(\text{s}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow$

$\text{Ca(HCO}_3)_2(\text{aq})$

128. On adding dilute hydrochloric acid to copper oxide powder, the solution formed is blue-green.

(i) Predict the new compound formed which imparts a blue-green colour to solution.

(ii) Write a balanced chemical equation of the reaction which takes place.

(iii) On the basis of the above reaction, what can you say about the nature of copper oxide?

Ans. (i) The new compound formed is Copper (II) chloride, CuCl_2

(ii) $\text{CuO}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CuCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$

(iii) Copper oxide is basic in nature.

129. Answer the following questions:

- (i) Why is it wrong to treat a bee sting with vinegar?
- (ii) Why is it wrong to treat a wasp sting with baking soda solution?

Ans. (i) Bee injects acid into the skin. Vinegar is acetic acid so it can't be used to treat bee sting.

(ii) Since baking soda is basic in nature so it can't be used to treat wasp sting because wasp injects alkaline liquid into the skin.

130. Answer the following questions:

(i) A substance X which is used as an antacid reacts with dilute hydrochloric acid to produce a gas Y which is used in one type of fire-extinguisher. Name the substance X and gas Y. Write a balanced equation for the chemical reaction which takes place.

(ii) You have been provided with three test-tubes. One of these test-tubes contains distilled water and the other two contain an acidic and a basic solution respectively. If you are given only blue litmus paper, how will you identify the contents of each test-tube?

Ans. (i) Substance X is sodium hydrogen carbonate; gas Y is carbon dioxide.

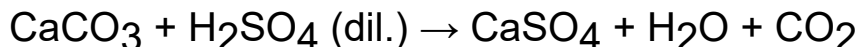


(ii) Acidic solution will turn blue litmus red. This red litmus will turn blue in basic solution. Distilled water will have no effect on any type of litmus paper.

131. A metal compound 'X' reacts with dil. H_2SO_4 to produce effervescence, The gas evolved extinguishes a burning candle. If one of the compound formed is calcium sulphate, then what is 'X' and the gas evolved? Also, write a balanced chemical equation for the reaction which occurred.

Ans. Compound X is calcium carbonate and gas evolved is carbon

dioxide.



Calcium sulphate

Practical Based Questions

132. Answer the following questions:

(i) How is pH paper used to find the pH of a solution? **[Board Question]**

(ii) The pH value of water is 7. What will be the pH value of:

(a) Aqueous solution of sodium hydroxide.

(b) Dil. HCl.

Ans. (i) A few drops of solution are taken on the strip of pH paper. Then the colour obtained on the paper is compared with colour and corresponding pH value given on the chart of the pH paper.

(ii) (a) Aqueous solution of sodium hydroxide is basic in nature. Therefore, its pH will be greater than 7.

(b) Dil. HCl is acidic in nature, so its pH will be less than 7.

133. A gas is liberated immediately with a brisk effervescence, when you add acetic acid to sodium hydrogen carbonate powder in a test tube. Name the gas evolved and describe the test that confirms the identity of the gas. [Board Question]

Ans. The gas liberated is carbon dioxide. When the gas produced is passed through lime water, it turns lime water milky. It confirms the identity of the gas.

134. What do you observe when you add few drops of acetic acid to a test tube containing:

(i) Phenolphthalein

(ii) Distilled water

(iii) Universal indicator

(iv) Sodium hydrogen carbonate powder. [\[Board Question\]](#)

Ans. (i) Phenolphthalein: No change or colourless.

(ii) Distilled water: No change

(iii) Universal indicator: Turns orange.

(iv) Sodium hydrogen carbonate powder: Evolution of colourless, odourless gas with brisk effervescence.

135. List two observations when a pinch of sodium hydrogen carbonate is added to acetic acid in a test tube. Write a chemical equation for the reaction that occurs. [\[Board Question\]](#)

Ans. When a pinch of sodium hydrogen carbonate is added to acetic acid in a test tube, Brisk effervescence appears and release of carbon dioxide gas takes place. The chemical reaction taking place is:



136. Name two salts each of calcium and magnesium which makes the water hard. [\[Board Question\]](#)

Ans. These salts are:

Calcium salts: Calcium chloride and calcium sulphate.

Magnesium salts: Magnesium chloride and magnesium sulphate.

137. What will be the action of liquid antacid on litmus paper? Is it acidic or basic?

Ans. It is basic in nature as it turns red litmus blue.

138. What is observed when 2 mL of dilute hydrochloric acid is added to 1 g of sodium carbonate taken in a clean and dry test tube? Write chemical equation for the reaction involved. [\[Board Question\]](#)

Ans. A brisk effervescence would be observed if HCl is added to Na_2CO_3 due to the evolution of CO_2 gas.



139. Answer the following questions:

(i) What colour will be produced when we put a drop of distilled water on pH paper? What is the pH of distilled water?

(ii) The pH of a solution is less than 7. What does it indicate? What is the pH of 1 M HCl solution?

(iii) What is the pH of solution 'A' which liberates CO_2 gas with a carbonate salt? Give the reason?

(iv) What is the pH of solution 'B' which liberates NH_3 gas with an ammonium salt? Give reason?

(v) How do you increase or decrease the pH of pure water?

(vi) What is the action of NaHSO_4 solution on litmus and why?

(vii) If the pH value of a solution is 6, then solution will be of what type?

Ans. (i) The colour produced will be green. Its pH is 7.

(ii) It indicates that the solution is acidic in nature. The pH of 1M HCl is zero.

(iii) The pH of solution 'A' is lesser than 7. Carbonates salts react with acids (A) to liberate CO_2 gas.

(iv) The pH of solution 'B' is lesser than 7 because 'B' is an alkali as it liberates NH_3 gas.

(v) By adding a few drops of alkali to pure water, it's pH increases; and by adding a few drops of an acid decreases the pH of pure water.

(vi) Blue litmus turns red in NaHSO_4 solution due to the release of H^+ ions along with Na^+ ions. Thus, NaHSO_4 is an acid salt.

(vii) The solution will be acidic.

140. A teacher provided acetic acid, water, lemon juice, aqueous solution of sodium hydrogen carbonate and sodium hydroxide to students in the school laboratory to determine the pH values of these substances using pH papers. One of the students reported the pH values of the given substances as 3, 12, 4, 8 and 14 respectively. Which one of these values is not correct? Write its correct value stating the reason. [\[Board Question\]](#)

Ans.	Given substance	Given pH	
	Acetic acid	3	Correct
	Water	12	Incorrect
	Lemon juice	4	Correct
	$\text{NaHCO}_3(\text{aq})$	8	Correct
	$\text{NaOH}(\text{aq})$	14	Correct

Correct pH for water will be 7, because it is nature.

141. What would a student report nearly after 30 minutes of placing duly cleaned strips of aluminium, copper, iron and zinc in freshly prepared iron sulphate solution taken in four beakers? [\[Board Question\]](#)

Ans. Aluminium displaces the iron from iron sulphate and the colour of two solution changes from green to brown.

No change takes place when copper strip is dipped in iron sulphate solution.

No change will be observed when iron strips are dipped in iron sulphate solution.

The colour of the solution changes from green to colourless when zinc is added to iron sulphate solution.

142. What is observed when a pinch of sodium hydrogen carbonate is added to 2 mL of acetic acid taken in a test tube? Write chemical equation for the reaction involved in this case.

[Board Question]

Ans. CO₂ gas is evolved with brisk effervescence when sodium hydrogen carbonate is added to acetic acid.



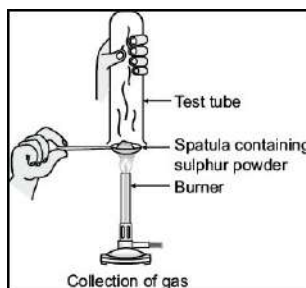
Sodium hydrogen carbonate Acetic acid Sodium acetate Carbon dioxide gas

143. Blue litmus solution is added to two test tubes A and B containing dilute HCl and NaOH solution respectively. In which test tube a colour change will be observed ? State the colour change and give its reason.

[Board Question]

Ans. Test tube A contains dilute HCl and test tube B contains dilute NaOH. On adding blue litmus solution to both the test tubes, the colour of test tube A will change from blue to red while the colour of test tube B will remain the same. This is because HCl is acid and acid turns blue litmus to red.

144. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in figure below. [NCERT]



(i) What will be the action of gas on

(a) dry litmus paper?

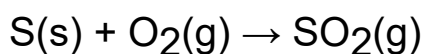
(b) moist litmus paper?

(ii) Write a balanced chemical equation for the reaction taking place.

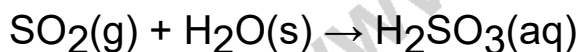
Ans. (i) (a) There will be no action on dry litmus paper.

(b) Since the gas is sulphur dioxide (SO_2), it turns moist blue litmus paper to red because sulphur dioxide reacts with moisture to form sulphurous acid.

(ii) The balanced chemical reaction can be given as:



Sulphur dioxide



Sulphurous Acid

Creating Based Questions

145. Answer the following questions:

(i) Yellow stain of an Indian style vegetable curry on a white cloth turns reddish brown on application of soap on the cloth. What is the reason behind ?

(ii) What is the colour of litmus solution, when it is neither acidic nor basic?

Ans. (i) A stain of curry on white cloth becomes reddish-brown when

soap is rubbed because curry contains turmeric which is a natural indicator whereas soap is basic in nature.

(ii) Litmus solution is purple in colour, when it is neither acidic nor basic.

146.

S. No.	Column I	Column II
1.	Tartaric acid	Calcium hydroxide
2.	Lactic acid	Sodium hydroxide
3.	Formic acid	Ammonia
4.	Citric acid	Magnesium

(i) What does column I represents?

(ii) What does column II represents?

(iii) Name one source of citric acid.

(iv) What is released by ant's sting?

Ans. (i) Column I represents acids.

(ii) Column II represents bases.

(iii) Oranges are good source of citric acid.

(iv) Formic acid is released by ant's sting.

147. A chemical compound X is prepared using sodium chloride as starting material. The compound X is used for faster cooking. It also finds use as an ingredient in medicine to treat indigestion.

(i) Identify the compound X.

(ii) Give an equation for the chemical reaction which takes place upon heating X during cooking.

(iii) Which quality of compound X makes it suitable for treating indigestion?

Ans. (i) Compound X is sodium hydrogen carbonate, NaHCO_3 .



Sodium hydrogen carbonate Sodium carbonate

(iii) Sodium hydrogen carbonate is a mild non-corrosive base and can be used to neutralize acid. Indigestion caused by increased acidity in stomach can be reduced by consuming medicine containing Sodium hydrogen carbonate (NaHCO_3).

148. A soil sample solution was analyzed with universal pH indicator paper and the colour of the paper turned yellowish.

(i) What is the nature of soil?

(ii) What type of substance should the farmer add to the soil in order to get a suitable soil for farming?

Ans. (i) As the soil solution turned universal indicator paper yellow, it indicates that the soil solution is acidic and contains a higher H^+ ion concentration.

(ii) The farmer should add some basic additives to soil such as slaked lime (calcium hydroxide) or quick lime (calcium oxide) to enhance the productivity of the soil.

Self-Assessment

149. Define strong acid and strong base.

150. Write the definition of weak acid and weak base.

151. What is an alkali?

152. What do you understand by pH of a solution?

153. Define universal indicator.

154. How will you prove that a given salt is a carbonate of a metal?

155. An aluminium can is used to store ferrous sulphate solution. It is observed that in few days, holes appeared in the can. Explain the cause for this observation and write the chemical reaction to support your answer.

156. A knife which is used to cut a fruit, was immediately dipped into water containing drops of blue litmus solution. If the colour of solution changes to red, what inference can be drawn about the nature of the fruit and why?

157. While constructing a house, a builder selects marble flooring and marble table tops for the kitchen where vinegar and juice of lemon, tamarind etc. are more often used for cooking. Will you agree to this selection and why?

158. Solutions X, Y and Z have pH value of 8, 9 and 10 respectively. Arrange them in increasing order of basic character giving reasons.

159. Why do we feel burning sensation in stomach when we over eat? What is the medicine used called? Give one example.

160. What is tooth enamel chemically? State the condition when it starts corroding. What happens when food particles left in mouth after eating degrades? Why do doctors suggest to use tooth paste to prevent tooth decay?

161. Account for the following:

(i) Antacid tablets are used by a person suffering from acidity.

(ii) Tooth paste is used for cleaning teeth.

(iii) Which acid is present in sting of ant?

162. A white powder is added while baking breads and cakes to make them soft and fluffy. Write the name of the powder. Name its main ingredients. Explain the function of each ingredient. Write the chemical reaction taking place when the powder is heated during

baking.

163. “Sodium hydrogen carbonate is a basic salt”. Justify the statement. How is it converted into washing soda? Explain.

164. A green coloured hydrated metallic salt on heating loses its water of crystallisation and gives the smell of burning sulphur. Identify the salt and write **down the reaction involved**.

165. (i) Identify the acid and the base whose combination forms the common salt that you use in your food. Write its formula and chemical name of this salt. Name the source from where it is obtained.

(ii) What is rock salt ? Mention its colour and the reason due to which it has this colour.

166. (i) Explain why is hydrochloric acid a strong acid and acetic acid, a weak acid. How can it be verified? **[Board Question]**

(ii) Explain why aqueous solution of an acid conducts electricity.

(iii) You have four solutions A, B, C and D. The pH of solution A is 6, B is 9, C is 12 and D is 7.

(a) Identify the most acidic and most basic solutions.

(b) Arrange the above four solutions in the increasing order of H^+ ion concentration.

(c) State the change in colour of pH paper on dipping in solution C and D

167. Assertion: Solutions of compounds like alcohol and glucose do not show acidic character.

Reason: They do not show acidic character because they do not dissociate into ions.

168. What is bleaching powder ? How is it prepared ? List two uses

of bleaching powder.

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Metals and Non-metals

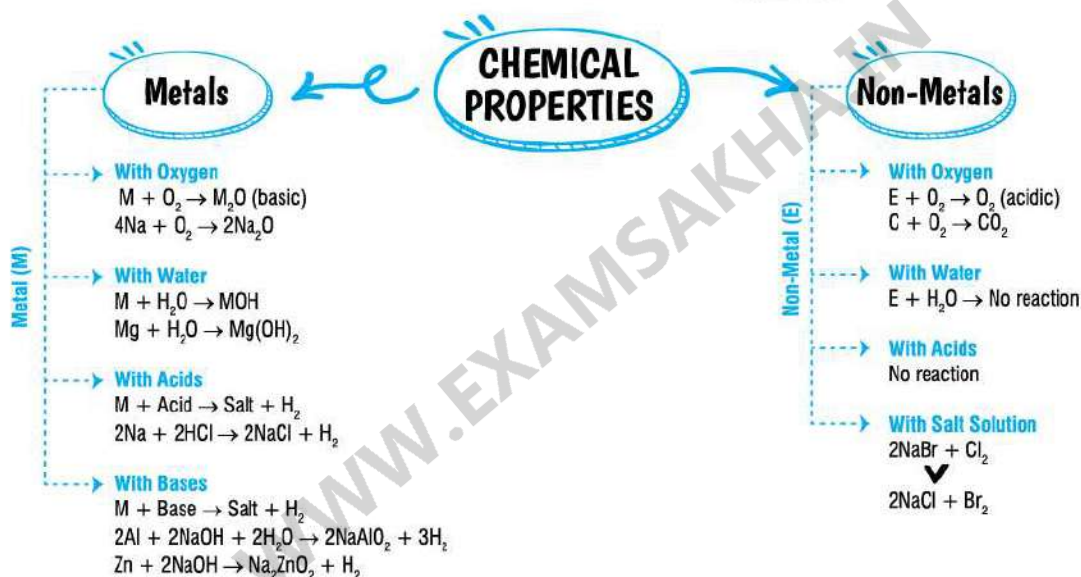
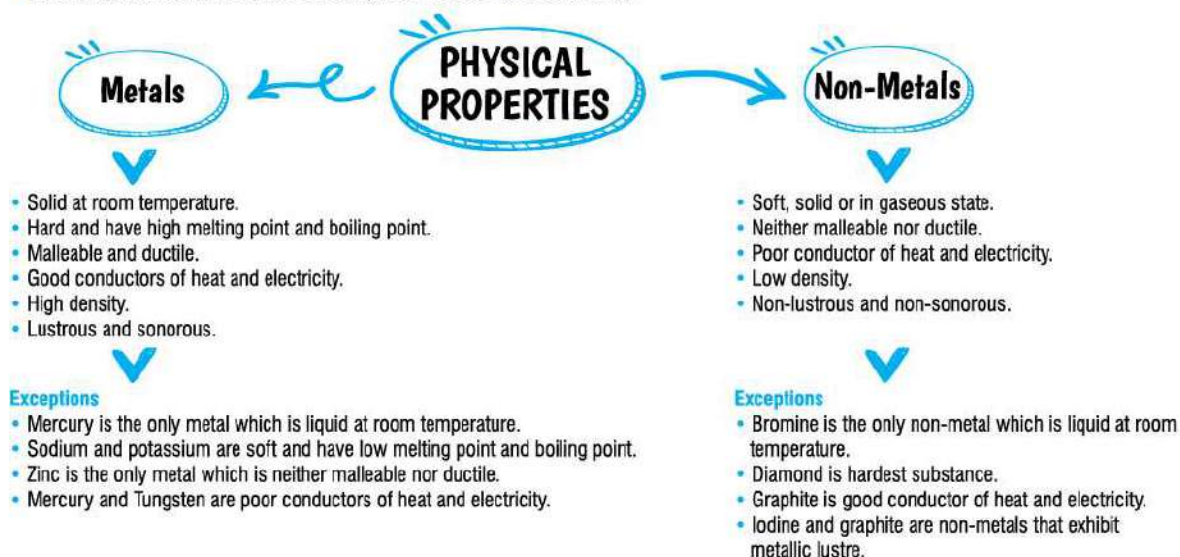
Chapter

3

Summary

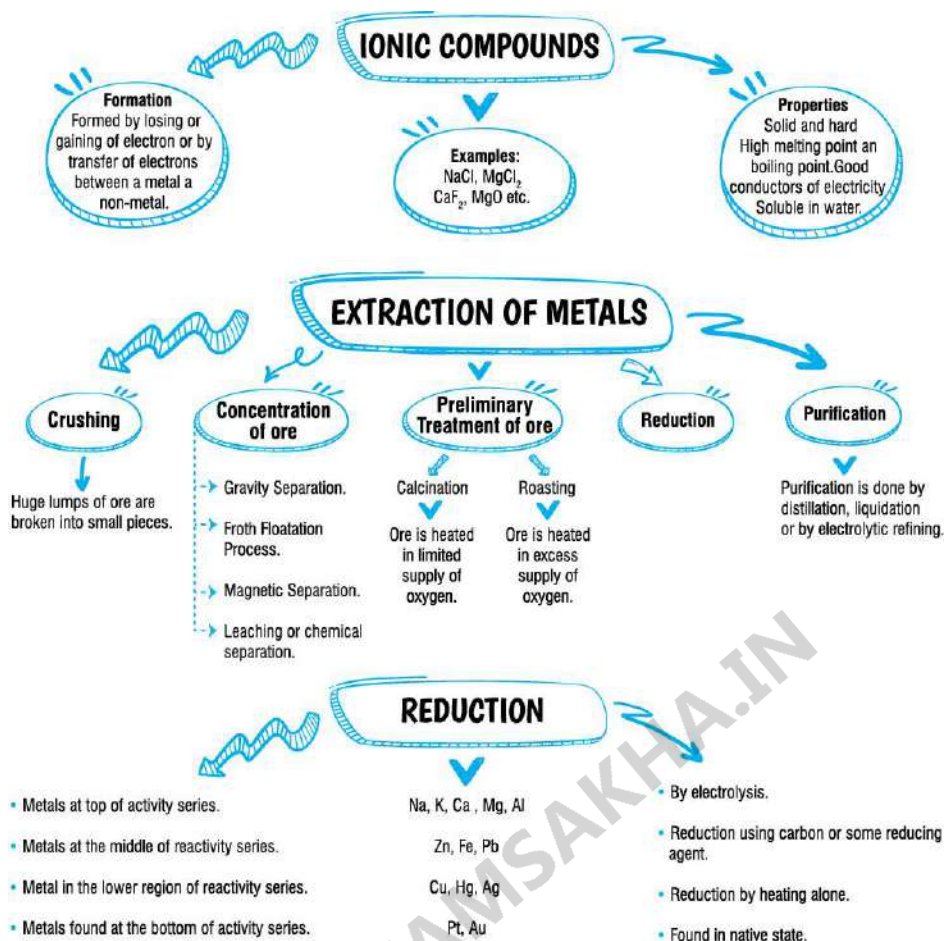
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- Elements are classified into Metals, Non-metals and Metalloids



Note :

- (1) Copper oxide is black in colour.
- (2) Aluminium oxide is amphoteric oxide.
- (3) Sodium and potassium react violently with water.
- (4) Magnesium do not react with cold water.
- (5) Some metals like aluminium, iron and zinc do not react either with cold or hot water.



Definitions

- Metals:** A substance with high electrical conductivity, lustre and malleability which readily loses electrons to form positive ions.
- Non-metals:** A substance with low electrical conductivity, non-lustrous, non-malleable and which readily gains electrons to form

negative ions.

3. Metalloids: Elements with properties intermediate between those of a metal and non-metal.

4. Alloy: A homogenous mixture of a metal with at least one other metal or non-metal.

5. Malleability: It is a physical property of metals that defines the ability to be hammered, pressed, or rolled into thin sheets without breaking.

6. Sonorous: It is the property of a substance to produce a deep resonant sound when collide together.

7. Ductility: It is a physical property of a material associated with their ability to be hammered thin or stretched into a wire without breaking.

8. Ore: A naturally occurring solid material from which a metal or valuable mineral can be extracted profitably.

9. Anion: A negatively charged ion formed by gain of electrons.

10. Cation: A positively charged ion formed by loss of electrons from a neutral atom.

11. Electrodes: An electrode is a solid electric conductor that carries electric current into non-metallic solids, or liquids, or gases, or plasmas, or vacuums.

12. Mineral: A mineral is a naturally occurring solid with a characteristic composition, crystalline atomic structure and distinct physical properties.

13. Smelting: It is a chemical process to isolate an element from its ore using heat and a reducing agent.

14. Gangue: It is an unwanted material or impurities in the form of sand, rock or any other material that surrounds the mineral in an ore

deposit.

15. Calcination: The conversion of metals into their oxides as a result of heating to a high temperature in the absence of air or oxygen. The organic matter, moisture, volatile impurities like carbon dioxide and sulphur dioxide are expelled from the ore which makes the ore porous.

16. Roasting: It is a process in metallurgy in which a sulphide ore is heated in air. The process may convert a metal sulphide to a metal oxide or to a free metal.

17. Electroplating: A process that uses electric current to reduce dissolved metal cations so that they form a thin coherent metal coating on an electrode.

18. Galvanisation: A process that applies a coat of zinc to a metal to prevent its oxidation.

19. Refining: It is a method of removing impurities in order to obtain metals of high purity.

Multiple Choice Questions

20. The ability of metals to be drawn into thin wire is known as:
[NCERT Exemplar]

- (a) Ductility
- (b) Malleability
- (c) Sonorousity
- (d) Conductivity

Ans. (a) Ductility

Explanation :

Ductility is the property which allows the metals to be drawn into thin wires.

21. The compound obtained on reaction of iron with steam

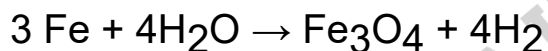
is/are:

- (a) Fe_2O_3
- (b) Fe_3O_4
- (c) FeO
- (d) Fe_2O_3 and Fe_3O_4

Ans. (b) Fe_3O_4

Explanation :

Iron does not react with the cold and hot water, but it reacts with steam to form metal oxide and hydrogen.



22. Which one of the following properties is not generally exhibited by ionic compounds?

[NCERT Exemplar]

- (a) Solubility in water
- (b) Electrical conductivity in solid state
- (c) High melting and boiling points
- (d) Electrical conductivity in molten state

Ans. (b) Electrical conductivity in solid state

Explanation :

Ionic compounds can conduct electricity in aqueous solution or molten state. In solid state, they are non-conductors of electricity because of the absence of free ions.

23. Which of the following properties of aluminium makes it suitable for making cooking utensils?

- (i) Good thermal conductivity
- (ii) Good electrical conductivity

(iii) Ductility

(iv) High melting point

(a) (i) and (ii)

(b) (i) and (iii)

(c) (ii) and (iii)

(d) (i) and (iv)

Ans. (d) (i) and (iv)

Explanation :

Good thermal conductivity and high melting point of aluminum are the properties that makes it suitable for making cooking utensils.

24. Which metal is displaced when zinc metal is put in the solution of copper sulphate ?

(a) Zinc

(b) Copper

(c) Sulphate

(d) All of these

Ans. (b) Copper

Explanation :

When zinc metal is put in the solution of copper sulphate, zinc metal will displace copper from its solution and form zinc sulphate. This is because zinc is above copper in the reactivity series and therefore, zinc is more reactive than copper. Also, the blue colour of the solution becomes colourless when zinc is added.

25. Silver articles become black on prolonged exposure to air. This is due to the formation of:

[NCERT Exemplar]

(a) Ag_3N

- (b) Ag_2O
- (c) Ag_2S
- (d) Ag_2S and Ag_3N

Ans. (c) Ag_2S

Explanation :

On prolonged exposure to air silver metal reacts with the hydrogen sulphide gas and forms a coating of silver sulphide (Ag_2S) due to which silver metal loses its shine, turns black and gets tarnished.

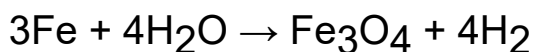
26. Which of the following oxide(s) of iron would be obtained on prolonged reaction of iron with steam ? [\[NCERT Exemplar\]](#)

- (a) FeO
- (b) Fe_2O_3
- (c) Fe_3O_4
- (d) Fe_2O_3 and Fe_3O_4

Ans. (c) Fe_3O_4

Explanation :

On prolonged heating with steam iron produces a mixed oxide of iron Fe_3O_4 with the evolution of hydrogen gas



27. Which one of the following metals is found in liquid state at room temperature ?

- (a) Na
- (b) Fe
- (c) Cr
- (d) Hg

Ans. (d) Hg

Explanation :

Except mercury, all the metals are solid at room temperature. Hence, mercury is the only metal which exists in liquid state at room temperature.

28. Predict the metal when 2 mL each of concentrated HCl, HNO₃ and a mixture of concentrated HCl and concentrated HNO₃ in the ratio of 3: 1 were taken in test tubes labelled as A, B and C. A small piece of metal was put in each test tube. No change occurred in test tubes A and B but the metal got dissolved in test tube C respectively.

(a) Al

(b) Au

(c) Cu

(d) Pt

Ans. (b) Au

Explanation :

Aqua regia which is a mixture of three parts of concentrated hydrochloric acid and one part of concentrated nitric acid (Aqua regia - 3:1 ratio) is given in the test tubes A, B and C to test the metals. Out of the given options Al, Au, Cu, Pt; gold is a noble metal that cannot dissolve in dilute acids and dissolves only in aqua regia. Hence, the metal that got dissolved in test tube C is gold (Au)

29. An alloy is: [NCERT Exemplar]

(a) an element

(b) a compound

(c) a homogeneous mixture

(d) a heterogeneous mixture

Ans. (c) a homogeneous mixture

Explanation :

Suspensions and colloids are heterogeneous mixture whereas an alloy is a homogeneous mixture of two or more metals. The various properties of a metal can be improved by mixing it with another metal such as melting point, electrical conductivity, resistant to corrosion and strong metals. Example of alloys are stainless steel (homogeneous mixture of Fe, Cr, Ni), brass (homogeneous mixture of Cu and Zn), bronze (homogeneous mixture of Cu and Sn) etc.

30. This element is very reactive to air and cannot be kept open in air. It reacts vigorously with water. Identify the element from the following.

- (a) Mg
- (b) Na
- (c) P
- (d) Ca

Ans. (b) Na

Explanation :

Element A is sodium as it is soft and can be cut with knife. It is kept in kerosene because it reacts vigorously when comes in contact with water or air.

31. Reaction between X and Y, forms compound Z. X loses electron and Y gains electron. Which of the following properties is not shown by Z ? [NCERT Exemplar]

- (a) Has high melting point
- (b) Has low melting point
- (c) Conducts electricity in molten state
- (d) Occurs as solid

Ans. (b) Has low melting point

Explanation :

Reaction between compound X and Y forms compound Z. In the reaction, X loses electron and Y gains electron which means compound Z is a crystalline solid as ionic or electrovalent bond is formed between X and Y. As compound Z is a crystalline solid, it has high melting point and it conducts electricity in the molten state. Thus, the property not shown by Z is that it has low melting point.

32. Predict the nature of the element if the electronic configurations of three elements X, Y and Z are X –2, 8, Y–2, 8, 7 and Z–2, 8, 2 respectively ?

- (a) X is a metal.
- (b) Y is a metal.
- (c) Z is a non-metal.
- (d) Y is a non-metal and Z is a metal.

Ans. (d) Y is a non-metal and Z is a metal.

Explanation :

Electronic configuration of X is 2, 8 = 10 (it is same as the electronic configuration of Neon) Thus, element X is a noble gas element.

Electronic configuration of Y is 2,8,7 = 17 (It is same as the electronic configuration of chlorine atom which belongs to halogen family and is a non-metal). Thus, element Y is a non-metal.

Electronic configuration of Z is 2,8 , 2 = 12 (it is same as the electronic configuration of magnesium atom which belongs to alkaline earth metals and is a metal). Thus, element Z is a metal.

Therefore, Y is a non-metal and Z is a metal.

33. What happens when calcium is treated with water ? **[NCERT Exemplar]**

- (i) It does not react with water.

(ii) It reacts violently with water.

(iii) It reacts less violently with water.

(iv) Bubbles of hydrogen gas formed stick to the surface of calcium .

(a) (i) and (iv)

(b) (ii) and (iii)

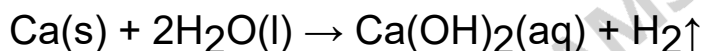
(c) (i) and (ii)

(d) (iii) and (iv)

Ans. (d) (iii) and (iv)

Explanation :

Calcium metal reacts less violently with water. It produces a hydroxide known as calcium hydroxide (a cloudy white precipitate) and the bubbles of hydrogen gas produced. The hydrogen gas thus produced stuck to the surface of calcium due to which it floats over the water surface.



Calcium hydroxide

Very less amount of heat is produced in this reaction due to which hydrogen gas formed does not catch fire.

34. Which insulating material is used for coating the electrical wires?

(a) Lead

(b) Graphite

(c) PVC

(d) All of these

Ans. (c) PVC

Explanation :

The electrical characteristics such as electrical insulating properties

or dielectric constant of PVC (polyvinyl chloride) are high due to which it is used as an insulating material. To prevent any accidental contact with other conductors, the metal part of an electrical wire are covered with PVC.

35. Which of the following properties are not shown in metals?

- (a) Electric conductivity
- (b) Sonorous in nature
- (c) Dullness
- (d) Ductility

Ans. (c) Dullness

Explanation :

Metals are good conductors of electricity. Metals are sonorous in nature which means on striking them they make a ringing sound.

Metals are lustrous which means they have shiny appearance. Metals are ductile which means they can be drawn into long thin wires. Hence, the property not shown by metals is dullness.

36. Aluminium foil is used for wrapping food because:

- (a) it is ductile
- (b) it is malleable
- (c) it is a good conductor of heat
- (d) it is sonorous

Ans. (b) it is malleable

Explanation :

Aluminium, being a less reactive metal, does not react with food items and does not alter their taste. Moreover, it is highly malleable and can be beaten into very thin foils which are perfect for food wrapping.

37. Of these, the most ductile metal is _____.

- (a) Al
- (b) Au
- (c) Cu
- (d) Ag

Ans. (b) Au

Explanation :

Ductility is the property by which metals can be drawn into long thin wires without breaking. Gold silver and platinum are often drawn into long stands for use in jewellery. However, gold has a significantly greater ductility than platinum and it is considered as the earth's most ductile metals as one ounce of gold could be drawn to a length of 50 miles.

38. Oxides of non-metals are:

- (a) acidic
- (b) basic
- (c) neutral
- (d) none of these

Ans. (a) acidic

Explanation :

Non-metals react with oxygen to form non-metallic oxide. Non-metallic oxide such as sulphur dioxide and nitrogen dioxide present in air are responsible for acid rain as they react with the moisture present in air and forms the acidic compounds.

39. Metal oxides are:

- (a) acidic
- (b) basic
- (c) neutral

(d) none of these

Ans. (b) basic

Explanation :

Oxides of metals are basic in nature because they react with water to form metal hydroxides which are alkaline in nature. These metal hydroxides when dissolved in water release OH^- ions in solution which will turn red litmus solution to blue. Therefore, non-metallic oxides are acidic in nature.

40. Food cans are coated with tin and not with zinc because:
[NCERT]

- (a) zinc is costlier than tin.
- (b) zinc has a higher melting point than tin.
- (c) zinc is more reactive than tin.
- (d) zinc is less reactive than tin.

Ans. (c) zinc is more reactive than tin.

Explanation :

Food cans are coated with tin and not with zinc because zinc is above the tin in the reactive series and can react with the food items and alter their taste. Hence, due to this reason food cans are coated with tin and not with zinc.

41. Which one of the following four metals would be displaced from the solution of its salts by other three metals ? [NCERT Exemplar]

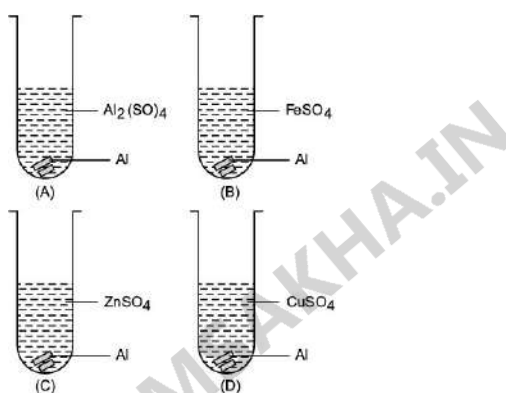
- (a) Mg
- (b) Ag
- (c) Zn
- (d) Cu

Ans. (b) Ag

Explanation :

Silver (Ag) metal would be displaced from the solution of its salts by other three metals because silver is less reactive than magnesium (Mg), zinc (Zn) and copper (Cu).

42. Mrignayani was doing the experiment of comparing reactivity of metals in the laboratory. She was given aluminium metal and was told to check reactivity by using four solutions as shown below. She would observe that reaction takes place in:



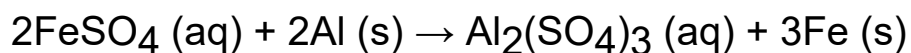
- (a) A and B
- (b) B, C and D
- (c) A, C and D
- (d) C and D

Ans. (b) B, C and D

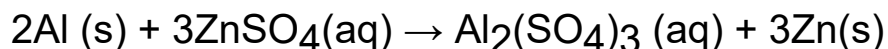
Explanation :

In the reactivity series aluminium is above zinc, iron and copper which makes it more reactive than these elements. Mrignayni would observe that out of the four solutions, reaction will take place in solution B, C and D. The reactions are as follows:

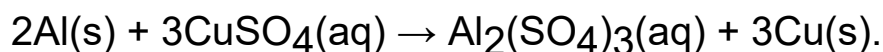
In Solution B: Aluminium will displace iron from ferrous sulphate solution to form aluminium sulphate and iron is precipitated



In Solution C: Aluminium will displace Zinc from zinc sulphate solution to form aluminium sulphate and zinc is precipitated.



In Solution D: Aluminium will displace copper from copper sulphate solution to form aluminium sulphate and copper is precipitated.



43. Which of the following alloys contain non-metal as one of their constituents?

- (a) Brass
- (b) Bronze
- (c) Steel
- (d) Amalgam

Ans. (c) Steel

Explanation :

Steel is an alloy which contains iron as a metal and carbon as a non-metal.

44. The elements or compounds which occur naturally in the earth crust are known as:

- (a) Ores
- (b) Minerals
- (c) Gangue
- (d) None of these

Ans. (b) Minerals

Explanation :

The elements or compounds which occur naturally in the earth crust are known as **minerals**.

The mineral from which an element can be extracted easily and profitably is called an **ore**.

The impurities or unwanted substances present in ore such as sand, rock etc is known as **gangue**.

Assertion and Reasoning Based Questions

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.
- (c) Assertion is true, but reason is false.
- (d) Assertion is false, but reason is true.

45. Assertion: Sodium is kept immersed in kerosene oil.

Reason: Sodium is very reactive metal.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Sodium is a very reactive metal. It reacts so vigorously that it catches fire if kept in the open. Therefore, to prevent the accidental fires, it is kept immersed in kerosene oil. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

46. Assertion: Platinum, gold and silver are used to make jewellery.

Reason: It is because they are very lustrous.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Platinum, gold, and silver are used to make jewellery because they are very lustrous. Also, they are very less reactive and do not corrode easily. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

47. Assertion: Copper is used to make hot water tanks and not steel (an alloy of iron).

Reason: Copper does not react with hot water.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Copper is not reactive to any form of water, such as steam, neither cold water nor hot water. Hence, the copper is used to make the hot water tanks as it does not react with the water. On the other hand, due to the presence of iron in the steel, Steel is not used to make hot water tanks. Thus, assertion is true , but reason is false.

48. Assertion: Alloys are commonly used in electrical heating devices like electric iron and heater.

Reason: Resistivity of an alloy is generally higher than that of its constituent metals but the alloys have low melting points than their constituent metals. [\[Board Question\]](#)

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

An alloy is combination of a metal and a non metal. So it has partial characteristics of metal and non metal. In an alloy the ions are randomly arranged. It does not have a specific arrangement of ions. Hence, the flow of electrons in this is more. This feature of alloy leads to increase in resistivity due to free crystal lattice. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

49. Assertion: Aluminium is used to make utensils for cooking.

Reason: Aluminium is a highly reactive metal.

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

Aluminium is a highly reactive metal but it is resistant to corrosion. The reason for this is that aluminium reacts with oxygen present in air to form a thin layer of aluminium oxide. This oxide layer is very stable and prevents further reaction of aluminium with oxygen. It is light in weight and a good conductor of heat. Therefore, used to make utensils for cooking. Thus, both assertion and reason are correct, but reason is not the correct explanation of the assertion.

50. Assertion: Tungsten is used for filament of electric bulb.

Reason: It has high melting point.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Tungsten is used for filament of electric bulb because it has high melting point and high resistance. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

51. Assertion: From metals school bells are made.

Reason: Metals are sonorous.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

School bells are made up of metals because metals are sonorous, *i.e.*, when bells are hit, they vibrate and produce sound. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

52. Assertion: Ionic compounds generally have high melting points.

Reason: It is because they are ionic in nature.

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

Ionic compounds are made up of positive and negative ions. There is a strong electrostatic force of attraction between them. A lot of heat energy is required to break this force of attraction and to melt or boil the ionic compound. As a result, ionic compounds have high melting points. Thus, both assertion and reason are correct, but reason is not the correct explanation of the assertion.

53. Assertion: Reactivity Series is an arrangement of element based on their reactivity.

Reason: Reactivity Series is used to separate elements based on their reactivity.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Reactivity Series is an arrangement of element based on their reactivity in the increasing or the decreasing order and this series is used to separate elements based on their reactivity. Thus both assertion and reason are correct and reason is the correct explanation of the assertion.

54. Assertion: Zinc fails to evolve hydrogen gas on reacting with dilute sulphuric acid.

Reason: It gives the NO gas on reaction with ammonia.

Ans. (d) Assertion is false, but reason is true.

Explanation :

It is because dil. HNO_3 is an oxidising agent therefore, zinc gives NO and not H_2 with dil. HNO_3 . Thus, assertion is false but reason is true.

55. Read the passage carefully and answer the following questions from (i) to (v).

Metals exhibit their chemical properties as per their electron releasing tendency of atoms. The greater the tendency, the more is the reactivity. Metals react with oxygen, water, hydrogen, acids, etc. They act as reducing agents because they can lose electrons. Some reactions metals undergo are given in this Table:

- | |
|---|
| <ol style="list-style-type: none">1. Metal + Oxygen \rightarrow Metal oxide2. Metal + Water \rightarrow Metal Hydroxide + Hydrogen3. Metal + Acid(dil.) \rightarrow Metal Salt + Hydrogen4. Metal A + Salt Solution of Metal B \rightarrow Salt solution of A + B
(Displacement) |
|---|

(i) Some metals react vigorously with oxygen so for safety they are kept in kerosene to prevent accidental fires. Which metals are these?

- (a) Phosphorous, Magnesium
- (b) Sodium, Potassium
- (c) Tin, lead
- (d) Calcium, Thallium

Ans. (b) Sodium, Potassium

(ii) Which of the following pairs will undergo displacement reaction:

- (a) Magnesium Chloride and aluminum metal
- (b) Silver nitrate solution and copper metal
- (c) Ferrous sulphate solution and silver metal

(d) Sodium chloride solution and copper metal

Ans. (b) Silver nitrate solution and copper metal

(iii) Identify four metals P, Q, S, T with the hints given below:

P forms basic oxides

Q forms amphoteric oxides

S oxide dissolves in water to form alkali

T does not react with water

(a) $P \rightarrow \text{Zn}$, $Q \rightarrow \text{Al}$, $S \rightarrow \text{Na}$, $T \rightarrow \text{Fe}$

(b) $P \rightarrow \text{Fe}$, $Q \rightarrow \text{Na}$, $S \rightarrow \text{K}$, $T \rightarrow \text{Zn}$

(c) $P \rightarrow \text{K}$, $Q \rightarrow \text{Cu}$, $S \rightarrow \text{Pb}$, $T \rightarrow \text{Na}$

(d) $P \rightarrow \text{Cu}$, $Q \rightarrow \text{Zn}$, $S \rightarrow \text{K}$, $T \rightarrow \text{Pb}$

Ans. (d) $P \rightarrow \text{Cu}$, $Q \rightarrow \text{Zn}$, $S \rightarrow \text{K}$, $T \rightarrow \text{Pb}$

(iv) The metal which does not react with dilute HCl is:

(a) Copper

(b) Iron

(c) Zinc

(d) Sodium

Ans. (a) Copper

(v) Food cans are coated with tin and not with zinc because:

(a) Zinc is less reactive than tin

(b) Zinc has a higher melting point than tin

(c) Zinc is more reactive than tin

(d) Zinc is costlier than tin

Ans. (c) Zinc is more reactive than tin

56. Read the passage carefully and answer **the following** questions

from (i) to (v):

All metals do not react with oxygen at the same rate. Different metals show different reactivities towards oxygen. Almost all metals combine with oxygen to form metal oxides. Metal oxides are basic in nature but some metal oxides, such as aluminium oxide, zinc oxide, etc show both acidic as well as basic behaviour. Most metal oxides are insoluble in water but some like Sodium oxide and potassium oxide dissolve in water to produce alkalis.

(i) Arrange the metals in the correct order of their reactivity.

(a) $\text{Mg} > \text{Al} > \text{Zn} > \text{Fe}$

(b) $\text{Al} > \text{Mg} > \text{Fe} > \text{Zn}$

(c) $\text{Mg} > \text{Zn} > \text{Al} > \text{Fe}$

(d) $\text{Al} > \text{Fe} > \text{Zn} > \text{Mg}$

Ans. (c) $\text{Mg} > \text{Zn} > \text{Al} > \text{Fe}$

(ii) Why does the magnesium ribbon need to be cleaned before burning it in air?

(a) To increase its efficiency.

(b) To remove the oxide layer from it

(c) To decrease its efficiency

(d) All of the above

Ans. (b) To remove the oxide layer from it



What is the reason for the surface of aluminium turns into dull colour after few days as shown in the figure?

(a) Due to the formation of a stable aluminium oxide layer.

(b) Due to the reaction with atmospheric dirt particles.

(c) Due to its ductile nature.

(d) None of the above.

Ans. (a) Due to the formation of a stable aluminium oxide layer.

(iv) Although metals form basic oxides, which of the following metals form an amphoteric oxide?

(a) Na

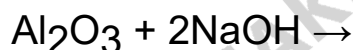
(b) Ca

(c) Al

(d) Cu

Ans. (c) Al

(v) Aluminium oxide reacts in the following manner with bases. The resultant product is:



(a) $2\text{AlCl}_3 + 3\text{H}_2\text{O}$

(b) $2\text{NaAlO}_2 + \text{H}_2\text{O}$

(c) $\text{Al}_2\text{O}_3 + \text{H}_2\text{O}$

(d) None of these

Ans. (b) $2\text{NaAlO}_2 + \text{H}_2\text{O}$

57. Read the passage carefully and answer **the following** questions from (i) to (v):

Metals are lustrous, malleable, ductile and are good conductors of heat and electricity. They are solids at room temperature, except mercury which is a liquid. They can form positive ions by losing electrons to non-metals. Metals combine with oxygen to form basic oxides. Different metals have different reactivities with water and dilute acids. Metals above hydrogen in the Activity series can displace hydrogen from dilute acids. A more reactive metal displaces

a less reactive metal from its salt solution. Metals occur in nature as free elements or in the form of their compounds. The extraction of metals from their ores and then refining them for use is known as metallurgy. The surface of some metals, such as iron, is corroded when they are exposed to moist air for a long period of time. This phenomenon is known as corrosion. Non-metals have properties opposite to that of metals. They are neither malleable nor ductile. They are bad conductors of heat and electricity, except for graphite, which conducts electricity.

(i) Which of the following pairs will give displacement reactions?

(a) MgCl_2 solution and aluminium metal.

(b) NaCl solution and copper metal.

(c) FeSO_4 solution and silver metal.

(d) AgNO_3 solution and copper metal.

Ans. (d) AgNO_3 solution and copper metal

(ii) An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be:

(a) Calcium

(b) Silicon

(c) Iron

(d) Carbon

Ans. (a) Calcium

(iii) A student placed Zn rod in FeSO_4 solution. After 10 hours when rod was taken out and it was observed that:

(a) Zn rod became thinner.

(b) Zn rod became thicker due to Iron deposition.

(c) Zn rod remains as it was.

(d) Zn rod has holes.

Ans. (a) Zn rod become thinner.

(iv) Formula of cinnabar is:

(a) HgS

(b) HgS₂

(c) HgS₄

(d) None of these

Ans. (a) HgS

(v) The most abundant metal in the earth's crust is :

(a) Iron

(b) Calcium

(c) Aluminium

(d) Sodium

Ans. (c) Aluminium

58. Read the passage carefully and answer the following questions from (i) to (v).

Metal	CuSO ₄	ZnSO ₄	FeSO ₄	AgNO ₃
A	No change	No change	No change	A coating on metal
B	Brown Coating	—	Grey deposit	A coating on metal
C	No change	No change	No change	No change

D	—	No change	No change	Brown deposit
E	Brown deposit	New coating	New coating	New coating

Sample pieces of five metals A, B, C, D, and E are added to the tabulated solutions separately. The results observed are shown in the table given below.

Based on the observations recorded in the table answer the following questions:

(i) Which is the most reactive metal?

- (a) B
- (b) C
- (c) D
- (d) E

Ans. (d) E

(ii) Which is the least reactive metal?

- (a) A
- (b) C
- (c) E
- (d) B

Ans. (b) C

(iii) Activity series of elements is:

- (a) The arrangement of elements in increasing order of reactivity
- (b) The arrangement of elements in decreasing order of reactivity
- (c) The arrangement of oxides of elements in increasing order of reactivity
- (d) None of the above

Ans. (b) The arrangement of elements in decreasing order of reactivity

(iv) Which of the following metal is least reactive:

- (a) Zinc
- (b) Copper
- (c) Silver
- (d) Iron

Ans. (c) Silver

(v) Decreasing order of reactivity is:

- (a) $A > B > C > D > E$
- (b) $B > E > C > D > A$
- (c) $E > B > D > A > C$
- (d) $D > C > B > E > A$

Ans. (c) $E > B > D > A > C$

59. Read the passage carefully and answer the following questions from (i) to (v):

An ionic compound is a chemical compound in which ions of elements are held together by ionic bonds. In this type of bond, two oppositely charged ions are held strongly through electrostatic forces. Metals have loosely bound electrons in their valence shell whereas non-metals need electrons for octet completion and to attain noble gas configuration. The metal thus completely loses an electron and the non-metal accepts it. By this transfer of electrons, the atoms remain no longer neutral. Cations and anions are formed respectively. Usually, ionic compounds are solids and found in the form of crystals. They have high melting and boiling points.

(i) Which among the following forms a cation?

- (a) Oxygen

- (b) Neon
- (c) Potassium
- (d) Fluorine

Ans. (c) Potassium

(ii) Ionic compounds are soluble in which of the following?

- (a) Petrol
- (b) Water
- (c) Kerosene
- (d) Edible oil

Ans. (b) Water

(iii) Consider these statements about ionic compounds:

- I. They conduct electricity in solid-state
- II. They conduct electricity in solutions.
- III. They conduct electricity in the molten state.

Choose the correct option.

- (a) I only
- (b) II only
- (c) III only
- (d) II and III only

Ans. (d) II and III only

(iv) Which of the following can change to an anion?

- (a) Xenon
- (b) Iodine
- (c) Calcium
- (d) Magnesium

Ans. (b) Iodine

(v) Identify the incorrect statement.

(a) Ionic compounds are usually brittle.

(b) Sharing of electrons is involved in ionic bonds.

(c) Common salt is an ionic compound.

(d) Ions are fundamental units of ionic compounds.

Ans. (b) Sharing of electrons is involved in ionic bonds.

60. Read the passage carefully and answer the following questions from (i) to (v):

The chemical reactivity of an element depends upon the atomic structure and its electronic configuration. Chemical reactivity is shown by all elements which have less than eight electrons in the outermost shell. Through chemical reactions, atoms of all elements actually try to achieve a completely filled valence shell. Metals have the tendency to lose one or more electrons from their valence shell and achieve the nearest noble gas configuration. This property of the metals is called electropositivity. The compounds formed by the transfer of electrons from one element to other are known as ionic or electrovalent compounds.

(i) Three elements A, B and C have their electronic configuration as shown below:

A: 2, Y: 2, 8, 7 Z: 2, 8, 2

Which of the following is correct regarding these elements?

(a) A is a metal

(b) Y is a metal

(c) Z is a non-metal

(d) Y is a non-metal and Z is a metal

Ans. (d) Y is a non-metal and Z is a metal

(ii) Element S reacts with element T to form a compound C. During the formation of compound C, atoms of S lose one electron whereas T gains one electron each. Which of the following properties is not shown by compound C?

- (a) High melting point
- (b) Low melting point
- (c) Occurrence as solid
- (d) Conduction of electricity in the molten state

Ans. (b) Low melting point

(iii) The electronic configuration of sodium ion is:

- (a) 2, 8, 8
- (b) 2, 8, 2
- (c) 2, 6
- (d) 2, 8

Ans. (d) 2, 8

(iv) Which of the following represents an electropositive element?

- (a) 2, 8, 8, 1
- (b) 2, 8, 8
- (c) 2, 8, 6
- (d) 2, 7

Ans. (a) 2, 8, 8, 1

(v) Choose the incorrect one.

- (a) An ionic bond represents sharing of electrons.
- (b) Metals are electropositive.
- (c) Non-metals are electronegative.
- (d) Atoms react in order to complete their octet.

Ans. (a) An ionic bond represents sharing of electrons.

Reasoning Based Questions

61. Explain why:

(i) Covalent compounds have generally low melting points.

(ii) Ionic compounds have generally high melting points.

Ans. (i) Covalent compounds are made up of electrically neutral molecules and force of attraction between the molecules of a covalent compound is very weak. Therefore, only a small amount of heat energy is required to break these bonds. As a result, melting point of covalent compounds is low.

(ii) Ionic compounds are made up of positive and negative ions. There is a strong electrostatic force of attraction between them. Therefore, a lot of heat energy is required to break this force of attraction and to melt or boil the ionic compound. As a result, ionic compounds have high melting points.

62. Answer the following questions:

(i) Explain why, ionic compounds conduct electricity in solution whereas covalent compounds do not conduct electricity .

(ii) Which of the following will conduct electricity and which not?

MgCl_2 , CCl_4 , NaCl , CS_2 , Na_2S Give reasons for your choice.

Ans. (i) Ionic compounds conduct electricity in solution because they are made up of electrically charged ions but covalent compounds are made up of electrically neutral molecules so they do not conduct electricity.

(ii) MgCl_2 , NaCl , Na_2S conduct electricity because these are ionic compounds

CCl_4 , CS_2 do not conduct electricity because these are Covalent compounds .

63. Give reason for the following:[Board Question]

- (i) School bells are made up of metals.
- (ii) Electric wires are made up of copper.

Ans. (i) School bells are made up of metals because metals are sonorous. Which means metals can produce sound on being hit with a solid object. Therefore, students will be able to hear the sound loud when the bell hits the metal bell.

(ii) Electric wires are made up of copper because it is a good conductor of electricity and cheaper than any other metallic wire.

64. Why is sodium kept immersed in kerosene oil?

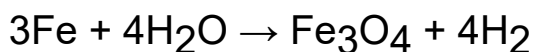
[NCERT]

Ans. Sodium is a very reactive metal and reacts vigorously with the oxygen, carbon dioxide and moisture present in the air such that it may even cause a fire. Therefore, to prevent these accidental fires, sodium is kept immersed in kerosene because it does not react with kerosene oil.

65. Give reasons why copper is used to make hot water tanks and not steel (an alloy of iron).

[NCERT]

Ans. Copper does not react with cold water, hot water, or steam. However, iron reacts with steam. If the hot water tanks are made of steel (an alloy of iron), then iron would react vigorously with the steam formed from hot water to corrode the tank due to the formation of iron oxide.



Iron Steam Iron oxide Hydrogen

Therefore, copper is used to make hot water tanks and not steel.

66. Generally, when metals are treated with mineral acids, hydrogen gas is liberated but when metals (except Mn and Mg), treated with HNO_3 , hydrogen is not liberated, why?

Ans. Most of the metals do not react with HNO_3 because nitric acid is a strong oxidising agent. Hence, when metals (except Mn and Mg) are treated with nitric acid; hydrogen gas is not liberated. Only magnesium and manganese can produce hydrogen gas with very dilute nitric acid.

67. Why is carbon not used for reducing aluminium from aluminium oxide.

Ans. Carbon is not used for reducing aluminium from aluminium oxide because aluminium has greater affinity for oxygen than for carbon, therefore carbon cannot reduce alumina (Al_2O_3) to aluminium.

68. Give reason for the following: [\[Board Question\]](#)

(i) Aluminium oxide is considered as an amphoteric oxide.

(ii) Ionic compounds conduct electricity in molten state.

Ans. (i) Amphoteric oxides are the oxides that behave as both acidic and basic oxides and neutralize both acids and bases. Thus, aluminium oxide (Al_2O_3) reacts with hydrochloric acid to form aluminium chloride and water. With sodium hydroxide solution it forms sodium aluminate (NaAlO_2) and water. Hence, it is called as amphoteric oxide.

(ii) Ionic compounds are bound to each other with strong attraction force. Thus, in their solid form, their ions are not mobile. On the other hand, when in molten state these ions become mobile and act as carriers for charge and hence conduct electricity.

69. Give reasons:

- (i) Platinum, gold and silver are used to make jewellery.
- (ii) Sodium, potassium and lithium are stored under oil.
- (iii) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.
- (iv) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.

Ans. (i) Platinum, gold, and silver are used to make jewellery because they are very lustrous. Also, they are very less reactive and do not corrode easily.

(ii) Sodium, potassium, and lithium are stored in kerosene because they are very reactive metals and react very vigorously with air as well as water. They are kept immersed in kerosene oil in order to prevent their contact with air and moisture.

(iii) Aluminium is a highly reactive metal but it is resistant to corrosion. The reason for this is that aluminium reacts with oxygen present in air to form a thin layer of aluminium oxide. This oxide layer is very stable and prevents further reaction of aluminium with oxygen. It is light in weight and a good conductor of heat. Therefore, it is used to make utensils for cooking.

(iv) Carbonate and sulphide ores are usually converted into oxides during the process of extraction because metals can be easily extracted from their oxides as compared from their carbonates and sulphides.

70. Answer the following questions:

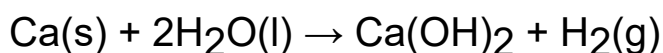
- (i) Explain why, metals usually do not liberate hydrogen gas with dilute nitric acid.
- (ii) Name two metals which can, however, liberate hydrogen gas from very dilute nitric acid.
- (iii) Why do calcium starts floating when added to water? **[Board**

Question]

Ans. (i) Metals do not liberate hydrogen gas with nitric acid because nitric acid is a strong oxidizing agent. So, as soon as hydrogen gas is formed in the reaction between a metal and dilute nitric acid, the nitric acid oxidizes this hydrogen to water.

(ii) Magnesium and manganese.

(iii) When calcium reacts with water, bubbles of $\text{H}_2(\text{g})$ and a white precipitate of $\text{Ca}(\text{OH})_2$ are formed. Calcium starts floating because the bubbles of hydrogen gas which are formed during the reaction stick to the surface of the calcium metal and make it lighter. As a result, calcium starts floating on water.



Very Short Answer Type Questions

71. Define the following terms. [NCERT]

(i) Mineral

(ii) Ore

(iii) Gangue

Ans. (i) **Mineral:** The elements or compounds, which occur naturally in the earth's crust, are known as minerals.

(ii) **Ore:** The mineral from which metal can be profitably extracted is called an ore.

(iii) **Gangue:** Ores mined from the earth are usually contaminated with large amounts of impurities such as soil, sand, etc. These impurities are called as gangue.

72. Answer the following questions:

(i) What is meant by metallurgy?

[Board Question]

(ii) Give two examples each of the metals that are good and poor conductors of heat respectively.

Ans. (i) The extraction of metals from their ores and then refining the metal for their use is known as metallurgy.

(ii) (a) Good conductor: Ag and Cu

(b) Poor conductor: Pb and Hg

73. Explain the meanings of malleable and ductile.

[NCERT]

Ans. Malleable: Substances that can be converted into thin sheets by beating are called malleable. Most of the metals are malleable. Gold and Silver are most malleable metals.

Ductile: Substances that can be drawn into thin wires are called ductile. Most of the metals are ductile. Gold is the most ductile metal.

74. Give an example of a metal which: **[NCERT]**

(i) Is a liquid at room temperature.

(ii) Can be easily cut with a knife.

(iii) Is the best conductor of heat.

(iv) Is a poor conductor of heat.

Ans. (i) Metal that exists in liquid state at room temperature : Mercury

(ii) Metal that can be easily cut with a knife : Sodium and Potassium

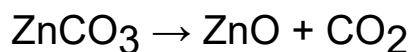
(iii) Metal that is the best conductor of heat : Silver and gold

(iv) Metals that are poor conductors of heat : Mercury and lead

75. What happens when ZnCO_3 is heated in the absence of air? Give the relevant equation.

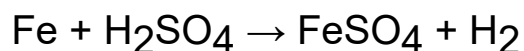
[Board Question]

Ans. When ZnCO_3 is heated in the absence of air, ZnO and CO_2 are formed.



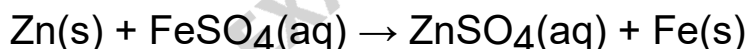
76. Which gas is produced when dilute hydrochloric acid is added to a reactive metal? Write the chemical reaction when iron reacts with dilute H_2SO_4 . [NCERT]

Ans. When reactive metals react with dilute hydrochloric acids, gives a salt and hydrogen gas. The reaction between iron and dil. H_2SO_4 :



77. What would you observe when zinc is added to a solution of iron (II) sulphate ? Write the chemical reaction that takes place. [NCERT]

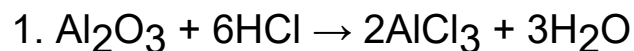
Ans. Zinc is more reactive than Iron. When Zn is added to Iron (II) Sulphate, Zinc displaces Iron from its solutions and zinc sulphate is formed.



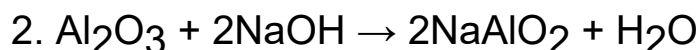
78. What are amphoteric oxides? Give an example. Write balanced chemical equations to justify your answer. [Board Question]

Ans. Those oxides which behave both as acidic and basic oxides are called amphoteric oxides.

Example: Al_2O_3 (Alumina)



Alumina Acid Salt



Alumina Base Salt

79. In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?[NCERT]

Ans. In the electrolytic refining of a metal M:

Anode → Impure metal M

Cathode → Thin strip of pure metal M

Electrolyte → Solution of salt of the metal M

80. A non-metal A is an important constituent of our food and forms two oxides B and C. Oxide B is toxic whereas C causes global warming.

(i) Identify A, B and C

(ii) To which Group of Periodic Table does A belong?

Ans. (i) A is carbon, B is carbon monoxide and C is carbon dioxide.

(ii) A belongs to Group – 14 of the Periodic Table

81. A non-metal X exists in two different forms Y and Z. Y is the hardest natural substance, whereas Z is a good conductor of electricity. Identify X, Y and Z.[Board Question]

Ans. 'X' is carbon, 'Y' is diamond as it is the hardest natural substance and 'Z' is graphite as it is good conductor of electricity.

82. What type of oxides are formed when non-metals combine with oxygen?[NCERT]

Ans. Non-metals combine with oxygen to form acidic oxides.

For example: $S(s) + O_2(g) \rightarrow SO_2(g)$

Acidic in nature

83. Why are the heating elements of electric toasters and electric irons made of an alloy rather than a pure metal?[Board Question]

Ans. The resistivity of an alloy is generally higher than that of its constituent metals. Alloys do not oxidise (burn) readily at higher temperatures. Therefore, conductors of electric heating devices, such as toasters and electric irons, are made up of an alloy rather than pure metal.

84. Given reasons: [Board Question]

- (i) Platinum, gold and silver are used to make jewellery.
- (ii) Metals like sodium and potassium are stored under oil.

Ans. (i) Platinum, gold and silver are used to make jewellery because of its bright and shiny surface. This property is called metallic lustre.

(ii) Metals like sodium and potassium are stored under oil because they are very reactive in nature, they react with oxygen present in air. Thus, to prevent their oxidation they are kept in the oil.

85. State the following:

- (i) A green layer is gradually formed on a copper plate left exposed to air for a week in a bathroom. What could this green substance be?
- (ii) Name the metal which has low melting point and can melt with heat of your palm?
- (iii) Which gas is liberated when a metal reacts with an acid? How will you test the presence of this gas?
- (iv) Name the metal which reacts with a very dilute HNO_3 to evolve hydrogen gas?
- (v) Name two metals which are found in nature in the free state?
- (vi) Name one metal which has a low melting point?
- (vii) Name the metal which is the poorest conductor of heat?
- (viii) What name is given to those metal oxides which show basic as

well as acidic behaviour?

(ix) Name two metals which form amphoteric oxides.

(x) Write the names and formulae of a metal hydride and a non-metal hydride.

(xi) Which of the two metals is more reactive: copper or silver?

(xii) Which metal foil is used for packing some of the medicine tablets?

(xiii) Name two metals which are found in nature in the free State.

[NCERT]

(xiv) Name an alloy of lead and tin.

(xv) What is an amalgam?

(xvi) Name two metals which are highly resistant to corrosion.

(xvii) Which metal becomes black in the presence of hydrogen sulphide gas in air?

(xviii) Give an example of an elementary substance which is a good conductor of electricity but it is not a metal.

(xix) Name a common metal which is highly resistant to corrosion.

(xx) What chemical process is used for obtaining a metal from its oxide?

(xxi) Name a non-metal which is lustrous and a metal which is non-lustrous?

Ans. (i) It is due to the formation of basic copper carbonate.

(ii) Gallium

(iii) Hydrogen gas is liberated. When a burning matchstick is brought near to it, hydrogen gas will burn explosively with 'pop' sound.

(iv) Magnesium

- (v) Gold and Silver
- (vi) Caesium
- (vii) Lead
- (viii) Amphoteric oxides
- (ix) Aluminium and zinc
- (x) Sodium hydride, Hydrogen sulphide
- (xi) Copper
- (xii) Aluminium foil
- (xiii) Gold and silver, are found in the free state in nature.
- (xiv) Solder is an alloy of lead and tin.
- (xv) An alloy of mercury metal with one or more other metals is known as an amalgam.
- (xvi) Gold and platinum are highly resistant to corrosion.
- (xvii) Silver metal becomes black in the presence of hydrogen sulphide gas in air.
- (xviii) Graphite
- (xix) Aluminium
- (xx) Reduction.
- (xxi) Iodine is a non-metal which is lustrous, whereas lead is a non-lustrous metal.

Short Answer Type Questions

86. Name a metal/non-metal : [Board Question]

- (i) Which makes iron hard and strong?
- (ii) Which is alloyed with any other metal to make an amalgam?
- (iii) Which is used to galvanize iron articles?

(iv) Whose articles when exposed to air form a black coating?

Ans. (i) Carbon

(ii) Mercury

(iii) Zinc

(iv) Silver.

87. Answer the following questions:

(i) What type of oxides are formed when non-metals react with oxygen? Explain with an example.

(ii) What type of oxides are formed when metals combine with oxygen? Explain with the help of an example.

Ans. (i) When non-metals react with oxygen, they form acidic oxides or neutral oxides.

Example: Carbon reacts with oxygen to form an acidic oxide called carbon dioxide.

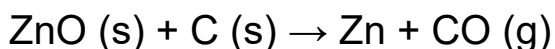
(ii) When metals combine with oxygen, they form basic oxides.

Example: Sodium reacts with oxygen to form a basic oxide called sodium oxide.

88. A metal M is found as its carbonate. It is used in the galvanization of iron. Identify 'M' and name its ore. How will you convert this ore into free metal? [Board Question]

Ans. M is metal Zinc. Zinc occurs as zinc carbonate in calamine ore (ZnCO_3).

Zinc carbonate can be converted into free metal by first converting into its oxide by calcination. Then zinc is extracted from zinc oxide by reduction with carbon.



89. How would you show that silver is chemically less reactive than copper?

Ans. Silver is chemically less reactive than copper, this can be shown by immersing a strip of silver metal in copper sulphate solution for some time. No reaction occurs. This shows that silver is not able to displace copper from copper sulphate solution and is less reactive.

90. The way, metals like sodium, magnesium and iron react with air and water is an indication of their relative positions in the 'reactivity series'. Is this statement true? Justify your answer with examples.

[Board Question]

Ans. Yes, sodium reacts explosively even with cold water, it is most reactive. Magnesium reacts with hot water, it is less reactive than Na. Iron reacts only with steam which shows it is least reactive among the three.

91. Samples of four metals A, B, C and D were taken and added to the following solution one by one. The results obtained have been tabulated as follows: [NCERT]

Metal	Iron (II) Sulphate	Copper (II) Sulphate	Zinc Sulphate	Silver Nitrate
A	No reaction	Displacement		
B	Displacement		No reaction	
C	No reaction	No reaction	No reaction	Displacement
D	No reaction	No reaction	No reaction	No reaction

Use the Table above to answer the following questions about metals A, B, C and D.

(i) Which is the most reactive metal?

(ii) What would you observe if B is added to a solution of Copper (II) sulphate?

Arrange the metals A, B, C and D in the order of decreasing reactivity.

Ans. As per reactivity series, Iron is most reactive metal among Iron, Silver and Copper. Since B can displace Iron from its sulphate, so B is the most reactive metal.

(i) As B is more reactive than Iron, it will displace Copper from its Copper Sulphate solution.

(ii) B is most reactive and D is the least reactive metal as unable to displace any of the solutions. Copper is more reactive than Silver and metal A can displace Copper, so A is more reactive than C.

Hence, the order of decreasing reactivity is $B > A > C > D$.

92. Given below are the steps for the extraction of copper from its ore. Write the chemical equation of the reactions involved in each case. **[Board Question]**

(i) Roasting of copper (I) sulphide.

(ii) Reduction of copper (I) oxide with copper(I) sulphide.

(iii) Electrolytic refining.

Ans. (i) $2\text{Cu}_2\text{S(s)} + 3\text{O}_2\text{(g)} \xrightarrow{\text{Roasting}} 2\text{Cu}_2\text{O(s)} + 2\text{SO}_2\text{(g)}$

Copper (I) sulphide Oxygen Copper (I) oxide Sulphur dioxide
(Copper glance ore) (From air)

(ii) $2\text{Cu}_2\text{O(s)} + \text{Cu}_2\text{S(s)} \xrightarrow{\text{Heat}} 6\text{Cu(s)} + \text{SO}_2\text{(g)}$

Copper (I) oxide Copper (I) Copper metal Sulphur dioxide
sulphide

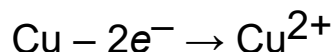
(iii) **1. At cathode:**



Copper iron Electrons Copper

(From electrolyte) (From cathode) (Deposits on cathode)

2. At anode:



Copper atom Electrons Copper iron

(From impure anode) (Given to anode) (Goes into electrolyte)

93. Answer the following questions:

(i) List in tabular form three chemical properties on the basis of which we can differentiate between a metal and a non-metal. **[Board Question]**

(ii) Give reasons for the following :

(a) Most metals conduct electricity well.

(b) The reaction of iron (III) oxide $[\text{Fe}_2\text{O}_3]$ with heated aluminium is used to join cracked machine parts.

Ans. (i) Difference between Metals and Non-metals:

Sr. No.	Metal	Non-metals
1.	<p>They react with oxygen to form basic oxide.</p> $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ <p>Magnesium Magnesium oxide</p>	<p>They react with oxygen to produce acidic or neutral oxides.</p> $4\text{C(s)} + \text{O}_2\text{(g)} \rightarrow \text{CO}_2\text{(g)}$

		Carbon Carbondioxide
2.	They react with water to produce metal hydroxide and hydrogen gas. $\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2 + \text{H}_2$	They do not react with water.
3.	Generally they do not combine with hydrogen except sodium, potassium, calcium which form ionic hydrides.	They react with hydrogen to form covalent hydrides.

(ii) (a) Metals for example Na has an electronic configuration of 2, 8, 1 *i.e.* It has one free electron. This electron moves through the metal and conducts electric current due to the presence of free electron.

(b) $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe} + \text{Heat}$

(s) (s) (s) (l)

It is thermite reaction.

This reaction is an exothermic reaction the reaction produces large amount of heat due to which iron metal is produced in molten form and use to join the tracks.


94. Answer the following questions:

(i) Write the electron dot structures for potassium and chlorine.

[Board Question]

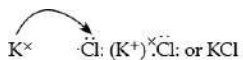
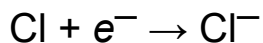
(ii) Show the formation of KCl by the transfer of electrons.

(iii) Name the ions present in the compound, KCl.

Ans. (i) K^+ 

2, 8, 8, 1 2, 8, 7

(ii) $\text{K} \rightarrow \text{K}^+ + \text{e}^-$



KCl has K^+ and Cl^- ions.

(iii) KCl has K^+ and Cl^- ions.

95. A metal 'X' acquires a green colour coating on its surface on exposure to air. [Board Question]

(i) Identify the metal 'X' and name the process responsible for this change.

(ii) Name and write chemical formula of the green coating formed on the metal.

(iii) List two important methods to prevent the process.

Ans. (i) Metal is copper. The process is corrosion.

(ii) Basic copper carbonate CuCO_3 .

(iii) Two methods to prevent corrossions are:

1. By painting and oiling.
2. It should be mixed with other metals to form alloys.

96. Mention the names of the metals for the following: [Board Question]

(i) Two metals which are alloyed with iron to make stainless steel.

(ii) Two metals which are used to make jewellery.

Ans. (i) Nickel and chromium.

(ii) Gold and platinum.

97. Write one example of each of : [Board Question]

(i) A metal which is so soft that, it can be cut with knife and a non-

metal which is the hardest substance.

(ii) A metal and a non-metal which exist as liquid at room temperature.

Ans. (i) Sodium, carbon (diamond).

(ii) Mercury is liquid metal, bromine is liquid non-metal.

98. Write down important properties of ionic compounds. [Board Question]

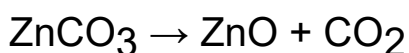
Ans. Some of the properties of ionic compounds are:

1. Ionic compounds have high melting and boiling points.
2. They are generally solid.
3. They are soluble in water.
4. They are good conductors of electricity in molten state.

99. Zinc is a metal found in the middle of the activity series of metals. In nature, it is found as a carbonate ore, ZnCO_3 . Mention the steps carried out for its extraction from the ore. Support with equations.

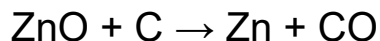
[Board Question]

Ans. 1. Metals found in the middle of the reactivity series are extracted by the reduction of their oxides with carbon, aluminium etc. So, in order to extract zinc metal from zinc carbonate, zinc carbonate is first converted into zinc oxide. Zinc carbonate (calamine ore) is heated strongly in the absence of air to obtain zinc oxide and carbon dioxide. This process is called calcination.



2. In the next step, the moderately reactive metal zinc is extracted from its oxide by using reducing agent like C. Zinc oxide is mixed with carbon (in the form of coke) and heated in a furnace. Carbon

reduces the metal oxide to free zinc metal.



100. Write one example of each of the following:[Board Question]

- (i) Most malleable and most ductile metal.
- (ii) The best conductor of heat and the poorest conductor of heat.
- (iii) A metal with highest melting point and a metal with lowest melting point.

Ans. (i) Gold and silver.

(ii) Silver is best conductor and lead is the poorest conductor of heat.

(iii) Tungsten has highest melting point and Gallium has lowest melting point.

101. You are provided with magnesium ribbon and sulphur powder. Explain with the help of an activity that metal oxides are basic and non-metal oxide are acidic in nature.[Board Question]

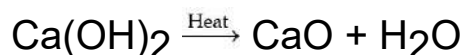
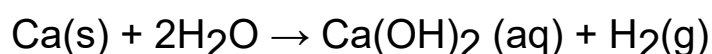
Ans. The steps are:

1. Take magnesium ribbon with a pair of tongs and burn it in flame in the presence of air.
2. Collect the product formed and dissolve it in warm water.
3. Add red litmus paper into it.
4. Observe the change in colour and decide the nature of the oxide formed.
5. Burn sulphur in a deflagrating spoon in the presence of air and dissolve the oxide formed in water.
6. Dip blue litmus paper into the solution and observe the change in the colour and decide the nature of the oxide formed.

Thus, the oxide formed by metal turns red litmus blue which shows they are basic in nature whereas oxide of non-metal turns blue litmus red which shows they are acidic in nature.

102. An element A reacts with water to form a compound B which is used in white washing. The compound B on heating forms an oxide C which on treatment with water gives back B. Identify A, B and C and give the reactions involved.

Ans. A—Ca : B— Ca(OH)₂ : C— CaO

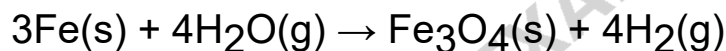


103. Write equations for the reactions of: [NCERT]

(i) Iron with steam

(ii) Calcium and potassium with water

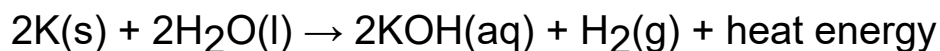
Ans. (i) Iron react with steam to form the metal oxide and hydrogen.



(ii) The reaction of calcium with water is exothermic but the heat evolved is not sufficient for the hydrogen to catch fire. Calcium starts floating because the bubbles of hydrogen gas formed stick to the surface of the metal.



Potassium react violently with cold water and its reaction is so violent and exothermic that the evolved hydrogen immediately catches fire.



104. Define the terms : [Board Question]

(i) Mineral

(ii) Ore

(iii) Gangue

Ans. (i) Mineral: It is a naturally occurring substance from which metal may or may not be extracted profitably or economically, example, Al cannot be extracted profitably from mica.

(ii) **Ore:** A naturally occurring solid material from which a metal or valuable mineral can be extracted profitably. Example, zinc blende is an ore of zinc from which zinc can be extracted profitably.

(iii) **Gangue:** It is a rocky material which is present along with the mineral in the ore, example. FeO is gangue in extraction of copper.

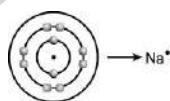
105. Answer the following questions:

(i) Write the electron-dot structures for sodium, oxygen and magnesium. **[NCERT]**

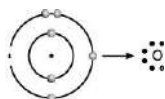
(ii) Show the formation of Na_2O and MgO by the transfer of electrons.

(iii) What are the ions present in these compounds?

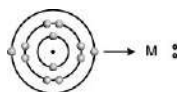
Ans. (i) Electron – dot structure for Sodium (2, 8, 1):



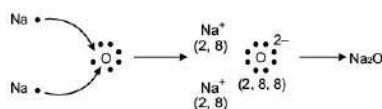
Electron – dot structure for Oxygen (2, 8, 6):



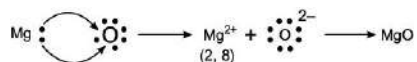
Electron – dot structure for Magnesium (2, 8, 2):



(ii) Formation of Na_2O by transfer of electron:



Formation of MgO by transfer of electron:



(iii) Ions present in these compounds are Mg^{2+} , O^{2-} and Na^{+} .

106. A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he had used?[NCERT]

Ans. The man must have dipped the gold metal in the solution of aqua regia - a 3 : 1 mixture of conc. HCl and conc. HNO_3 . Aqua regia is a fuming, highly corrosive liquid. It dissolves gold in it. After dipping the gold ornaments in aqua regia, the outer layer of gold gets dissolved and the inner shiny layer appears. As a result, the weight of gold ornament reduced.

107. A metal X combines with a non-metal Y by the transfer of electrons to form a compound Z:

- (i) State the type of bond in compound Z.
 - (ii) What can you say about the melting and boiling point of compound Z?
 - (iii) Will this compound dissolve in kerosene or petrol?
 - (iv) Will this compound be a good conductor of electricity?
- [Board Question]

Ans. (i) Compound Z has an ionic bond.

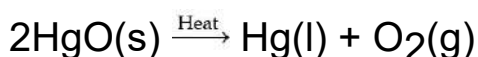
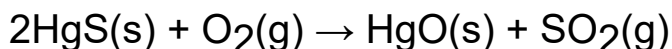
(ii) Melting and boiling point of the compound is high.

(iii) No, compound will not dissolve in kerosene or petrol.

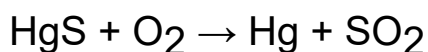
(iv) Yes, the compound is a good conductor of electricity.

108. What is cinnabar? How is metal extracted from cinnabar? Explain briefly. [Board Question]

Ans. Cinnabar is HgS . It contains metal mercury. Mercury is obtained by roasting cinnabar. HgO formed is thermally unstable and gives mercury.



or



Mercury can be purified by distillation.

109. Suggest a method of reduction for the following metals during their metallurgical processes:

(i) Metal 'A' which is one of the last, second or third position in the reactivity.

(ii) Metal 'B' which gives vigorous reaction even with water and air.

(iii) Metal 'C' which is kept in the middle of activity series. [Board Question]

Ans. (i) 'A' can be obtained by chemical reduction using carbon or carbon monoxide as reducing agent.

(ii) 'B' can be obtained by electrolytic reduction.

(iii) 'C' can be reduced by reducing agent like 'Al'.

110. Answer the following questions:

(i) A non-metal 'X' exists in two different forms Y and Z. Y is the hardest substance whereas Z is a good conductor of electricity. Identify X, Y and Z. [Board Question]

(ii) An element 'X' on reaction with oxygen forms an oxide XO_2 . The oxide when dissolved in water turns blue litmus red. State whether element X is metal or a non-metal?

(iii) Name the metal which is alloyed with copper to make bronze.

Ans. (i) X is carbon, Y is Diamond and Z is Graphite.

(ii) X is a non-metal.

(iii) The metal which is alloyed with copper to make bronze is Tin.

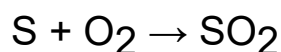
111. State three reasons for the following facts: **[Board Question]** (i) Sulphur is a non-metal.

(ii) Magnesium is a metal :

One of the reasons must be supported with a chemical equation.

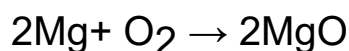
Ans. (i) Sulphur is a non- metal:

1. It is a poor conductor of electricity.
2. Sulphur is neither malleable nor ductile.
3. Sulphur forms acidic oxide.



(ii) Magnesium is a metal.

1. It is a good conductor of electricity.
2. Magnesium is malleable nor ductile.
3. It forms basic oxides.



112. Answer the following questions:

(i) Arrange the following metals in order of their decreasing activities: Aluminium, gold, sodium, copper.

[Board Question]

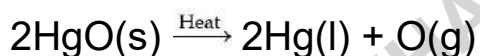
(ii) Give chemical equation for the reaction of aluminium powder with manganese dioxide on heating.

Ans. (i) Sodium > Aluminium > Copper > Gold.

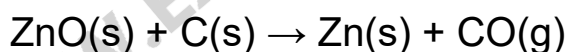
(ii) $3\text{MnO}_2(\text{s}) + 4\text{Al}(\text{s}) \rightarrow 3\text{Mn}(\text{l}) + 2\text{Al}_2\text{O}_3(\text{s}) + \text{Heat}$

113. What chemical process is used for obtaining a metal from its oxide? [NCERT]

Ans. The extraction of metal from its oxide depends on its position in reactivity series. For example, Metals low in the activity series are very unreactive. The oxides of these metals can be reduced to metals by heating alone.



The metals in the middle of the activity series such as iron, zinc, lead, copper, etc., are moderately reactive. These metal oxides are reduced to the corresponding metals by using suitable reducing agent :



The metals high up in the reactivity series are very reactive. They are separated from their oxides by electrolysis process.

114. What kind of impurities are generally found in ores? What name is given to such impurities and state the basis of removing the impurities from the ore. [Board Question]

Ans. Generally the ores mined from earth are usually contaminated with large amount of impurities such as soil, sand etc. The name given to such impurities is 'gangue'. The process of removing these impurities are based on the difference between the physical or chemical properties of gangue or ore.

115. Name one metal which is extracted by: [Board Question]

- (i) Reduction with carbon.
- (ii) Electrolytic reduction.
- (iii) Reduction with aluminium.
- (iv) Reduction with heat alone.

Ans. (i) Zinc

(ii) Aluminium,

(iii) Manganese,

(iv) Mercury.

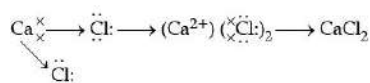
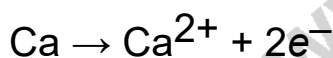
116. Answer the following questions:

(i) Write electron dot diagram for chlorine (At No. 17) and calcium (At No. 20). Show the formation of calcium chloride by transfer of electrons. **[Board Question]**

(ii) Identify the nature of above compound and explain three physical properties of such compound.

Ans. (i) $\text{Ca}^{\times} \quad \text{Cl}^{\cdot\cdot}$

2 8 7 2, 8, 8, 2



(ii) It is ionic compound.

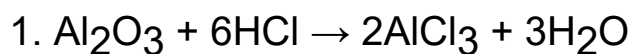
117. What are amphoteric oxides? Give an example. Write balanced chemical equations to justify your answer.

[Board Question]

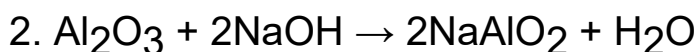
Ans. Those oxides which behave both acidic and basic oxides are

called amphoteric oxides.

Example : Al_2O_3 (Alumina)



Alumina Acid Salt



Alumina Base Salt

118. Silver articles become black when kept in open for some time, whereas copper vessels lose their shiny brown surfaces and gain a green coat when kept in open. Name the substances present in air with which these metals react and write the name of the products formed. [\[Board Question\]](#)

Ans. Silver articles become black when kept in open for some time, whereas copper vessel lose their shiny brown surfaces and gain a greencoat when kept in open because silver articles reacts with sulphur compounds such as hydrogen sulphide present in the air to form silver sulphide (Ag_2S) whereas copper reacts slowly with CO_2 and water present in the air to form green coating of mixture of copper carbonate and copper hydroxide.

119. Name a metal of medium reactivity and write three main steps in the extraction of this metal from its sulphide ore. [\[Board Question\]](#)

Ans. Zinc

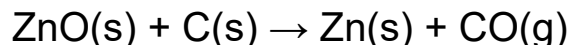
The steps involved in extraction of zinc from zinc sulphide are:

1. Roasting of sulphide ore in the presence of air to convert it into metal oxide.



Zinc sulphide Oxygen Zinc oxide Sulphur dioxide

2. Reduction of metal oxide with carbon to get the free metal.



Zinc oxide Carbon Zinc Carbonmonoxide

3. Refining of impure metal to get pure metal.

120. Explain the following :[Board Question]

(i) Sodium chloride is an ionic compound which does not conduct electricity in solid state where as it does conduct electricity in molten state as well as in aqueous solution.

(ii) Reactivity of aluminium decrease if it is dipped in nitric acid.

(iii) Metals like calcium and magnesium are never found in their free state in nature.

Ans. (i) Sodium chloride is an ionic compound but it conducts electricity only in molten and aqueous state because in molten and aqueous form the compound liberate to give ions. These ions move freely and hence conduct electricity.

(ii) Reactivity of aluminium decrease if it is dipped in nitric acid because it is a strong oxidising reagent. The layer of aluminium oxide prevents further reaction of aluminium due to which its reactivity decreases.

(iii) Metals like calcium and magnesium are never found in their free states in nature because these metals are present on the top of the reactivity series. They are so reactive that they react with gases and surrounding elements, form compounds and thus are not found in free state.

Long Answer Type Questions

121. Answer the following questions:

(i) What are metals? Name five metals.

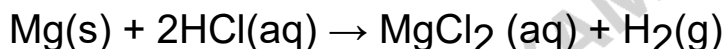
- (ii) Name a metal which is so soft that it can be cut with a knife.
- (iii) Name the metal which is the best conductor of heat and electricity.
- (iv) What happens when a metal reacts with dilute hydrochloric acid? Explain with the help of an example.

Ans. (i) Metals are the elements that conduct heat and electricity, and are malleable and ductile.

Example: Iron, aluminium, copper, gold and silver.

- (ii) Sodium is a soft metal that can be cut with a knife.
- (iii) Silver is the best conductor of electricity.
- (iv) When a metal reacts with dilute hydrochloric acid, it forms metal chloride and hydrogen gas.

Example: Magnesium reacts rapidly with dilute hydrochloric acid to form magnesium chloride and hydrogen.



122. Answer the following questions:

- (i) Define non-metals. Give five examples of non-metals.
- (ii) Name a non-metal which conducts electricity.
- (iii) Name a non-metal having lustre (shining surface).
- (iv) Name a non-metal which is extremely hard.
- (v) How do non-metals react with oxygen? Explain with an example. Give equation of the reaction involved. What is the nature of the product formed? How will you demonstrate it?

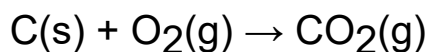
Ans. (i) Non-metals are the elements that do not conduct heat and electricity and are neither malleable nor ductile. **Example:** Carbon, sulphur, phosphorus, silicon and oxygen.

- (ii) Carbon is a non-metal which conducts electricity.

(iii) Iodine is a non-metal having lustre.

(iv) Diamond an allotrope of carbon is a non-metal which is extremely hard.

(v) Non-metals react with oxygen to form acidic oxides or neutral oxides. Carbon burns in air to form carbon dioxide.



The nature of the product formed is acidic. When carbon dioxide dissolves in water, it forms carbonic acid. It turns blue litmus to red which shows it is acidic in nature.

123. Answer the following questions:

(i) What is meant by the reactivity series of metals? Arrange the following metals in an increasing order of their reactivities towards water: zinc, iron, magnesium, sodium.

(ii) Hydrogen is not a metal but still it has been assigned a place in the reactivity series of metals. Why?

(iii) Name one metal more reactive and another less reactive than hydrogen.

(iv) Name one metal which displaces copper from copper sulphate solution and one which does not.

(v) Name one metal which displaces silver from silver nitrate solution and one which does not.

Ans. (i) The arrangement of metals in the order of decreasing reactivities is called reactivity series. Increasing order of reactivity: Iron < zinc < magnesium < sodium

(ii) Hydrogen can lose electrons and forms positive ions like metals. Therefore, it has been placed in the reactivity series of metals.

(iii) Lead is more reactive than hydrogen and copper is less reactive than hydrogen.

(iv) Zinc displaces copper from copper sulphate solution and mercury does not displace copper from copper sulphate solution.

(v) Copper displaces silver from silver nitrate solution and gold does not.

124. Draw the electron-dot structures of the following compounds and state the type of bonding in each case:

(i) KCl

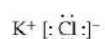
(ii) NH₃

(iii) CaO

(iv) N₂

(v) CaCl₂

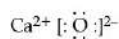
Ans. (i) KCl—Ionic bond



(ii) NH₃—Covalent bond



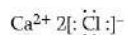
(iii) CaO—Ionic bond



(iv) N₂—Covalent bond



(v) CaCl₂—Ionic bond



125. Give reasons for the following: [\[Board Question\]](#)

(i) Silver and copper lose their shine when they are exposed to air. Name the substance formed on their surface in each case.

(ii) Tarnished copper vessels are cleaned with tamarind juice.

(iii) Aluminium is more reactive than iron yet there is less corrosion of aluminium as compared to iron when both are exposed to air.

Ans. (i) Silver and copper lose their shine when they are exposed to air due to corrosion. Silver forms black Ag_2S (silver sulphide) and copper form greenish layer of basic copper carbonate $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$.

(ii) Tarnished copper vessels have deposits of basic copper carbonate which is basic in nature. Therefore, when tamarind juice which is acidic in nature is applied over tarnished copper vessel, neutralises the basic copper carbonate and the vessel gets cleaned.

(iii) When aluminium is exposed to air, it forms oxide layer on its surface which prevents further oxidation.

126. Answer the following questions:

(i) Explain any two physical properties of ionic compounds giving reasons. **[Board Question]**

(ii) List any two metals found in free state in earth's crust.

(iii) Metals towards the top of the activity series cannot be obtained from their compounds by reducing with carbon. Why?

(iv) What will you observe when:

(a) Some zinc pieces are put in copper sulphate solution.

(b) Some silver pieces are put into green coloured ferrous sulphate solution.

Ans. (i) 1. Ionic compounds are soluble in water because they dissociate into ions.

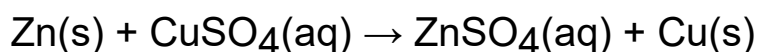
2. Ionic compounds have high melting and boiling points because ionic compounds are made up of oppositely charged ions which are held together by strong electrostatic force of attraction. Therefore,

large amount of energy is required to overcome these forces.

(ii) Gold and Platinum are the two metals that are found in free state in the earth's crust.

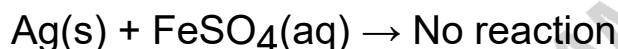
(iii) Metals such as sodium, magnesium, calcium, aluminium high up in the reactivity series are very reactive and cannot be obtained from their compounds by heating with carbon. This is because these metals have more affinity for oxygen than carbon.

(iv) (a) The blue solution will become colourless and reddish brown copper metal will be deposited.



Blue Colour (reddish brown)

(b) When some silver pieces are put into green coloured ferrous sulphate solution, there will be no reaction because Ag is less reactive than iron:



127. Answer the following questions:

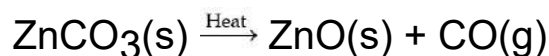
(i) An ore on treatment with dilute hydrochloric acid produces brisk effervescence. What type of ore is this? What steps will be required to obtain metal from the enriched ore?

[Board Question]

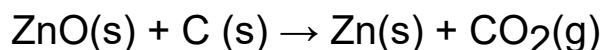
(ii) Copper coin is kept immersed in silver nitrate solution for some time. What change will take place in coin and colour of the solution? Write balanced chemical equation of the reaction involved.

Ans. (i) It is a Carbonate ore. The steps required to obtain metal from ore are:

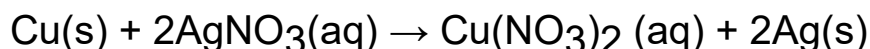
1. Calcination: Carbonate ore is heated in limited supply of air and oxide is obtained. For example,



2. Reduction with carbon: ZnO is then reduced with carbon and zinc metal is obtained.



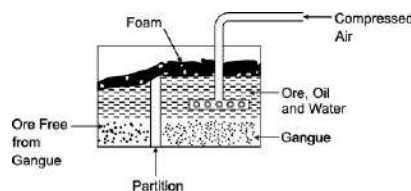
(ii) The colour of solution will turn to blue. Copper displaces silver from silver nitrate solution. Silver gets deposition of silver on copper coin.



128. Describe two methods for the concentration of ores.

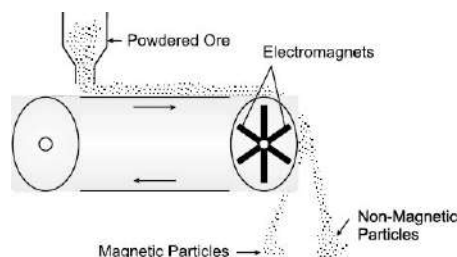
Ans. Two methods used for separation of ores are:

1. Froth Flotation Method: It is used generally to remove gangue from sulphide ores. First of all, the ore is powdered and a suspension in water is formed. To this ore Collectors and Froth Stabilisers were added. The collectors generally used are pine oils, fatty acids etc. The function of collectors is to increase the non-wettability of the metal part of the ore and allows it to form a froth. Froth Stabilizers (cresols, aniline etc.) sustain the froth. The oil wets the metal and the water wets the gangue. Paddles and air constantly stir up the suspension to create the froth. This frothy metal is skimmed off the top and dried, to recover the metal.



2. Magnetic ore Separation: This method is used in those cases where either ore or the impurities are of magnetic nature. In this method, the powdered impure ore in the form of thin layer is allowed to fall on a rubber belt which moves horizontally over two rollers, one of which has electromagnet attached to it. As the ore particles roll

over the belt, the magnetic component in the ore gets attracted towards the magnet. It gets collected in a heap while the non – magnetic component forms a separate heap.



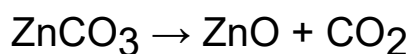
129. Answer the following questions:

(i) Write the steps involved in the extraction of pure metals in middle of the activity series from carbonate ores. **[Board Question]**

(ii) How is copper extracted from its sulphide ore? Explain the various steps supported by chemical equations. Draw labelled diagram for electrolytic refining of copper.

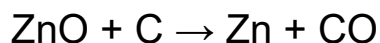
[Board Question]

Ans. (i) First of all the carbonate ore of a metal is heated in absence of air. This process is called calcination.



Zinc carbonate Zinc oxide Carbon dioxide

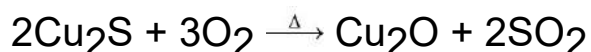
Then, ZnO is heated with coke.



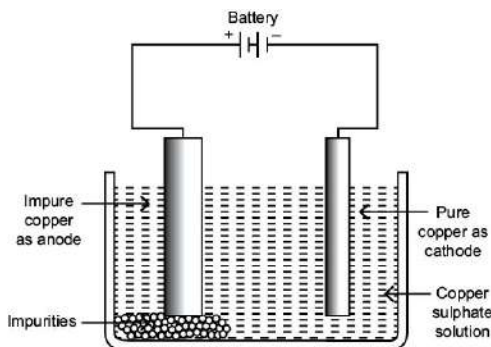
Coke Pure metal Carbon

monoxide

(ii) Copper is extracted from sulphide ore by the process of roasting. It is done in presence of air:



Electrolytic Refining of Copper.



130. Answer the following questions:

(i) Define the term alloy and amalgam. name the alloy used for welding electric wires together. What are its constituents? **[Board Question]**

(ii) Name the constituents of the following alloys:

(a) Brass (b) Stainless steel (c) Bronze

State one property in each of these alloys, which is different from its main constituents.

Ans. (i) An alloy is a homogeneous mixture of a metal with a metal or a non-metal. Amalgam is an alloy of a metal with mercury.

The alloy used for welding electric wires together is Solder. Its constituents are Lead and Tin.

(ii) (a) Brass: Brass alloy is made of zinc (Zn) and copper (Cu).

(b) Stainless steel contains chromium (12.14%), molybdenum (0.21 %), nickel (less than 2%), and carbon (about 0.11%).

(c) Bronze is an alloy consisting primarily of copper, commonly with about 12% tin and often with the addition of other metals (such as aluminium, manganese, nickel or zinc) and sometimes non-metals or metalloids such as arsenic, phosphorus or silicon.

Brass and bronze have lower electrical conductivity than their constituents. Stainless steel does not corrode easily as iron does.

131. Distinguish between metal and non-metals on the basis of physical properties.

Ans.	Property	Metals	Non-metals
1.	Hardness	Metals are generally hard except sodium and potassium.	Non-metals are soft except diamond.
2.	Malleability and ductility	Metals are malleable and ductile except zinc.	Non-metals are neither malleable nor ductile. They are brittle in nature.
3.	Conductivity	Metals are good conductors of heat and electricity except mercury and tungsten.	Non-metals are poor conductors of heat and electricity.
4.	Density	Metals have high density except sodium and potassium.	Non-metals have lower density as compared to metals except diamond.
5.	Lustre	All the metals have a brilliant shine or lustre.	Non-metals do not have luster except iodine and graphite.

132. Differentiate between metal and non-metal on the basis of their chemical properties.[\[NCERT\]](#)

Ans.	Property	Metals	Non-metals
1.	Nature of	Metals form basic oxides.	Non-metals form

	Oxides	Ex. $\text{Na} + \text{O}_2 \rightarrow \text{Na}_2\text{O}$	acidic or neutral oxides. Ex. $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$ (acidic)
2.	Nature of ions	They form positive ions by losing electrons. Ex. $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$	They form negative ions by gaining electrons. Ex. $\text{Cl} + \text{e}^- \rightarrow \text{Cl}^-$
3.	Reaction with water	Some metals like Na, K, Ca, Al etc., displace hydrogen from water.	Non-metals except fluorine generally do not react with water.
4.	Reaction with dilute acids	Metals which lie above hydrogen in activity series displace hydrogen from dilute acids. Ex. $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$	Non-metals do not react with dilute acids.
5.	Nature	Metals can lose electrons and hence behave as reducing agents.	Non-metals can accept electrons and hence behave as oxidising agents.

133. Differentiate between: **[Board Question]**

- (i) Mineral and Ore
- (ii) Corrosion and Rancidity
- (iii) Malleability and Ductility

Ans. (i) Difference between Mineral and ore.

S. No.	Mineral	Ore
1.	Naturally occurring substances of metals present in the earth's crust are called minerals.	Minerals which can be used to obtain the metal profitably are called ores.
2.	All minerals are not ores	All ores are essentially minerals

(ii) Difference between Corrosion and Rancidity

S. No.	Corrosion	Rancidity
1.	The tarnishing of the metals by the attack of moisture and acids in the air is called corrosion.	When fats and oils present in the food gets oxidized, the smell and taste of the food change. This is called Rancidity.

(iii) Difference between malleability and Ductility

S. No.	Malleability	Ductility
1.	The property which allows the metals to be hammered into thin sheets is called malleability.	The property which allows the metals to be drawn into thin wires is called ductility.

134. What is the difference between calcination and roasting?

Ans.	S. No.	Calcination	Roasting
	1.	In this process, the	The process of heating the ore in the

	ore is heated in a limited supply of air below its melting point. The process involves the removal of volatile impurities, moisture and the decomposition of any carbonate ore into oxide.	excess supply of air below its melting point is called roasting. This process is employed when oxidation of the ore is required. As a result of roasting, moisture is driven away, volatile impurities are removed, the impurities like sulphur, phosphorus, arsenic are removed as their oxides and the ore undergoes oxidation to form metal oxide or sulphate.
2.	Moisture organic impurities are removed and the ore becomes porous and more reactive.	Volatile impurities are removed as oxides (SO_2 , P_2O_5 , As_2O_3) and the ore becomes porous and more reactive.
3.	Carbonate and hydrated ores are calcined and CO_2 or water vapour is given off. $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$	Sulphide ores are roasted, so SO_2 is given off. $2 \text{ZnS} + 3 \text{O}_2 \xrightarrow{800^\circ - 900^\circ \text{C}} 2 \text{ZnO} + 2 \text{SO}_2$

Analysis and Evaluation Based Questions

135. The welding process is mainly used for rail welding in railways. It is also used for welding copper conductors and other metals that include cast iron, stainless steel, common steels, bronze, brass and monel. It is highly stable to repeated short circuit pulses and the electrical resistance remains

unchanged over the lifetime of the installation. It highly depends on environmental condition like moisture contain, work piece alignment etc.

(i) Name the process used in the joining railway tracks.

(ii) State whether heat is evolved or absorbed.

(iii) Give the chemical reaction for the process.

(iv) What type of chemical reaction is occurring.

(a) Combination

(b) Reduction

(c) Displacement

(d) Decomposition

Ans. (i) Thermite process.

(ii) Heat is evolved. So, it is exothermic reaction.

(iii) $\text{Fe}_2\text{O}_3(\text{s}) + 2\text{Al}(\text{s}) \rightarrow 2\text{Fe}(\text{l}) + \text{Al}_2\text{O}_3(\text{s}) + \text{Heat}$

(iv) (c) Displacement.

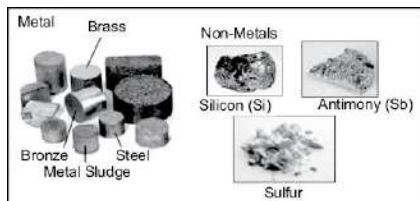
136. A non-metal A is an important constituent of our food and forms two oxides B and C. Oxide B is toxic whereas C causes global warming. (i) Identify A, B and C, (ii) To which group of periodic table does A belong?

Ans. (i) A = Carbon (C); B = Carbon monoxide (CO); C = Carbon dioxide(CO₂).

(ii) Carbon (or A) has atomic number = 6, its electronic configuration is 2, 4. It is present in 14th group (14 + valence electron) of the periodic table.

137. Properties of ionic compounds are well known and are of great use. These are physical nature of solid as solids hard (generally brittle). Solids have high M.P. and B.P., as large

amount of heat energy is required to break strong ionic attraction. Solubility in water and insolubility in kerosene and petrol. Ionic compounds in solid state do not conduct electricity. Ions cannot move due to rigid solid structure. Ionic compounds conduct electricity in molten state. Ions can move freely since the electrostatic forces of attraction between the oppositely charged ions are overcome due to heat.



- (i) Why ionic compounds are soluble in water?
- (ii) Why ionic compounds do not conduct electricity in solid state?
- (iii) What does high melting and boiling point of ionic compounds indicate?
- (iv) Which of these statements is correct?
 - (a) Ionic compounds are hard due to strong force of attraction.
 - (b) Ionic compounds are soluble in kerosene and petrol and insoluble in water.
 - (c) Ionic compounds do not conduct electricity in molten state.

Ans. (i) Ionic compounds are polar and water is also polar. Therefore, ionic compounds are soluble in water.

(ii) In solid state, the ions of ionic compounds are not free to move. Therefore, ionic compounds do not conduct electricity in solid state.

(iii) High melting and boiling point of ionic compounds indicate that the force of attraction between the ions of ionic compounds is very strong.

(iv) Ionic compounds are hard in nature due to strong force of attraction between the ions. Hence, the correct option is (i).

138. Royal water is prepared by mixing two acids A and B. It can dissolve gold and platinum. It is highly corrosive and fuming liquid. Identify A and B. What is the ratio in which A and B are mixed?

Ans. Acid A is concentrated HCl. Acid B is concentrated nitric acid. 3 parts of concentrated HCl is mixed with 1 part of concentrated nitric acid to make Royal water called aqua regia.

139. Metals X and Y can be recovered from the anode mud left behind after the electrolytic refining of copper metal. The coins made of metal X look new even after several years of use but the coins made of metal Y lose their shine gradually and get blackened soon. When metal X is alloyed with a small amount of metal Y, it becomes hard and hence suitable for making ornaments. What are metals X and Y ? Also state the colour of metal X.

Ans. Metal X is gold and Metal Y is silver; the colour of metal X (gold) is yellow.

140. A metal 'M' which is one of the best conductor of heat and electricity is used in making electric wires is found in nature as sulphide ore M_2S ?

[Board Question] (i) Name the metal 'M'.

(ii) Which process will be suitable for extraction of this metal M from its ore M_2S ? Write the balanced chemical reactions involved in the process of extraction.

(iii) With the help of a labelled diagram, explain the process of electrolytic refining of the metal.

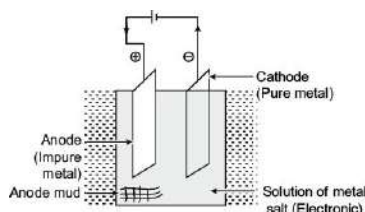
Ans. (i) Metal M is Copper.

(ii) It is concentrated by Froth-Floatation process. Impure copper is purified by electrolytic refining.

Roasting: $2\text{Cu}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{Cu}_2\text{O} + 2\text{SO}_2$

Bessemerisation: $\text{Cu}_2\text{S} + 2\text{Cu}_2\text{O} \rightarrow 6\text{Cu} + \text{SO}_2$

(iii) Impure metal is taken as anode whereas pure metal is taken as cathode. Soluble salt of metal is taken as electrolyte. When electric current is passed, impure metal changes to ions which gain electrons at cathode and change into pure metal. Impurities are left behind as anode mud.



141. A black metal oxide XO_2 is used as a catalyst in the preparation of oxygen gas from potassium chlorate. The oxide XO_2 is also used in ordinary dry cells. The metal oxide XO_2 cannot be reduced satisfactorily with carbon to form metal X.

(i) Name the metal X.

(ii) Name the metal oxide XO_2

(iii) Which reducing agent can be used to reduce XO_2 to obtain metal X?

(iv) Name another metal which can also be extracted by the reduction of its oxide with the above reducing agent.

Ans. (i) Manganese

(ii) Manganese dioxide

(iii) Aluminium

(iv) Chromium

142. Four metals P, Q, R and S are all obtained by the reduction of their oxides with carbon. Metal P is used to form a thin layer

over the sheets of metal S to prevent its corrosion. Metal Q is used for electroplating tin boxes made of metal S whereas metal R is used in making car batteries. Metals Q and R form an alloy called solder. What are metals P, Q, R and S ? How have you arrived at this conclusion?

Ans. Metal P is zinc; metal Q is tin; metal R is lead; metal S is iron.

Metal P (zinc) is used to form a thin layer on metal S (iron) by the process of galvanization to prevent its corrosion.

Metal Q (tin) is used for electroplating tin boxes made of metal S (iron).

Metal R (lead) is used in making car batteries.

Metals Q (tin) and R (lead) is used to form an alloy called solder.

143. In an electrolytic tank, aluminium metal is being extracted by the electrolysis of molten aluminium oxide using carbon electrodes. It is observed that one of the carbon electrodes is gradually burnt away and has to be replaced.

(i) Which carbon electrode (cathode or anode) is burnt away?

(ii) Why is this carbon electrode burnt away?

Ans. (i) Positively charged carbon electrode (Anode).

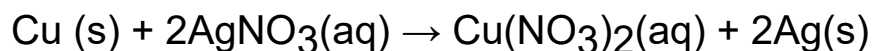
(ii) This carbon electrode is burnt away because oxygen produced during the electrolysis of molten aluminium oxide reacts gradually with the carbon of carbon anode to form carbon dioxide gas.

Practical Based Questions

144. A copper coin is kept immersed in silver nitrate solution for sometime. What change will take place in the coin and colour of the solution. Write the chemical equation involved.

[Board Question]

Ans. Copper metal is more reactive than silver metal. When copper coin is kept immersed in silver nitrate solution for sometime, it displaces silver from silver nitrate solution. The grey solid crystals of Ag metal are seen growing on the copper and solution turns blue in colour.



145. A piece of granulated Zn was dropped into copper sulphate solution. Write down the colour change that you will observe?

Ans. When a piece of granulated Zn was dropped into copper sulphate solution, blue colour solution become colourless, reddish brown Cu gets deposited.

146. Aluminium strip was placed in a solution of copper sulphate. After one hour, it was observed that the colour of solution changes. What will be the colour of solution? Give reason.

Ans. The solution become colourless because aluminium displaces Cu from copper sulphate solution.

147. When an aluminium strip is kept immersed in freshly prepared ferrous sulphate solution taken in a test tube. What change is observed in the test tube?

Ans. The green solution of ferrous sulphate slowly turns brown. As aluminium is more reactive than iron, it displaces iron from ferrous sulphate solution.

148. Answer the following questions:

- (i) What happens when a strip of copper was placed in a beaker containing zinc sulphate solution?
- (ii) Blue copper sulphate solution is added to a test tube containing zinc granules. What will be the colour of the resulting solution?

(iii) When you place an iron nail in copper sulphate solution, what will be the nature of the reddish brown coating formed on the nail?

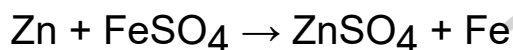
Ans. (i) Copper is less reactive than zinc and, therefore, no reaction occurs.

(ii) White.

(iii) The coating is soft and dull.

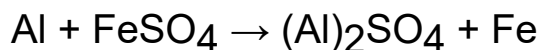
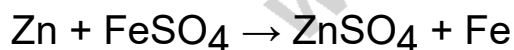
149. Ferrous sulphate solution should not be stored in zinc containers, why?

Ans. Ferrous sulphate solution cannot be placed in zinc containers because zinc is more reactive than iron, it will displace iron.



150. 10 mL of freshly prepared iron sulphate was taken in each of the four test tubes. Strips of copper, iron, zinc and aluminium was introduced in separate test tubes, A residue was obtained in two of them ? What will be the right pair of metals forming the precipitates?

Ans. Zinc and aluminium being more reactive will replace iron from iron sulphate.



151. An aqueous solution of zinc sulphate was taken in four test tubes. Zinc, iron, copper and aluminium pieces were dropped into separate test tubes. In which test tube reaction will be observed?

Ans. Reaction will take place only in (IV) test tube. Al is more reactive than Zn.

152. A cleaned aluminium foil was placed in an aqueous

solution of zinc sulphate. When the aluminium foil was taken out of the zinc sulphate solution after 15 minutes, its surface was found to be coated with a silvery grey deposit. From the given observation, what can be concluded?

Ans. Surface of aluminium foil was found to be coated with a silvery grey deposit due to the formation of aluminium sulphate as aluminium is more reactive than zinc.



153. Consider the following table given below and answer the questions with reasons :

S. No.	Metals	Iron (II) sulfate	Copper (II) sulfate
1.	I	No reaction	Displacement reaction
2.	II	Displacement reaction	Displacement reaction
3.	III	No reaction	No reaction
4.	IV	No reaction	No reaction

- (i) Which metals are more reactive than iron?
- (ii) Which metals are more reactive than copper?
- (iii) Which of the following is correct?
 - (a) Metal IV is least reactive.
 - (b) Metal I is least reactive.
 - (c) Metal II is least reactive.
 - (d) Metal I is most reactive.
- (iv) Which metals are least reactive?

Ans. (i) Metal II is more reactive than iron as only this displaces iron from iron sulphate solution.

(ii) Metal II and I are more reactive than copper as both of them displace copper from copper sulphate solution.

(iii) Metal IV does not displace any metal from iron sulphate and copper sulphate solutions. Therefore, the correct option is (a).

(iv) Metal III and IV are least reactive as both of them cannot displace copper or iron from their respective solutions.

154. Give reasons for following:

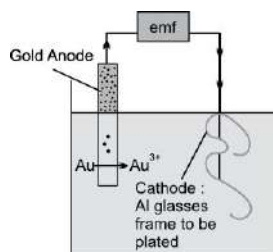
(i) Copper is used for making electrical circuits but brass is not.

(ii) Steel is used for making utensil but pure iron is not.

Ans. (i) Copper is pure metal and its electrical conductivity is high, whereas brass is an alloy of copper and zinc hence, it is not very good conductor of electricity. Thus, copper is used for making electrical circuits.

(ii) Pure iron is soft and stretches easily, hence it cannot be used for making utensils as on heating during cooking the utensils will change shape. Whereas, steel is an alloy of iron containing Fe, Ni and Cr. Steel has modified properties, *i.e.*, it is hard, retains shape on heating and does not change its shape. Thus, steel is used for making utensils but pure iron is not rusted.

155. Mr. Joe has a long-cherished wish of wearing a golden frame spectacle. He expressed his wish in front of his chemist daughter. His daughter was overwhelmed to hear her father's wish and decided to set up the experiment herself to get the golden frame. Suggest the rough set up of experiment with a diagram.



Ans. She can take an aluminium frame for spectacles which would behave as cathode where Au metal would get deposited and a small bar made of gold can be used as anode. Both the electrodes are dipped in a suitable electrolyte. Both the electrodes are connected through the outer circuit.

156. From the given table, answer the following questions :

S. No.	Metals	Non-metals
1.	Lustrous	Non-lustrous
2.	Hard	Soft
3.	Ductile	Non-ductile
4.	Malleable	Non-malleable
5.	Good conductors	Poor conductors

(i) Give one example each of metals and non-metals.

(ii) Explain ductility.

(iii) Explain malleability.

(iv) What is meant by luster ?

Ans. (i) Sodium is metal and chlorine is a non-metal.

(ii) Ductility is the property of metals in which they are converted into wires.

(iii) Malleability is the property of metals in which they are converted into thin sheets.

(iv) The shiny appearance of metal is known as luster.

157. A farmer was working with an agricultural machine when he observed a crack. He realized that if the crack is not mended it will lead to further damage of the machine. He reached out to the local mechanic who repaired the crack with some iron compound and aluminium. What is the technique used by the local mechanic? Write relevant chemical reaction equation for the same.

Ans. The local mechanic used thermite reaction for repairing the crack in machine.

In the thermite reaction, Iron(III) oxide (Fe_2O_3) with aluminium (Al) are reacted. The reaction is accompanied by evolution of large amount of heat, which is used to melt the metal around the crack which solidifies after cooling and hence fills the crack.



Self-Assessment

158. Define cation and anion.

159. Define the properties of metals such as malleability and ductility.

160. What is an alloy?

161. Elements that are brittle and cannot be rolled into wires are known as:

- (a) liquid
- (b) non-elastic
- (c) non-metal
- (d) metal

162. Which metal is stored in Kerosene Oil in a laboratory?

- (a) Magnesium
- (b) Copper
- (c) Sodium
- (d) Zinc

163. The metal that form amphoteric oxide is?

- (a) Cobalt
- (b) Sodium
- (c) Zinc
- (d) Calcium

164. Name a metal other than aluminium that is covered with an oxide film layer.

165. Name two metal which have very low melting point.

166. Metals can be given different shapes according to our needs. why?

167. Why alumina is dissolved in molten cryolite for electrolysis to obtain aluminum metal.

168. Why metals are hard and have high melting point?

169. Why the item made of silver turns black when exposed to air?

170. An element X on reacting with O_2 forms X_2O . This oxide dissolves in water and turns blue litmus paper red. Predict the nature of element whether it is a metal or a non metal.

171. What is meant by the term 'enrichment of ore'?

172. What would you observe when zinc is added to a solution of iron (II) sulphate? Write the chemical reaction that takes place.

173. Write the electron dot structure for oxygen and magnesium.

174. Give reasons for the following:

(i) Zinc oxide is considered as amphoteric oxide.

(ii) Copper is used to make hot water tanks and not steel.

175. Assertion: Sodium is kept immersed in kerosene oil.

Reason: Sodium is very reactive metal.

176. What is the activity series of metals? Rearrange the following metals in an increasing order of reactivity: aluminium, zinc, mercury.

177. What is roasting?

WWW.EXAMSAKHA.IN

Carbon and its Compounds

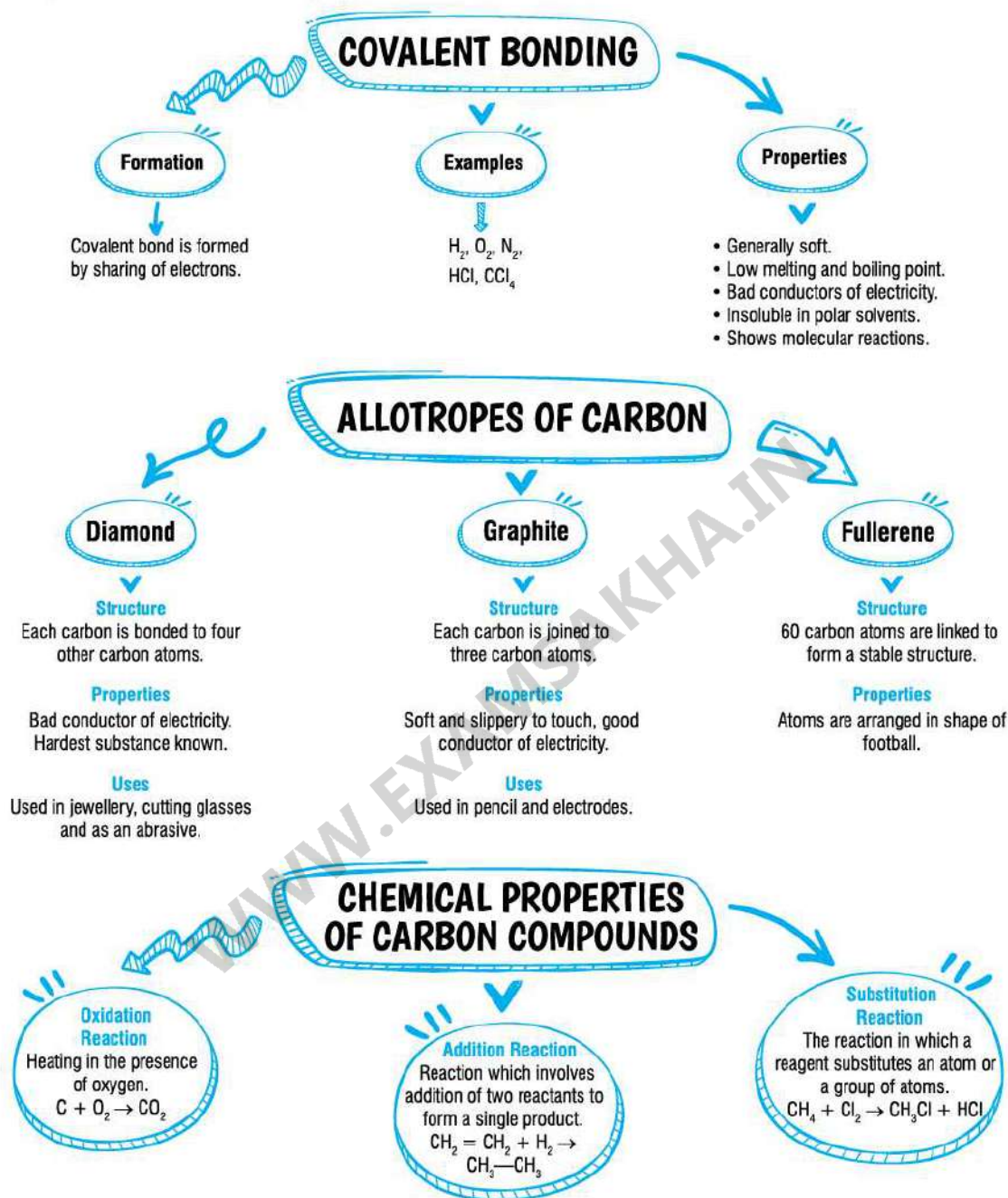
Chapter

4

Summary

WWW.EXAMSAKHA.IN

- The study of carbon compounds is called organic chemistry.
- Carbon is a non-metal having atomic number 6.
- Bonding in carbon : Covalent bonding is present in carbon.



IMPORTANT CARBON COMPOUNDS

Ethanoic acid or Acetic acid [CH_3COOH]

Properties

- Colourless pungent odour liquid
- Reacts with ethanol to give ester
 $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightarrow \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$
- React with base to give salt
 $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa}$
- React with carbonates to give CO_2 gas
 $2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$

Uses

- For making vinegar
- Making pickles
- Ester preparation

Ethanol [$\text{C}_2\text{H}_5\text{OH}$]

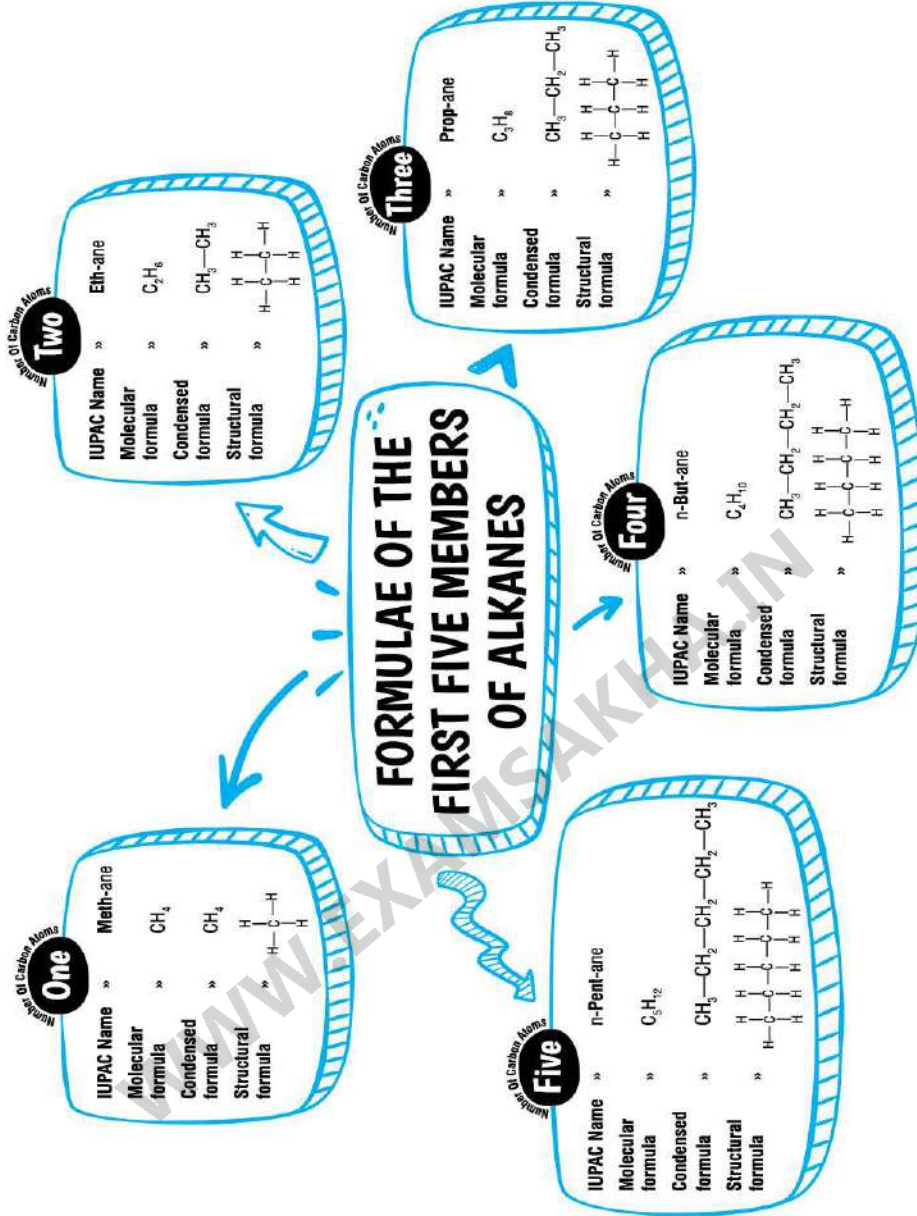
Properties

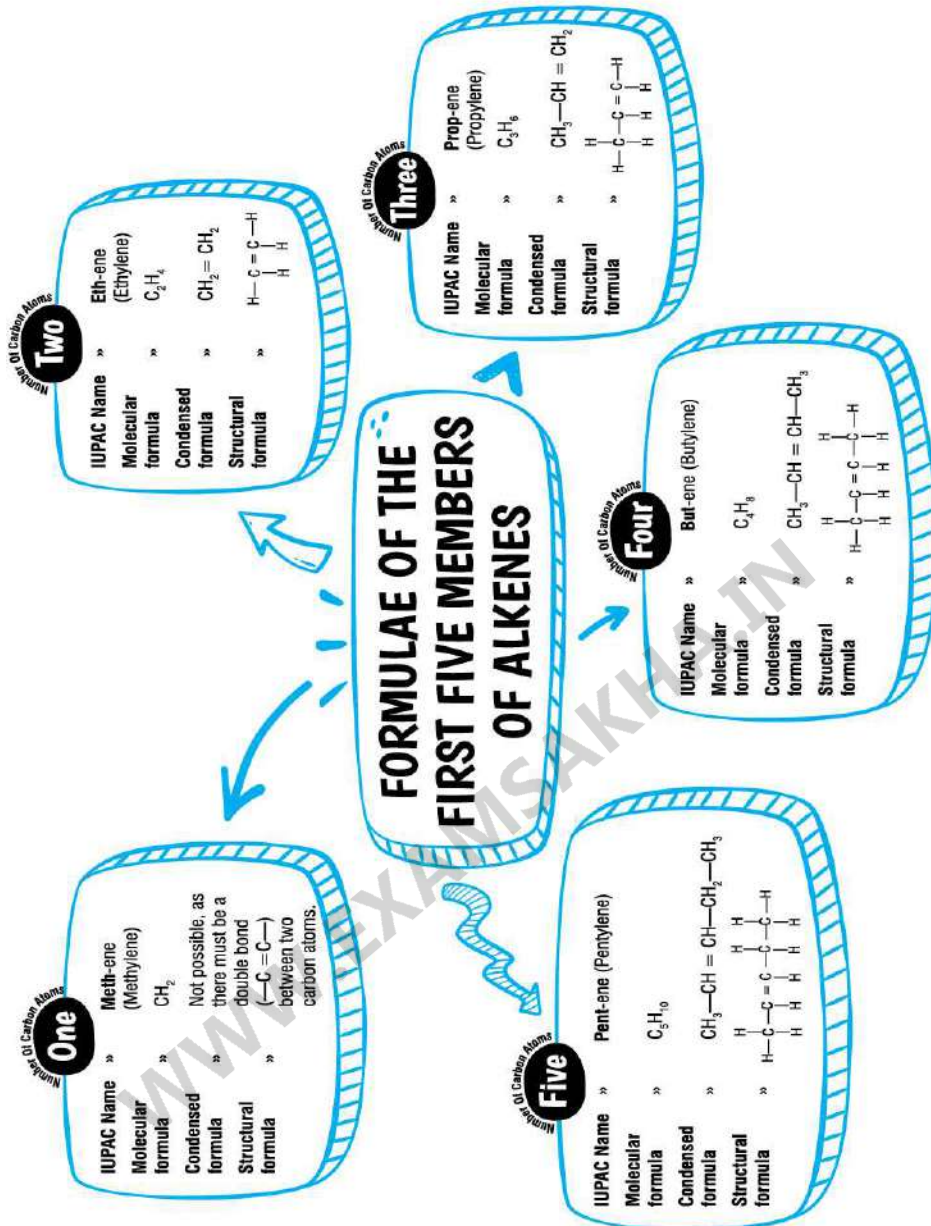
- Liquid, colourless and have distinct smell.
- Soluble in water.
- Reacts with sodium to form sodium ethoxide and H_2 gas.
 $\text{C}_2\text{H}_5\text{OH} + \text{Na} \rightarrow \text{C}_2\text{H}_5\text{ONa} + \text{H}_2$
- It reacts with conc. H_2SO_4 to give ethene.
 $\text{C}_2\text{H}_5\text{OH} \xrightarrow{\text{conc. H}_2\text{SO}_4} \text{CH}_2 = \text{CH}_2$

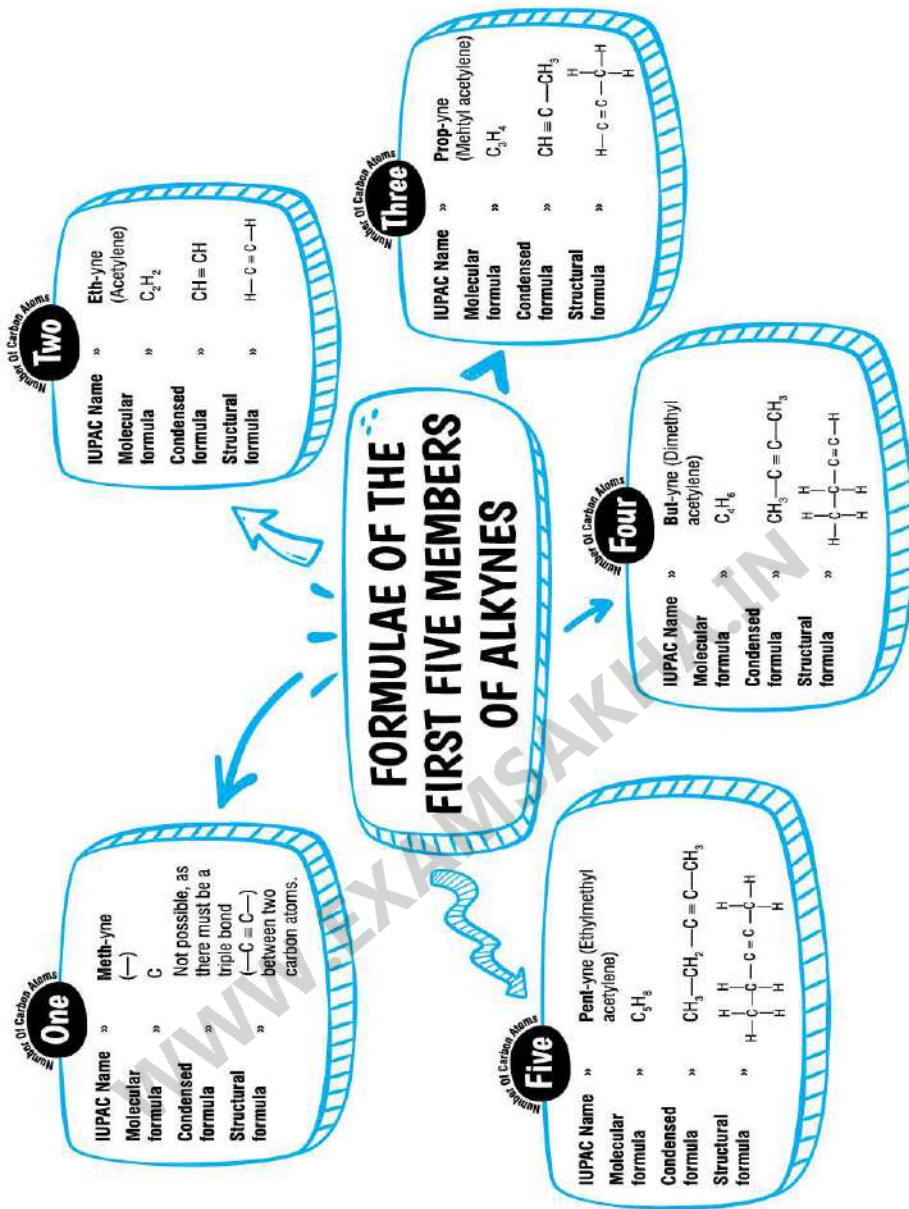
Uses

- Used in all alcoholic drinks
- As an antiseptic.
- In medicines like tincture of iodine, cough syrup, tonic etc.
- As hypnotic.

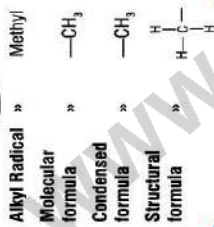
Number of carbon atoms in one molecule	Greek name (Alk)
One carbon atom	Meth
Two carbon atoms	Eth
Three carbon atoms	Prop
Four carbon atoms	But
Five carbon atoms	Pent
Six carbon atoms	Hex
Seven carbon atoms	Hept
Eight carbon atoms	Oct



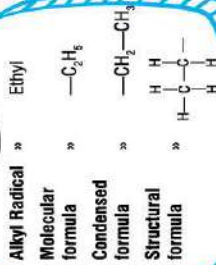




Alkane
Methane
 CH_4

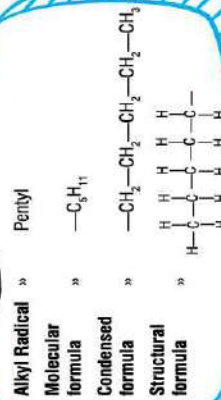


Alkane
Ethane
 C_2H_6

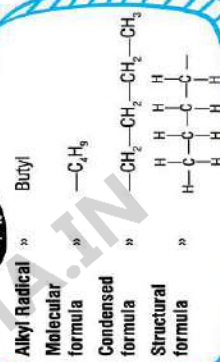


FIRST FIVE MEMBERS OF ALKYL RADICAL OBTAINED FROM ALKANES

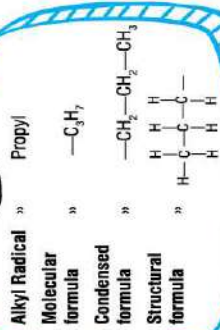
Alkane
n-Pentane
 C_5H_{12}



Alkane
n-Butane
 C_4H_{10}



Alkane
Propane
 C_3H_8



COMMON FUNCTIONAL GROUP

Name of the functional group	Formula of the functional group	Formula of the compound containing functional group	Name of the compound containing functional group	IUPAC Name
Alcoholic or Alkanol	—OH	$\text{C}_2\text{H}_5\text{OH}$	Ethyl alcohol	Ethanol
Alcoholic or Alkanal	$\begin{array}{c} \text{C} \\ \parallel \\ \text{—CHO or —C—OH} \end{array}$	HCHO	Formaldehyde	Methanal
Carboxyl or Alkanoic	$\begin{array}{c} \text{C} \\ \parallel \\ \text{—COOH or —C—OH} \end{array}$	CH_3COOH	Acetic acid	Ethanoic acid
Ketonic or Alkanone	$>\text{C}=\text{O}$	$\text{H}_3\text{C—CO—CH}_3$	Acetone or Dimethylketone	Propanone
Halogen or Halide	—X [X stands for Cl, Br, I, etc.]	CH_3Cl	Methyl chloride	Chloromethane

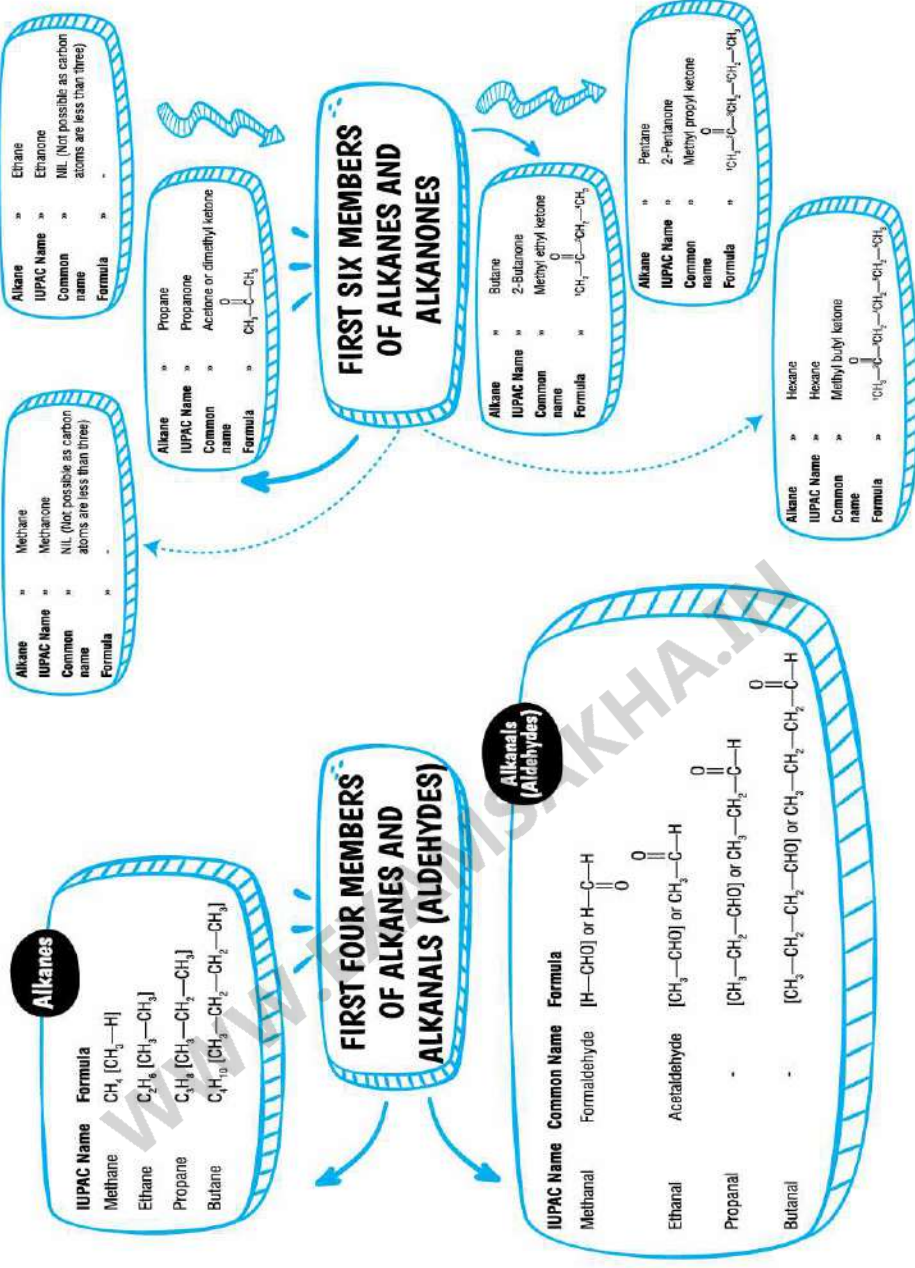
Alkanes

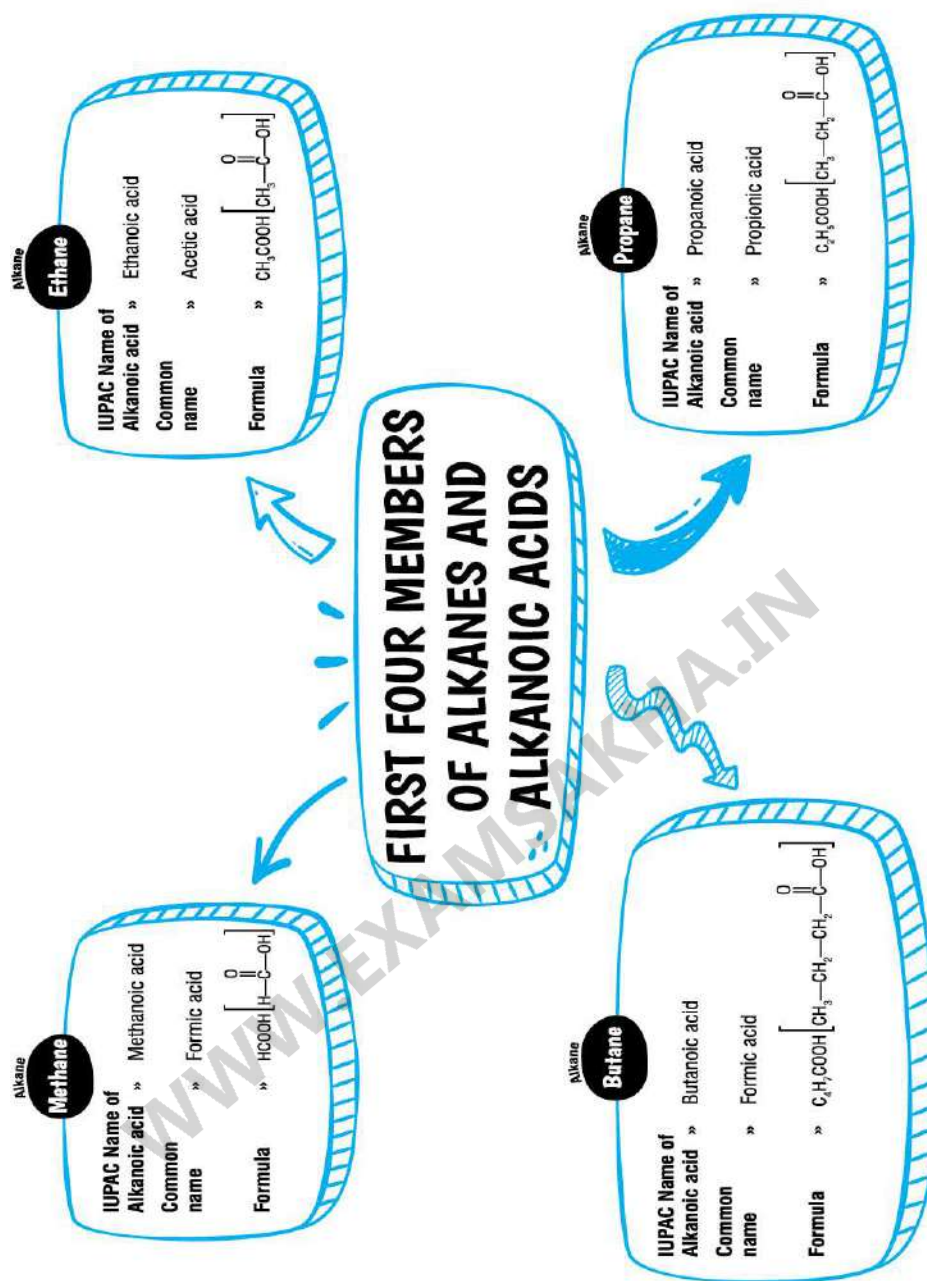
IUPAC Name	Formula
Methane	CH_4 [$\text{CH}_3\text{—H}$]
Ethane	C_2H_6 [$\text{CH}_3\text{—CH}_3$]
Propane	C_3H_8 [$\text{CH}_3\text{—CH}_2\text{—CH}_3$]
Butane	C_4H_{10} [$\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_3$]

FIRST FOUR MEMBERS OF ALKANES AND ALKANOLS (ALCOHOLS)

Alkanols (Alcohols)

IUPAC Name	Formula
Methanol	CH_3OH
Ethanol	$\text{C}_2\text{H}_5\text{OH}$
Propanol	$\text{C}_3\text{H}_7\text{OH}$
Butanol	$\text{C}_4\text{H}_9\text{OH}$





Definitions

- 1. Hydrocarbons:** An organic compound containing only carbon and hydrogen atoms.
- 2. Allotropy:** The phenomenon of existence of two or more different physical forms of a chemical element.

3. Catenation: The property of self linking of elements to form a long chains of compounds.

4. Tetravalency: Tetravalency is the state of an atom in which there are four electrons available with the atom for covalent chemical bonding.

5. Saturated hydrocarbons: A substance in which the atoms are linked by single bonds.

6. Unsaturated hydrocarbons: A substance in which atoms are linked by double or triple bond.

7. Isomers: Compounds having similar molecular formula but different structure are known as Isomers.

8. Isomerism: The phenomenon in which the compounds have the same molecular formula and different structural formula is known as Isomerism.

9. Homologous series: A homologous series is a group of organic chemical compounds, usually listed in order of increasing size, that have a similar structure (and hence also similar properties) and whose structures differ only by the number of CH_2 units in the main carbon chain.

10. Esterification: The chemical reaction that takes place during the formation of an ester is called esterification. Ester is obtained by an esterification reaction of an alcohol with carboxylic acid.

11. Saponification: A chemical reaction in which an ester is heated with an alkali to make soap.

12. Soaps: Soaps are sodium and potassium salts of long chain of fatty acids such as stearic acid, palmitic acid etc.

13. Detergents: They are ammonium or sulphonate salts of long chain hydrocarbons.

14. Hydrophobic substance: "Water fearing". Hydrophobic compounds do not dissolve easily in water, and are usually non-polar.

15. Hydrophilic substance: Having an affinity for water; capable of interacting with water through hydrogen bonding.

Multiple Choice Questions

16. Carbon exists in the atmosphere in the form of:

[NCERT Exemplar]

- (a) carbon monoxide only
- (b) carbon monoxide in traces and carbon dioxide
- (c) carbon dioxide only
- (d) coal

Ans. (c) carbon dioxide only

Explanation :

Carbon exists in the atmosphere in the form of carbon dioxide gas (CO_2) in air (Only 0.03%) and in the earth crust it exists in the form of the minerals like carbonates. It also occurs in the form of fossil fuels, organic compounds, wood, cotton and wool, etc.

17. What is true about covalent compounds? They:

- (a) have high melting and boiling point.
- (b) are mostly soluble in water.
- (c) are formed between atoms of metals and non-metals.
- (d) are formed by the sharing of electrons in the bonding atoms.

Ans. (d) are formed by the sharing of electrons in the bonding atoms.

Explanation :

Covalent compounds are held together by weak intermolecular

forces which fails to hold the compound bind tightly. Thus, a small amount of heat energy is capable of breaking these weak intermolecular forces, therefore, the melting and boiling points of covalent compounds is low. Covalent compounds are non-polar in nature which means they do not dissolve in water, instead make a separate layer on the water's surface. Hence, covalent bonds are insoluble in water. Covalent compounds are formed by the sharing of electron in the bonding atoms between two non-metals.

18. Which of the following statements are correct for carbon compounds?

- (i) Most carbon compounds are good conductors of electricity.
 - (ii) Most carbon compounds are poor conductors of electricity.
 - (iii) Force of attraction between molecules of carbon compounds is not very strong.
 - (iv) Force of attraction between molecules of carbon compounds is very strong.
- (a) (ii) and (iv)
 - (b) (ii) and (iii)
 - (c) (i) and (iv)
 - (d) (i) and (iii)

Ans. (b) (ii) and (iii)

Explanation :

Electricity results from motion of electrons or ions. Most carbon compounds are poor conductors of electricity because they are formed by the sharing of electrons and therefore, they do not have free electrons. On dissolving them in water they do not form ions. So, they are generally poor conductors of electricity. Force of attraction between molecules of carbon compounds is not very strong because they form covalent bond by sharing their valence electron in order to attain stable electronic gas configuration.

19. The property of self-linkage among identical atoms to form long chain compounds is known as:

- (a) Catenation
- (b) Isomerisation
- (c) Superposition
- (d) Halogenation

Ans. (d) Catenation

Explanation :

Catenation is the property of self-linking of an element by which an atom combines with the other atoms of the same element to form long chains. This property is exhibited by carbon as it forms covalent bonds with other carbon atoms to form longer chains and structures. This is the reason for the presence of the vast number of organic compounds in nature.

20. Buckminster fullerene is an allotropic form of :

[NCERT Exemplar]

- (a) Phosphorus
- (b) Sulphur
- (c) Carbon
- (d) Tin

Ans. (c) Carbon

Explanation :

Buckminsterfullerene (C₆₀) is an allotropic form of carbon. It has carbon atoms arranged in the form of football and due to their resemblance with football they are also known as Bucky balls.

21. How many number of carbon atoms are joined in a spherical molecule of Buckminsterfullerene?

- (a) 30

(b) 60

(c) 90

(d) 120

Ans. (b) 60

Explanation :

Buckminsterfullerene is the first discovered fullerene. It is a molecule of carbon in the form of a soccer ball consisting of 60 C-atoms and is having the formula C_{60} . These 60 carbon atoms are joined together by strong covalent bonds and are arranged in interlocking hexagonal and pentagonal rings of carbon atoms.

22. The allotrope of carbon which is a good conductor of heat and electricity is:

(a) Diamond

(b) Graphite

(c) Charcoal

(d) None of these

Ans. (b) Graphite

Explanation :

The allotrope of carbon which is a good conductor of heat and electricity is graphite. This is because, in its planar structure it has three electrons which are covalently bonded and fourth electron is free to move along the layers from one carbon atom to the next when connected to an external battery.

23. In diamond, each carbon atom is bonded to four other carbon atoms to form:

(a) a hexagonal array

(b) a rigid three-dimensional structure

(c) a structure in the shape of a football

(d) a structure of a ring

Ans. (b) a rigid three-dimensional structure

Explanation :

In diamond, each carbon atom is bonded to four other carbon atoms tetrahedrally to form a rigid three-dimensional structure. This rigid three dimensional structure of carbon is responsible for the hardness and rigidity of diamond.

24. Which of the following is not an allotropic form of carbon?

(a) Fluorine

(b) Fullerene

(c) Diamond

(d) Graphite

Ans. (a) Fluorine

Explanation :

Carbon is found in many forms in nature which differ from each other in various physical properties but they exist in same state. These forms of carbon are known as allotropes of carbon. From the given options, fullerene, diamond, graphite are all different types of allotropes. Whereas, fluorine is a non-metal which belongs to halogen family. Hence, fluorine is not an allotrope of carbon.

25. Which of the following is not a characteristic of Diamond?

(a) Hardest substance

(b) High thermal conductivity

(c) High refractive index

(d) Good conductor of electricity

Ans. (d) Good conductor of electricity

Explanation :

Diamond is the hardest substance known, this is due to its structure in which carbon atoms are arranged in a lattice giving it a giant covalent structure with great forces of attraction.

Diamond has high thermal conductivity, this is due to the stiff chemical bonds between the carbon atoms. It has high refractive index which gives it the transparency and brilliance and it is bad conductor of electricity because of the absence of free mobile electrons.

26. Which of the following properties is not true regarding organic compounds ?

- (a) They are generally covalent compounds.
- (b) Show isomerism
- (c) Compounds have high melting and boiling points.
- (d) Generally insoluble in water.

Ans. (c) Compounds have high melting and boiling points.

Explanation :

Organic compounds have low melting and boiling points because they are made of weak covalent bonds. Thus, the property which is not true regarding organic compounds is that they have high melting and boiling points.

27. How many electrons are there in the outermost shell of carbon?

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Ans. (d) 4

Explanation :

Carbon as a group 14 element, has four electrons in its outer shell. Carbon typically shares electrons to achieve a complete valence shell, forming bonds with multiple other atoms.

28. Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms, e.g., hydrogen. After the formation of four bonds, carbon attains the electronic configuration of:

[NCERT Exemplar]

- (a) Helium
- (b) Neon
- (c) Argon
- (d) Krypton

Ans. (b) Neon

Explanation :

The electronic configuration of carbon (C) is 2, 4. To complete its octet, it will share its 4 valence electrons with hydrogen atom and form CH_4 molecule. As carbon is sharing its 4 valence electrons, it will form four covalent bonds.

Now, the electronic configuration of C in CH_4 is 2,8

Electronic configuration of Ne (atomic number = 10) is 2, 8. Hence, after the formation of four covalent bonds, carbon attains the electronic configuration of Neon.

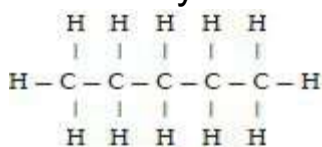
29. The term 'Isomerism' applies to organic compounds with same :

- (a) molecular formula but different structural formulae.
- (b) molecular formula but different empirical formulae.
- (c) empirical formula but different molecular formulae.
- (d) structural formulae but different molecular formula.

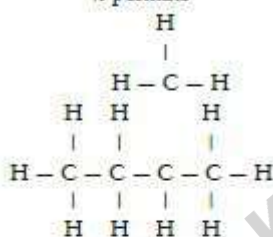
Ans. (a) molecular formula but different structural formulae.

Explanation :

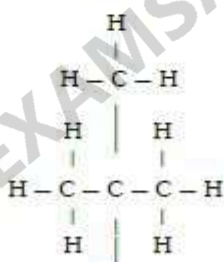
The term isomerism refer to the organic compounds with same molecular formula but different structural formulae. An example is the compound with the molecular formula C_5H_{12} . It has three isomers: n-pentane, isopentane and neopentane which differ from each other in their structure but they have same molecular formula.



n-pentane



Iso-pentane



Neo-pentane

30. A hydrocarbon should have minimum how many carbon atoms to show isomerism?

- (a) Three
- (b) Four
- (c) Five
- (d) Six

Ans. (b) Four

Explanation :

Since, branching is not possible with carbon 1, 2, 3 so the minimum number of the carbons required by the hydrocarbon to show isomerism is four.

31. Pentane has the molecular formula C_5H_{12} . It has:

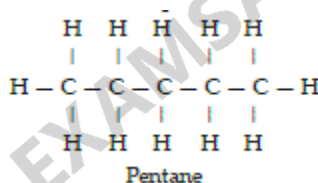
[NCERT Exemplar]

- (a) 5 covalent bond
- (b) 12 covalent bonds
- (c) 16 covalent bonds
- (d) 17 covalent bonds

Ans. (c) 16 covalent bonds

Explanation :

Structural formula of pentane is:



Number of C – C covalent bonds = 4

Number of C – H covalent bonds = 12

Hence, the total number of covalent bonds in the structure of pentane is 16.

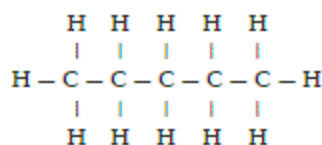
32. The number of isomers of pentane is:

- (a) 2
- (b) 3
- (c) 4
- (d) 5

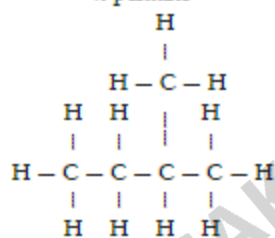
Ans. (b) 3

Explanation :

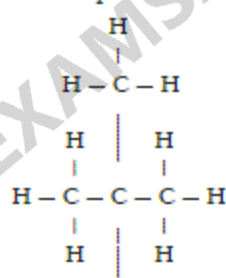
Isomerism is a phenomenon in which two or more compounds have the same chemical formula but possesses different structural formulae. Pentane is an organic compound and an alkane with molecular formula C_5H_{12} . There are five carbons in its structure which can be arranged in three different ways to form 3 different structural isomers of pentane. These are *n*-pentane, iso-pentane and neo-pentane.



n-pentane



Iso-pentane



Neo-pentane

33. Which of the following does not belong to the same homologous series ?[\[NCERT Exemplar\]](#)

- (a) CH_4
- (b) C_2H_6
- (c) C_3H_8
- (d) C_4H_8

Ans. (d) C_4H_8

Explanation :

CH_4 , C_2H_6 , C_3H_8 are all saturated carbon compounds with general formula C_nH_{2n+2} whereas C_4H_8 is an alkene with general formula C_nH_{2n} . Thus, C_4H_8 does not belong to the same homologous series as it is an alkene.

34. Which of the following belongs to homologous series of alkynes? C_6H_6 , C_2H_6 , C_2H_4 , C_3H_4 .

(a) C_6H_6

(b) C_2H_4

(c) C_2H_6

(d) C_3H_4

Ans. (d) C_3H_4

Explanation :

Homologous series is the series comprising of compounds that share same chemical properties and functional groups. Alkynes have general formula, C_nH_{2n-2} , where n is number of carbon atoms.

Thus, from the given options, C_3H_4 belongs to the homologous series of alkynes.

35. C_3H_8 belongs to the homologous series of:

(a) Alkynes

(b) Alkenes

(c) Alkanes

(d) Cyclo alkanes

Ans. (c) Alkanes

Explanation :

A homologous series is a family of compounds with the same general formula, same functional group and similar chemical properties. Each family of organic compound is called a homologous series for example,

Homologous series of Alkanes with general formula C_nH_{2n+2}

Homologous series of Alkene with general formula C_nH_{2n}

Homologous series of Alkyne with general formula C_nH_{2n-2}

Hence, from the general formula of the homologous series of alkanes, this can be confirmed that C_3H_8 belongs to the homologous series of alkanes.

36. The first member of the alkyne homologous series is:
[NCERT Exemplar]

- (a) ethyne
- (b) ethene
- (c) propyne
- (d) methane

Ans. (a) ethyne

Explanation :

The first member of the alkyne family is ethyne (C_2H_2), with two carbon atoms bonded by a triple bond. It is a hydrocarbon and the simplest alkyne. Its molecular weight is 26.04 g/mol.

37. By how much atomic mass unit successive members of a homologous series vary?

- (a) One
- (b) Sixteen
- (c) Fourteen

(d) Twelve

Ans. (c) Fourteen

Explanation :

In homologous series, the two consecutive members will differ by CH_2 unit or 14 amu.

The molecular masses of first three members of alkanes with general formula $\text{C}_n\text{H}_{2n+2}$ are shown below:

Methane (CH_4) = 16 amu

Ethane (C_2H_6) = 30 amu

Propane (C_3H_8) = 44 amu

From the above examples, it is clear that atomic mass unit of successive members of a homologous series vary by 14 amu.

38. In double covalent bond, there is sharing of:

(a) 2 electrons

(b) 4 electrons

(c) 6 electrons

(d) 3 electrons

Ans. (b) 4 electrons

Explanation :

A double covalent bond is formed when two pairs of electrons are shared between them. For example, in an oxygen molecule, there is a double bond between two oxygen atoms as they share two pairs of electrons *i.e.*, 4 electrons.

39. Hydrocarbons are mainly composed of:

(a) Hydrogen, carbon and nitrogen

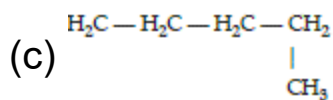
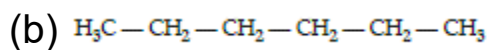
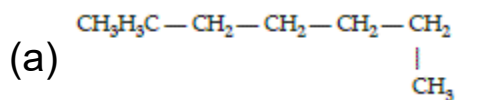
(b) Hydrogen and carbon

(d) Hydrogen, oxygen and carbon

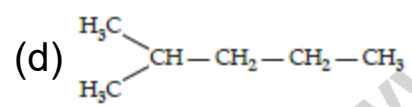
Explanation :

A hydrocarbon is an organic chemical compound composed exclusively of hydrogen and carbon atoms. For example, the simplest hydrocarbon is methane molecule with the molecular formula CH_4 .

40. Which of the following is not a straight chain hydrocarbon?

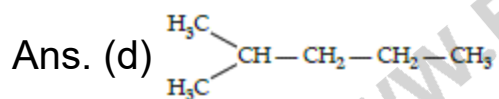






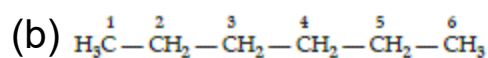
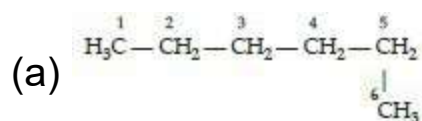
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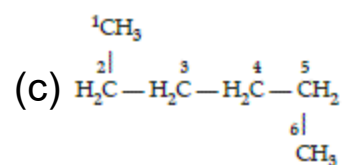




Explanation :

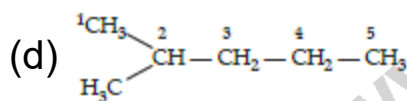
In straight chain hydrocarbons, carbon atoms are connected through covalent bond in one continuous chain with no branches. In the structure (a), (b) and (c), all the carbon atoms are connected to each other in a continuous straight chain:





In structure (d), — CH₃ group is attached to the second carbon atom of the chain forming a branch. Hence, compound in structure (d) is a branched chain hydrocarbon.





41. The bond between two identical non-metallic atom has a pair of electron :

- (a) unequally shared between two atoms.
- (b) transferred completely from one atom to another.
- (c) with identical spins.
- (d) equally shared between them.

Ans. (d) equally shared between them.

Explanation :

The bond between two identical non-metallic atoms has a pair of

electron equally shared between them. This is due to the equal sharing of electrons between the bonded atoms. Hence, the bonded atoms will hold on the shared pair of electrons.

42. Complete combustion of hydrocarbons gives:

- (a) Carbon dioxide and water
- (b) Carbon monoxide and water
- (c) Carbon monoxide and hydrogen
- (d) Carbon dioxide and hydrogen

Ans. (a) Carbon dioxide and water

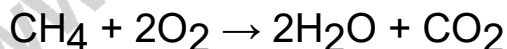
Explanation :

Hydrocarbons undergo complete combustion when a sufficient amount of oxygen is available. During the complete combustion of hydrocarbons, carbon dioxide and water are formed.

The equation for the combustion of a hydrocarbon in air can be represented as:

Fuel + Oxygen →

Water + Nitrogen + Carbon dioxide



43. How many single bonds are there in methane?

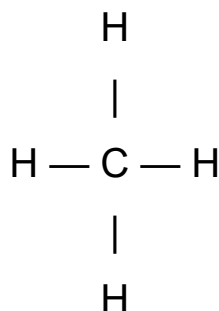
- (a) Four
- (b) Five
- (c) Six
- (d) Three

Ans. (a) Four

Explanation :

There are four single bonds present in methane as 4 hydrogen atom satisfies the carbon valency 4 which can be represented as shown in

the figure:



Assertion and Reasoning Based Questions

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.
- (c) Assertion is true, but reason is false.
- (d) Assertion is false, but reason is true.

44. Assertion: Catenation is not shown by carbon.

Reason: Catenation is not shown by carbon because it has valency of 5.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Catenation is shown by carbon because it has valency of 4 and thus it can form large number of compounds by sharing its 4 valence electrons with other atoms of carbon or with atoms of other elements. Thus, assertion is true but reason is false.

45. Assertion: Carbon forms ionic compounds.

Reason: It is because of its valency of 4.

Ans. (d) Assertion is false, but reason is true.

Explanation :

Carbon forms covalent compounds because of its valency of 4, it is tetravalent in nature due to which it can share its 4 electrons easily. Thus, assertion is false but reason is true.

46. Assertion: Mass number of a carbon is 12.

Reason: Carbon possesses equal number of all three fundamental particles.

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

Number of electrons, protons and neutrons in carbon are equal, *i.e.*; 6. The mass number of carbon is 12. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

47. Assertion: Covalent compounds have high melting and boiling points.

Reason: It is because the forces present in covalent bonds are held together by weak Van der Waals forces.

Ans. (d) Assertion is false, but reason is true.

Explanation :

The forces present in covalent bonds are held together by weak Van der Waals forces and the force of attraction between these molecules are not very strong. A supply of a small amount of energy can weaken this force to a great extent that is why carbon compounds have low melting and boiling point. Thus, assertion is false but reason is true.

48. Assertion: Covalent compounds are poor conductors of electricity.

Reason: It is because they do not form the ions.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Covalent compounds are poor conductors of electricity because they do not form the ions. Thus both assertion and reason are correct and reason is the correct explanation of the assertion.

49. Assertion: Carbon and its compounds are used as fuels.

Reason: They give lot of heat and light when burnt in air.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Carbon and its compounds are used as fuels for most applications because most of the carbon compounds give a lot of heat and light when burnt in air. Saturated hydrocarbons burn with a clean flame and no smoke is produced. The carbon compounds, used as a fuel, have high calorific values. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

50. Assertion: General formula of alkanes is C_nH_{2n+2} .

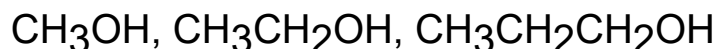
Reason: It is because they are saturated compounds.

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

Alkanes are saturated compounds because they are very unstable. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

51. Assertion: Following are the members of a homologous series :[\[Board Question\]](#)



Reason: A series of compounds with same functional group but

differing by $\text{—CH}_2\text{—}$ unit is called a homologous series.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

The Homologous series of the compounds differ by —CH_2 units and molecular mass of each member differs by 14 amu. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

52. Assertion: In a homologous series of alcohols, the formula for the second member is $\text{C}_2\text{H}_5\text{OH}$ and the third member is $\text{C}_3\text{H}_7\text{OH}$.

[Board Question]

Reason: The difference between the molecular masses of the two consecutive members of a homologous series is 14.

Ans. (d) Assertion is false, but reason is true.

Explanation :

In homologous series, two consecutive members differ by —CH_2 and differ in molecular masses by 14. Thus, assertion is false but reason is true.

53. Assertion: For welding purpose a mixture of oxygen and ethyne is used.

Reason: Ethyne when burnt in air gives smoky flame.

Ans. (c) Assertion is true, but reason is false.

Explanation :

When ethyne is burnt in air, due to incomplete combustion it gives a sooty flame. But when ethyne is burnt with oxygen, it gives a clean flame with temperature of 3000°C . Thus, assertion is true but reason is false.

54. Assertion: Detergents are better cleansing agent than soaps.

Reason: It is because they work with soft water.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Detergents are better cleansing agents than soaps because they can work both in hard and soft water. They do not form insoluble precipitates with calcium and magnesium ions in hard water. Thus, assertion is true but reason is false.

55. Assertion: Hard water contains magnesium and phosphate salts.

Reason: It is because they are easily available in hard water.

Ans. (d) Assertion is false, but reason is true.

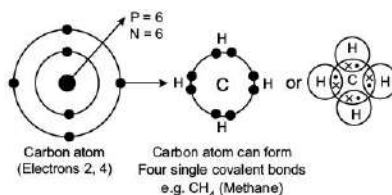
Explanation :

Hard water forms foam with water because it contains calcium and potassium salts. Thus, assertion is false but reason is true.

Case Based Questions

56. Read the passage carefully and answer the following questions from (i) to (v):

As a versatile element, carbon can form large compounds because of its tetravalency and the property of catenation that it exhibits. Here, catenation refers to the combination of carbon atoms itself to form large molecules. Carbon forms stronger covalent bonds with itself and other elements such as hydrogen, oxygen, sulphur, nitrogen and chlorine. This is because its nucleus has a strong force of attraction and holds these bonds tightly together.



(i) The molecular formula of ethane C_2H_6 has:

- (a) 6 covalent bonds.
- (b) 7 covalent bonds.
- (c) 8 covalent bonds.
- (d) 9 covalent bonds.

Ans. (b) 7 covalent bonds

(ii) Which of the following statements regarding carbon is incorrect?

- (a) A single atom of carbon can participate in two double bonds
- (b) A single atom of carbon can participate in three single bonds and one double bond
- (c) A single atom of carbon can participate in four single bonds
- (d) A single atom of carbon can participate in two single bonds and one double bond

Ans. (b) A single atom of carbon can participate in three single bonds and one double bond

(iii) Which of the following puts the elements in the right order in terms of their valency, starting with the element of lowest valency?

- (a) O, C, N, H
- (b) C, O, N, H
- (c) H, C, O, N
- (d) H, O, N, C

Ans. (d) H, O, N, C

(iv) Match the columns:

Column A Column B

(1) Methane (p) C_8H_{18}

(2) Propane (q) C_4H_{10}

(3) Butane (r) C_5H_{12}

(4) Pentane (s) C_3H_8

(5) Octane (t) CH_4

(a) (1)-(q), (2)-(s), (3)-(t), (4)-(p), (5)-(r)

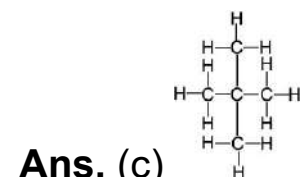
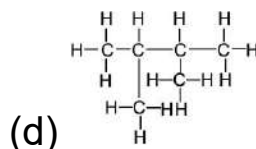
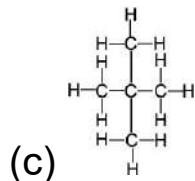
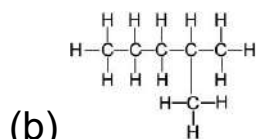
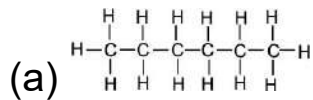
(b) (1)-(p), (2)-(r), (3)-(s), (4)-(q), (5)-(t)

(c) (1)-(t), (2)-(s), (3)-(q), (4)-(r), (5)-(p)

(d) (1)-(t), (2)-(q), (3)-(s), (4)-(r), (5)-(p)

Ans. (c) (1)-(t), (2)-(s), (3)-(q), (4)-(r), (5)-(p)

(v) Which of the following does not represent the molecular formula C_6H_{14} ?

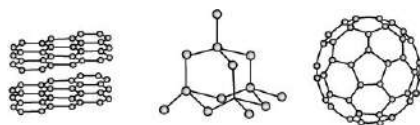


Ans. (c)

57. Read the passage carefully and answer the following questions from (i) to (v):

The nature of the covalent bond enables carbon to form a large number of compounds. Carbon has the unique ability to form bonds with other atoms of carbon, giving rise to large molecules. Since carbon has a valency of four, it is capable of bonding with four other atoms of carbon or atoms of some other monovalent element.

(i) Mark the correct option from the following names marked in A, B and C.



(A) (B) (C)

(a) A- Graphite, B-Diamond, C- Fullerene

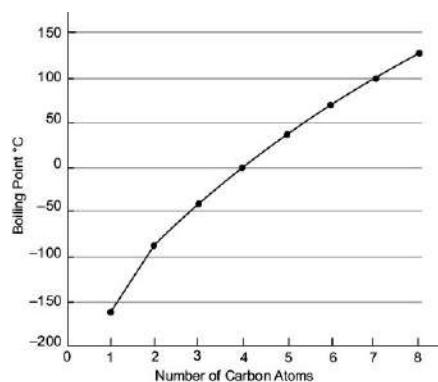
(b) A- Diamond, B-Graphite, C- Fullerene

(c) A- Fullerene, B-Diamond, C- Graphite

(d) A- Graphite, B-Fullerene, C- Diamond

Ans. (a) A- Graphite, B-Diamond, C- Fullerene

(ii) The following represent the relation of boiling of alkanes with respect to number of carbon atoms.



Which of the following is the correct order for the boiling points of given alkanes?

(a) $\text{CH}_4 < \text{CH}_3\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

(b) $\text{CH}_4 > \text{CH}_3\text{CH}_3 > \text{CH}_3\text{CH}_2\text{CH}_3 > \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

(c) $\text{CH}_4 > \text{CH}_3\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_3 > \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

(d) $\text{CH}_4 < \text{CH}_3\text{CH}_3 > \text{CH}_3\text{CH}_2\text{CH}_3 > \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

Ans. (a) $\text{CH}_4 < \text{CH}_3\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

(iii) Which of the following is the major constituent of the liquefied petroleum gas?

(a) Methane

(b) Ethane

(c) Propane

(d) Butane

Ans. (d) Butane

(iv) A student while observing the properties of acetic acid would report that this smells like:

(a) vinegar and turns red litmus blue

(b) rotten egg and turns red litmus blue

(c) vinegar and turns blue litmus red

(d) rotten egg and turns blue litmus red

Ans. (c) vinegar and turns blue litmus red

(v) Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms, e.g., hydrogen. After the formation of four bonds, carbon attains the electronic configuration of:

(a) Helium

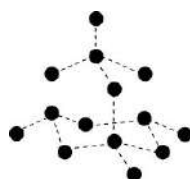
- (b) Neon
- (c) Argon
- (d) Krypton

Ans. (b) Neon

58. Read the passage carefully and answer the following questions from (i) to (v):

The phenomenon of the existence of an element in two or more physical forms within the same physical state is known as allotropy. Allotropes have similar physical properties but they differ in chemical properties. In crystalline form, Carbon occurs as graphite, diamond, and fullerenes. Diamond is the hardest natural substance known and is used in cutting marbles, granite, and glass. Graphite is a greyish black and opaque substance, lighter than a diamond with comparative low density. Graphite has a sheet-like structure having hexagonal layers. One layer slides over the other layer due to weak forces and hence it is soft to touch and breaks easily. Graphite is also used as a lubricant.

(i) Substance A is a moderate conductor of electricity. Observe the structure of substance A given below.



Choose the correct statements regarding substance A.

Statement I - It is a covalent compound.

Statement II - It has a giant molecular structure.

Statement III - It has the same structure as graphite.

Statement IV - It has the same structure as diamond.

- (a) I and III

- (b) II and III
- (c) II and IV
- (d) I, II and IV

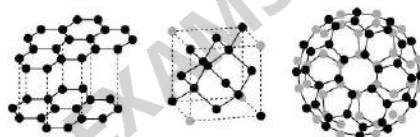
Ans. (c) II and IV

(ii) Which of the following is correct about a diamond's structure?

- (a) Carbon atoms are held together by single covalent bonds
- (b) Electrons move freely through the structure
- (c) Layers of atoms slide easily over each other
- (d) Carbon atoms conduct electricity in the molten state

Ans. (a) Carbon atoms are held together by single covalent bonds

(iii) Which three allotropes of carbon do the given figures represent?



- (I) (II) (III)
- (a) I-Graphite II-Diamond III-Fullerene
- (b) I-Diamond II-Fullerene III-Graphite
- (c) I-Graphite II-Fullerene III-Diamond
- (d) I-Fullerene II-Graphite III-Diamond

Ans. (a) I-Graphite II-Diamond III-Fullerene

(iv) Identify the incorrect statement(s):

- I. Diamond is the hardest substance known while graphite breaks easily.
- II. Each carbon atom in diamond is bonded to 4 other carbon atoms

in a tetrahedral manner to form a giant lattice. All carbon atoms are bonded by strong covalent bonds.

III. Graphite is poor conductor of electricity unlike other non metals.

IV. In each layer of graphite, each carbon atom is bonded to three other carbon atoms forming hexagonal rings of carbon atoms.

(a) I and III

(b) Only III

(c) II and IV

(d) I, II and IV

Ans. (b) Only III

(v) The number of carbon atoms surrounding each carbon atom in a diamond are:

(a) 3

(b) 4

(c) 2

(d) 5

Ans. (b) 4

59. Read the passage carefully and answer the following questions from (i) to (v):

The compounds which have the same molecular formula but differ from each other in physical or chemical properties are called isomers and this phenomenon is known as isomerism. Structural isomerism is when isomers have difference in the arrangement of atoms within the molecule, without any reference to space. We can say that compounds which have the same molecular formula but different structural formula show structural isomerism. Compounds of carbon show this phenomenon as the atoms can be linked together in the form of straight chains, branched chains or even

rings.

(i) Among the following sets of compounds, choose the set having the same molecular formulae:

- (a) Butane and iso-butane
- (b) Cyclohexane and hexene
- (c) Propanal and propanone
- (d) All of the above

Ans. (d) All of the above

(ii) The minimum number of carbon atoms required in an organic compound, in order to form branch:

- (a) 3
- (b) 4
- (c) 5
- (d) 2

Ans. (b) 4

(iii) Which of the following pairs show isomerism?

- (a) Ethane and ethene
- (b) Propane and butane
- (c) Ethane and propane
- (d) Butane and 2-methyl propane

Ans. (d) Butane and 2-methyl propane

(iv) Which among the following has the longest chain?

- (a) Iso-pentane
- (b) 2-methylpentane
- (c) 2,2-dimethylbutane

(d) neopentane

Ans. (b) 2-methylpentane

(v) The number of isomers of pentane is:

(a) 4

(b) 3

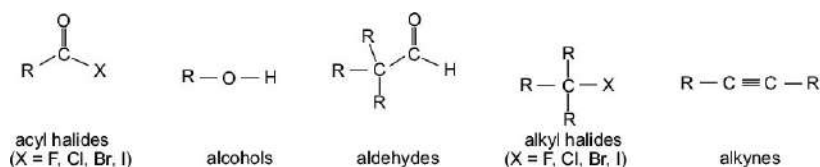
(c) 2

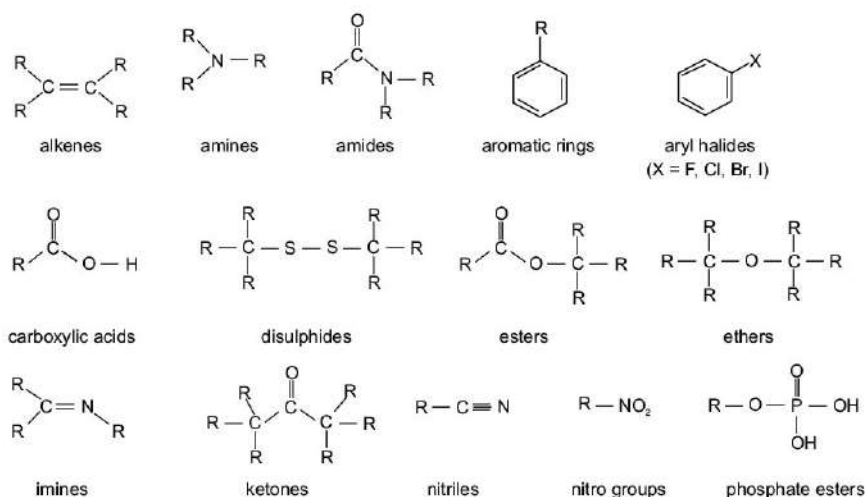
(d) 5

Ans. (b) 3

60. Read the passage carefully and answer the following questions from (i) to (v):

The ability of carbon to form chains gives rise to a homologous series of compounds in which the same functional group is attached to carbon chains of different lengths. It is hard to remember every compound. To remember compounds easily, we classify them in groups as per their functional groups. A series in which compounds with the same functional group are arranged is a homologous series. All the members of a homologous series can be found by a general formula. The consecutive members of a homologous series, differ by CH_2 group. Some compounds with different functional groups are given:





(i) Subsequent members of homologous series differ by how many atomic mass units?

- (a) 14
- (b) 16
- (c) 24
- (d) 28

Ans. (a) 14

(ii) The first member of alkyne homologous series is:

- (a) Ethyne
- (b) Ethene
- (c) Propyne
- (d) Methane

Ans. (a) Ethyne

(iii) Which of the given does not belong to the same homologous series?

- (a) CH₄
- (b) C₂H₆

(c) C_3H_8

(d) C_4H_8

Ans. (d) C_4H_8

(iv) Which one of the following statements regarding alkanes is false?

(a) Alkanes are non-polar molecules

(b) Alkanes are soluble in water

(c) Alkanes experience dispersion forces

(d) Alkanes have low boiling points

Ans. (b) Alkanes are soluble in water

(v) Match the following with correct response.

Column-A Column-B

(1) Catenation (A) Butene

(2) Alkane (B) Carbon compounds

(3) Alkene (C) Ethyne

(4) Alkyne (D) Ethane

(a) 1-D, 2-A, 3-C, 4-B

(b) 1-C, 2-B, 3-D, 4-A

(c) 1-B, 2-D, 3-A, 4-C

(d) 1-A, 2-C, 3-B, 4-D

Ans. (c) 1-B, 2-D, 3-A, 4-C

Nomenclature of Compounds

61. Write the molecular formula of the following compound and draw their electron dot structure.

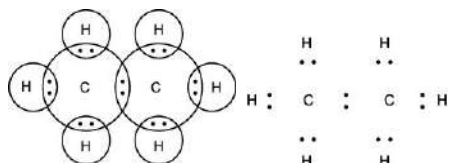
[Board Question]

(i) Ethane

(ii) Ethene

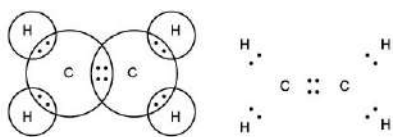
(iii) Ethyne

Ans. (i) Molecular Formula of Ethane: C_2H_6



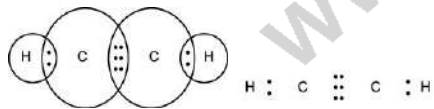
Structure of Ethane molecule Electron dot structure of Ethane molecule

(ii) Molecular Formula of Ethene : C_2H_4



Structure of Ethene molecule Electron dot structure of Ethene molecule

(iii) Molecular Formula of Ethyne : C_2H_2



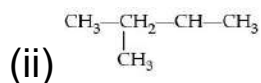
Structure of Ethyne molecule Electron dot structure of Ethyne molecule

62. How many structural isomers can you draw for pentane?

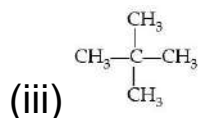
Ans. Three structural isomers are possible for pentane:

(i) $CH_3-CH_2-CH_2-CH_2-CH_3$

n-pentane

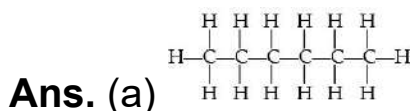


Iso-pentane

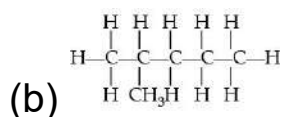


neo-pentane

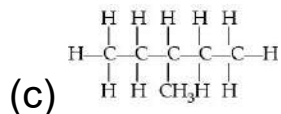
63. Write the structural formulae of all the isomers of hexane.



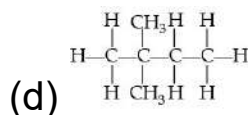
n-hexane



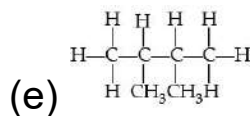
2-methyl pentane



2, 2-dimethyl butane

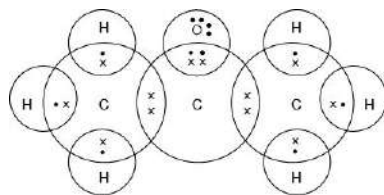
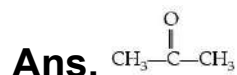


2, 3-dimethyl butane

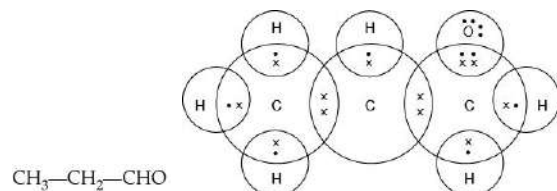


3-methyl pentane

64. Draw the possible isomers of the compound with molecular formula $\text{C}_3\text{H}_6\text{O}$ and also give their electron dot structures.



Propanone Electron dot structure of propanone



Propanal Electron dot structure of propanal

65. Draw the electron dot structures for :

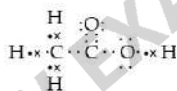
(i) Ethanoic acid

(ii) Hydrogen Sulphide

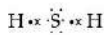
(iii) Propanone

(iv) Flourine

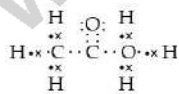
Ans. (i) Ethanoic acid



(ii) H_2S



(iii) Propanone



(iv) F_2



66. Draw the structure of the following : (i)Propanoic acid

(ii) 2-propanol (iii) 1-iodopropane

(iv) 3-chlorobutanone

(v) Propyne

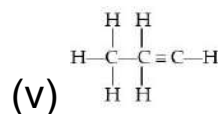
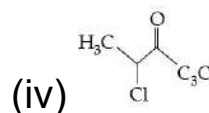
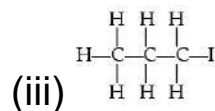
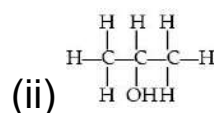
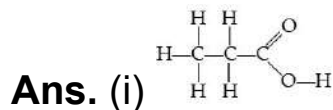
(vi) Ethanoic acid

(vii) Bromopentane

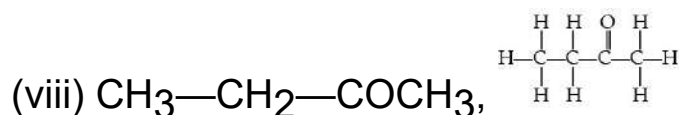
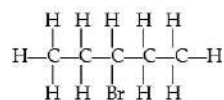
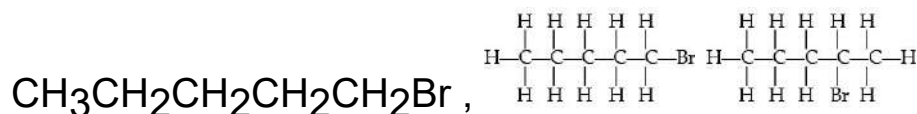
(viii) Butanone

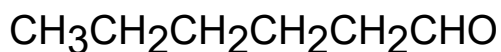
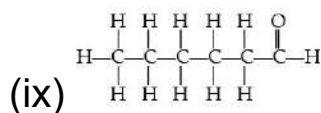
(ix) Hexanal

Are structural isomers possible for bromopentane? [Board Question]

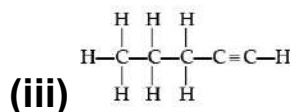
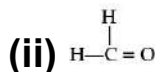
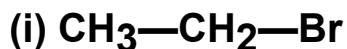


(vii) There are many structural isomers possible for bromopentane. Among them, the structures of three isomers are given.





67. How would you name the following compounds?

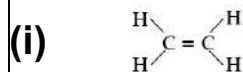


Ans. (i) Bromoethane

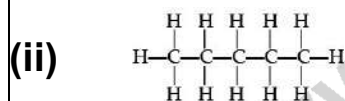
(ii) Methanal

(iii) Hexyne

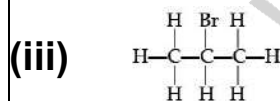
68. Write the IUPAC name of the following:



(v)



(vi)



(vii)



Ans. (i) Ethene

(ii) Pentane

(iii) 2-Bromopropane

(iv) 4-chloro-2-pentene

(v) Pent-2-en-1-al

(vi) Propanone

(vii) Butanone

Reasoning Based Questions

69. Why are carbon and its compounds used as fuels for most applications?

[NCERT & Board Question]

Ans. Carbon and its compounds are used as fuels for most applications because most of the carbon compounds give a lot of heat and light when burnt in air. Saturated hydrocarbons burn with a clean flame and no smoke is produced. The carbon compounds, used as a fuel, have high calorific values.

70. Catenation is the ability of an atom to form bonds with other atoms of the same element. It is exhibited by both carbon and silicon. Compare the ability of catenation of the two elements. Give reasons.

Ans. Carbon has the maximum capacity of catenation. The reason for this is the smaller size of carbon which makes the C — C bonds strong. The size of sulphur is greater than Carbon. This makes Si—Si bonds comparatively weaker than C — C bond.

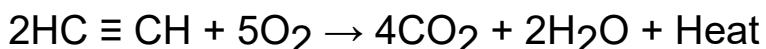
71. Why is fullerene so called?

Ans. Fullerene is so called because it resembles the framework of dome shaped halls designed by American architect Buckminster fuller.

72. A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?**[NCERT]**

Ans. When ethyne is burnt in air, due to incomplete combustion it gives a sooty flame. But when ethyne is burnt with oxygen, it gives a

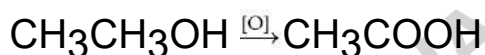
clean flame with temperature 3000°C because of complete combustion. This oxy-acetylene flame is used for welding. It is not possible to attain such a high temperature without mixing oxygen. This is the reason why a mixture of ethyne and air is not used. The reaction can be given as:



Ethyne

73. Why is the conversion of ethanol to ethanoic acid an oxidation reaction?[\[NCERT\]](#)

Ans. The conversion of ethanol to ethanoic acid involves the addition of oxygen to ethanol. Therefore, it is an oxidation reaction.



Ethanol Ethanoic acid

74. Hard water do not produce foam with soap easily. Why?

Ans. When soap is added to hard water the Ca^{+2} and Mg^{+2} ions present in hard water react with soap. Since soaps contain the sodium salts which are converted to their respective calcium and magnesium salts which are precipitated as scum. So, hard water does not form lather with soap.

75. Why detergents are better cleansing agents than soaps? Explain.

Ans. Detergents are better cleansing agents than soaps because they can work both in hard and soft water. They do not form insoluble precipitates with calcium and magnesium ions in hard water.

76. Why does micelle formation takes place when soap is added to water? Will a micelle is formed in other solvents such as ethanol also?[\[NCERT\]](#)

Ans. Soap may be represented by the formula RCOONa where R is an alkyl group which represents long chain of carbon with fifteen or more atoms. Oil drops containing dirt particles and water do not mix. Soap helps in their mixing by reducing interfacial tension or friction. Actually it forms a sort of bridge between oil drops and water in which the alkyl portion (hydrophobic end) point towards oil drop while other portion (hydrophilic end) is directed towards water. This is known as micelle formation. Thus, soap helps in the formation of a stable emulsion between oil and water. Ethanol and other similar solvents which are of organic nature do not help in micelle formation because soap is soluble in them.

Very Short Answer Type Questions

77. Answer the following questions:

- (i) What are the two properties of carbon which lead to the huge number of carbon compounds we see around us? **[NCERT]**
- (ii) Which element exhibit the property of catenation to maximum extent and why? **[Board Question]**

Ans. (i) The two features of carbon that give rise to a large number of compounds are as follows:

1. Catenation: The ability to form bonds with other atoms of carbon to form a long chain

2. Tetravalency: With the valency of four, carbon is capable of bonding with four other atoms of carbon or atoms of some other monovalent element such as oxygen, hydrogen, nitrogen, sulphur and chlorine.

(ii) Carbon exhibit the property of catenation to maximum extent. It is due to strong tetravalency of carbon.

78. Answer the following questions:

- (i) What is homologous series of carbon compounds? **[Board]**

Question]

(ii) Write the name and formula of the 2nd member of homologous series having general formula (C_nH_{2n+2}). [Board Question]

(iii) Write the molecular formula of the 2nd and 3rd member of the homologous series where the first member is ethyne. [Board Question]

(iv) What is the difference in molecular formula of any two consecutive members of a homologous series?

Ans. (i) The series of organic compounds having same functional group and similar chemical properties is called homologous series. Each member differs from successive member by $-CH_2$ group. The difference in molecular weight between two successive members is $14u$.

(ii) The name of 2nd member of alkanes: Ethane. The formula of 2nd member of alkanes: C_2H_6 or $CH_3 - CH_3$.

(iii) 2nd member of homologous series of alkyne is propyne (C_3H_4)

3rd member of homologous series of alkyne is butyne (C_4H_6)

(iv) The molecular formula of two consecutive members of a homologous series differ by $-CH_2$ group.

79. State the following:

(i) Two properties of carbon which lead to the formation of a large number of carbon compounds.

(ii) Give the name and structure of an alcohol with four carbon atoms in its molecule.

(iii) Write the next homologue of C_2H_4 and C_4H_6 .

(iv) Write the name and molecular formula of the first member of the homologous series of alkyne.

(v) Write the name and formula of second member of homologous series having general formula (C_nH_{2n}).

(vi) Write the name and formula of second member of homologous series having general formula (C_nH_{2n-2}).

(vii) Write the next two members of homologous series for C_2H_6 and C_3H_8 ?

(viii) Name the following compounds, CH_3-CH_2-OH and CH_3-CHO ?

(ix) Write the name and molecular formula of the fourth member of alkane series.

(x) Select saturated hydrocarbons from the following: C_3H_6 , C_5H_{10} , C_4H_{10} , C_6H_{14} , C_2H_4 .

(xi) Write the number of covalent bonds in the molecule of propane, ethane and butane.

(xii) Write the chemical equations for the conversion of ethanol to ethanoic acid in the presence of $KMnO_4$.

(xiii) Write the names of any two isomers represented by the molecular formula C_5H_{12} .

Ans. (i) Catenation and tetravalency.

(ii) $CH_3 - CH_2 - CH_2 - CH_2 - OH$ (Butanol)

(iii) C_3H_6 and C_5H_8

(iv) Ethyne (C_2H_2)

(v) Propene (C_3H_6)

(vi) Propyne (C_3H_4)

(vii) C_4H_{10} and C_5H_{12}

(viii) Ethanol and Ethanal

(ix) Butane, C_4H_{10}

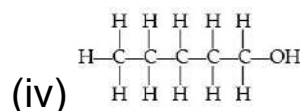
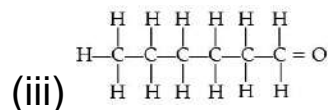
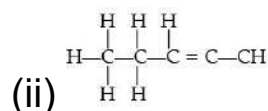
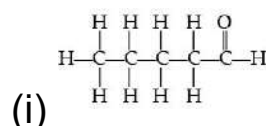
(x) Saturated hydrocarbons, C_4H_{10} , C_6H_{14}

(xi) Ten, Seven and Thirteen

(xii) $CH_3CH_2OH + KMnO_4 \rightarrow CH_3COOH$

(xiii) Isopentane and Neopentane.

80. Write the names of the following compounds:



Ans. (i) Pentanal

(ii) Butene

(iii) Heptanal

(iv) Pentanol

81. Give the names of the following functional groups:

(i) $-CHO$

(ii) $-C = O$

(iii) $-OH$

(iv) -COOH

Ans. (i) Aldehyde group

(ii) Carbonyl group

(iii) Alcoholic group

(iv) Carboxylic acid group.

82. What is combustion?

Ans. It is the process of burning of a substance in the presence of oxygen to produce carbon dioxide along with heat and light. Combustion reactions are also called oxidation reactions. For example,



Methane

83. List two chemical properties on the basis of which ethanol and ethanoic acid may be differentiated and explain how. [Board Question]

Ans. Properties to differentiate between ethanol and ethanoic acid are :

1. Ethanol does not react with sodium bicarbonate but ethanoic acid reacts with sodium bicarbonate releasing CO_2 gas.

2. Ethanol does not change the colour of blue litmus paper but ethanoic acid changes the colour of blue litmus to red due to presence of carboxylic acid group.

84. Answer the following questions:

(i) Give a test that can be used to differentiate chemically between butter and cooking oil.

[NCERT]

(ii) How does graphite acts as a lubricant?

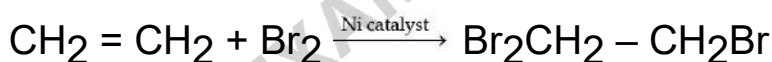
Ans. (i) Butter contains saturated fats. Therefore, it cannot be hydrogenated. On the other hand, oil has unsaturated fats. That is why it can be hydrogenated to saturated fatty solids.

(ii) Graphite is used as a lubricant in the form of graphite powder or mixed with petroleum jelly or with any lubricant oil to form graphite grease.

85. Unsaturated hydrocarbons contain multiple bonds between two carbon atoms and these compounds show addition reactions. Out of saturated and unsaturated carbon compounds, which compounds are more reactive? Write a test to distinguish ethane from ethene.

[Board Question]

Ans. Unsaturated carbon compounds are more reactive than saturated carbon compounds. Bromine water is decolourised by ethene but there is no change of colour of bromine water with ethane.



Ethene Bromine Dibromoethane

86. Unsaturated hydrocarbons contain multiple bonds between the two C-atoms and show addition reactions. Give the test to distinguish ethane from ethene.

Ans. The two can be distinguished by subjecting them to the flame. Saturated hydrocarbons generally give a clear flame while unsaturated hydrocarbons give a yellow flame with lots of black smoke.

87. In electron dot structure, the valence shell electrons are represented by crosses or dots.

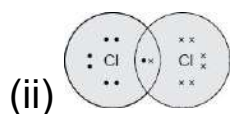
(i) The atomic number of chlorine is 17. Write its electronic configuration

(ii) Draw the electron dot structure of chlorine molecule.

Ans. (i) Electronic configuration of chlorine atom having atomic number 17 is :

K, L, M

2, 8, 7



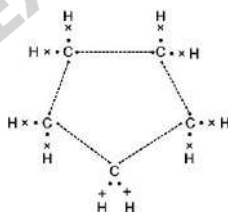
88. Answer the following questions:

(i) What will be the formula and electron dot structure of cyclopentane?[\[NCERT\]](#)

(ii) Draw electron dot structure of carbon dioxide and write the nature of bonding between carbon and oxygen in its molecule.

[\[Board Question\]](#)

Ans. (i) The formula for cyclopentane is C_5H_{10} . Its electron dot structure is given below.



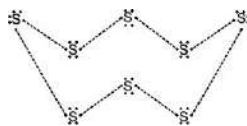
Covalent bond (double bond) is present in between C and O.

89. Answer the following questions:

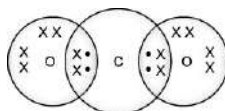
(i) What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? [\[NCERT\]](#)

(ii) What would be the electron dot structure of carbon dioxide which has the formula CO_2 ?[\[NCERT\]](#)

Ans. (i) Electron dot structure of a sulphur molecule.



(ii) Electron dot structure of CO_2 is:



Short Answer Type Questions

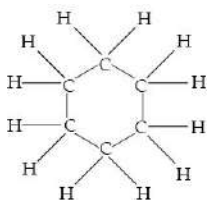
90. Carbon has the unique property to form bonds with other carbon atoms:[Board Question]

- (i) Name the unique property of carbon.
- (ii) Give reason for unique property of carbon atom.
- (iii) Draw the structure of cyclohexane.

Ans. (i) Catenation.

(ii) It is due to tetravalency of carbon atom.

(iii) Cyclohexane.



91. What are covalent compounds ? Why are they different from ionic compounds? List their three characteristics properties. [Board Question]

Ans. The compounds which are formed by sharing of electrons between two or more same atoms or between two or more non-metals are called covalent compounds. They are different from ionic compounds as:

1. Covalent compounds are bad conductors of electricity whereas

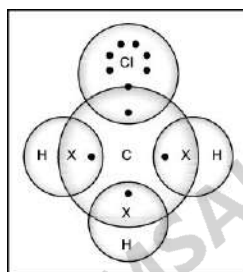
ionic compounds are good conductors of electricity in molten state.

2. Covalent compounds are directional and ionic compounds are non-directional.

Characteristics of Covalent compounds are:

1. They have low melting and boiling point.
2. These compounds are generally insoluble in water.
3. These compounds are bad conductors of electricity.

92. Explain the nature of the covalent bond using the bond formation in CH_3Cl . [NCERT]



Ans. Carbon has 4 valence electrons. It completes its octet by sharing its four electrons with other carbon atoms or with atoms of other elements as it can neither lose four of its electrons nor gain four electrons as both the processes require extra amount of energy and would make the system unstable. Such bonds that are formed by sharing electrons are known as covalent bonds. In covalent bonding, both the atoms share the valence electrons, *i.e.*, the shared electrons belong to the valence shells of both the atoms.

In the formation of CH_3Cl , carbon requires 4 electrons to complete its octet, while each hydrogen atom requires one electron to complete its duplet. Also, chlorine requires an electron to complete the octet. Therefore, all of these share the electrons and as a result, carbon forms 3 bonds with hydrogen and one with chlorine.

93. State the meaning of functional group in an organic compound. Write the formula of the functional group present in

alcohols, aldehydes, ketones and Carboxylic acid.[Board Question]

Ans. An atom or group of atoms which makes a carbon compound reactive and decides its chemical properties is called a functional group. The functional group present in the compounds are:

1. Alcohols — OH
2. Aldehyde — CHO
3. Ketone — C = O
4. Carboxylic acid —COOH

94. What is a homologous series? Explain with an example.
[NCERT]

Ans. A homologous series is a series of carbon compounds that have different numbers of carbon atoms but contain the same functional group. There is a difference of —CH₂ unit between each successive member and mass differ by 14u.

For example, methane, ethane, propane, butane, etc., are all part of the alkane homologous series. The general formula of this series is C_nH_{2n+2}.

95. Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen can take place. Stating the essential conditions required for an addition reaction to occur, write the chemical equation giving the name of the reactant and the product of such a reaction.

[Board Question]

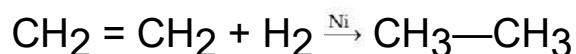
Ans. Alkene: C_nH_{2n}

Alkyne: C_nH_{2n-2}

Essential condition for the reaction to occur are:

1. Presence of multiple bonds between carbon atoms in the chain of hydrocarbons.
2. Presence of catalyst such as nickel and platinum.

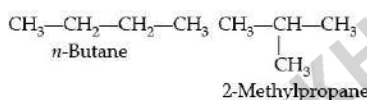
Chemical equation:



96. What are isomers? Draw the structures of two isomers of butane, C₄H₁₀. Why can not we have isomers of first three members of alkane series?

[Board Question]

Ans. Isomers are compounds, which have same molecular formula but different structural formulae.



In first three members of alkane series, branching is not possible. Therefore, we cannot have isomers.

97. An aldehyde as well as ketone can be represented by the same molecular formula, say C₃H₆O. Write the structures and name them. State the relation between the two in the language of science.

[Board Question]

Ans. Molecular formula: C₃H₆O

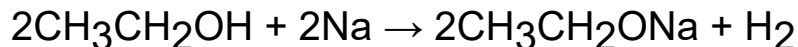
Aldehyde: CH₃—CH₂—CHO

Ketone: CH₃COCH₃

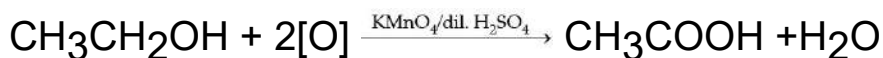
Aldehyde and ketones are known as isomers. Isomers are compounds having same molecular formula but different structural formula. They do not have same physical properties since their functional group is different.

98. What happens when ethanol reacts with (i) sodium, (ii) potassium permanganate solution.

Ans. (i) With sodium metal, sodium ethoxide is formed.



(ii) With alkaline potassium permanganate, ethanol is oxidised to ethanoic acid.

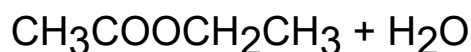
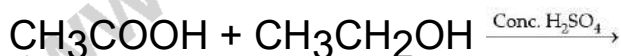


99. Answer the following questions:

(i) What name is given to the reaction which take place when ethanoic acid reacts with ethanol in the presence of conc. sulphuric acid? Name the products obtained in this reaction.

(ii) The structural formula of an ester is $\text{HCOOCH}_2\text{CH}_2\text{CH}_3$ write the formula of acid and the alcohol from which it is made?

Ans. (i) When ethanoic acid reacts with ethanol in presence of conc. H_2SO_4 the reaction is called esterification. In this reaction products formed are ethyl ethanoate and water.

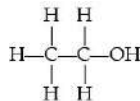


(ii) To write the formula of the acid and the alcohol add $-\text{COO}$ bond of the ester so that $-\text{OH}$ goes with $-\text{CO}$ part; acid HCOOH and the alcohol $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$.

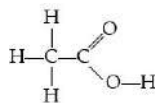
100. State the meaning of functional group in a carbon compound. Write the functional group present in (a) Ethanol (b) Ethanoic acid and also draw their structure. [Board Question]

Ans. A functional group is an atom or a group of atoms that characterizes the chemical properties of an organic compound.

1. Ethanol: Functional group: Alcohol (OH).



2. Ethanoic acid: Functional group : carboxylic acid (—COOH).



101. Explain the following: [Board Question]

- (i) CH_3COOH is a weak acid.
- (ii) Propene undergoes addition reaction.
- (iii) The gas stoves have inlets for air.

Ans. (i) CH_3COOH is a weak acid because it does not ionise completely into its ions.

(ii) Addition reaction occurs in hydrocarbons containing multiple bonds. Propene is an unsaturated compound. Also, it contains double bond. Therefore, it undergoes addition reaction.

(iii) The gas stoves have inlets for air so that sufficient air can be supplied to stove and complete combustion can take place.

102. List any two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed? [Board Question]

Ans. 1. Litmus test: Take 2 strips of litmus paper. Place a drop of each of alcohol and carboxylic acid on these strips separately. The blue litmus paper turns red in case of carboxylic acid and remains unaffected in case of alcohol.

2. Sodium hydrogen carbonate test: A pinch of sodium hydrogen carbonate is added to both alcohol and carboxylic acid separately. If brisk effervescence is observed with the evolution of a colourless

gas, it indicates the presence of carboxylic acid. If no effervescence are observed, alcohol is present.

103. Write the name and molecular formula of an organic compound having its name suffixed with 'ol' and having two carbon atoms in its molecule. Write the balanced chemical equation to indicate what happens when this compound is heated with conc. H_2SO_4 and the name of main product formed. Also state the role of conc. H_2SO_4 in the reaction. [Board Question]

Ans. The compound is ethanol. Its formula is $\text{C}_2\text{H}_5\text{OH}$.

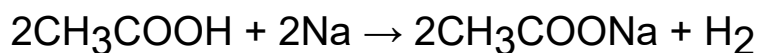
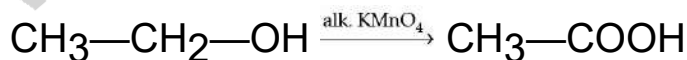


Conc. H_2SO_4 acts as a dehydrating agent.

104. An organic compound 'P' is a constituent of wine. 'P' on reacting with acidified $\text{K}_2\text{Cr}_2\text{O}_7$ forms another compound 'Q'. When a piece of sodium is added to 'Q' a gas 'R' evolves which burns with pop sound. Identify P, Q, R and write the balanced chemical equation of the reactions involved.

[Board Question]

Ans. P is Ethanol, Q is Ethanoic acid and R is Hydrogen gas.



Ethanoic acid Sodium Sodium ethanoate Hydrogen gas

105. Answer the following questions:

(i) Write the chemical names of CH_3COCH_3 and $\text{C}_2\text{H}_5\text{COOH}$.

[Board Question]

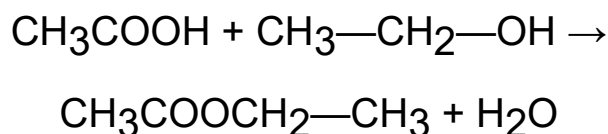
(ii) What happens when acetic acid and ethanol react in presence of

conc. sulphuric acid ? Write the reactions there in.

Ans. (i) CH_3COCH_3 — Propanone

$\text{C}_2\text{H}_5\text{COOH}$ — Propanoic acid

(ii) When acetic acid and ethanol reacts in presence of conc. sulphuric acid, esters are formed. This process is known as esterification.



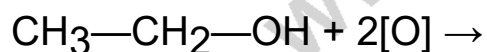
106. Write the chemical equations for the following chemical reactions and name the carbonic compound obtained. [Board Question]

(i) Reaction of acidified potassium dichromate solution with ethanol on heating.

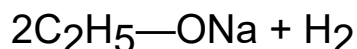
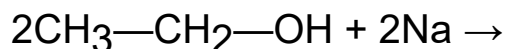
(ii) Reaction of sodium metal with ethanol.

(iii) Reaction of concentrated sulphuric acid with ethanol at 443 K.

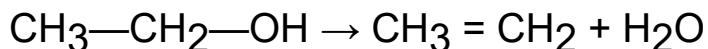
Ans. (i) Reaction of acidified potassium dichromate solution with ethanol on heating gives Ethanoic acid.



(ii) Ethanol when react with sodium gives Sodium ethoxide and Hydrogen gas is evolved.

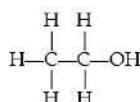


(iii) When ethanol is treated with concentrated sulphuric acid at 443K, ethene is formed.

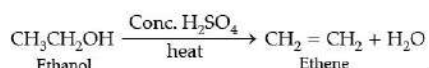


107. Write the structural formula of ethanol. What happens when it is heated with excess of conc. H_2SO_4 at 443 K? Write the chemical equation for the reaction stating the role of conc. H_2SO_4 in this reaction. [Board Question]

Ans. Structural formula of ethanol:



On heating ethanol with conc. H_2SO_4 acid, ethene gas is produced.



Conc. H_2SO_4 acts as a dehydrating agent.

108. Answer the following questions:

(i) Write the name of the following compounds:

(a) HCOOH

(b) $\text{CH}_3\text{COCH}_2\text{CH}_3$.

(ii) Explain why carbon generally forms compounds by covalent bonds.

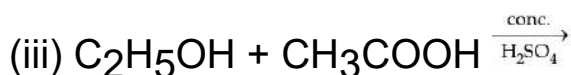
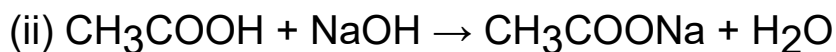
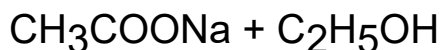
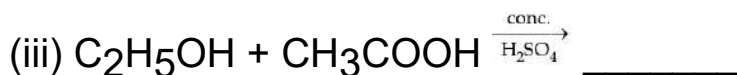
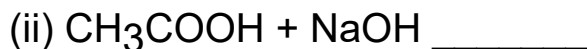
Ans. (i) (a) Methanoic acid (b) Butan-2-one.

(ii) Carbon generally forms covalent bond because of tetra valency of carbon. It has four electrons in its valence shell. It can neither donate nor accept four electrons due to energy consideration. Therefore, it shares its four electrons with other atoms and forms covalent bond.

109. Complete the following chemical equations:

[Board Question]

(i) $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOH}$ _____



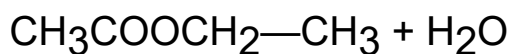
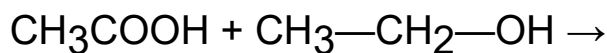
110. When ethanol react with ethanoic acid in the presence of conc. H_2SO_4 , a substance with fruity smell is produced. Answer the following:

[Board Question]

(i) State the class of compounds to which the fruity smelling compound belong. Write the chemical equation for the reaction and write the chemical name of the product formed.

(ii) State the role of conc. H_2SO_4 .

Ans. (i) The compound belong to functional group ester.



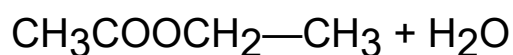
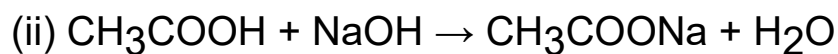
Ethyl acetate

(ii) Conc. H_2SO_4 acts as dehydrating agent.

111. Write the chemical equations of the reaction of ethanoic acid with the following:

(i) Sodium (ii) Sodium hydroxide, (iii) Ethanol

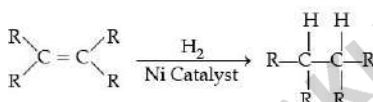
[Board Question]



112. What is hydrogenation? What is its industrial application?

[NCERT]

Ans. Hydrogenation is the process of addition of hydrogen. Unsaturated hydrocarbons are added with hydrogen in the presence of palladium and nickel catalysts to give saturated hydrocarbons.

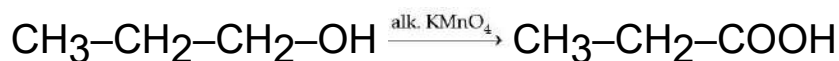


Industrial application: This reaction is used in the hydrogenation of vegetables oils, which contain long chains of unsaturated carbons.

113. What is an oxidising agent? What happens when an oxidising agent is added to Propanol? Explain with the help of a chemical equation.

[Board Question]

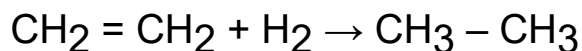
Ans. The substance which helps in oxidation but itself gets reduced is known as oxidising agent. When an oxidising agent is added to Propanol, it gets converted to propanoic acid.



114. With the help of an example, explain the process of hydrogenation. Mention the essential condition for the reaction and state the change in physical property with the formation of the product.

[Board Question]

Ans. Hydrogenation is the chemical process in which hydrogen molecule is added to an unsaturated hydrocarbon to make a saturated one. Example. Hydrogenation of Ethene.



Ethene Ethane

Conditions Required: This reaction takes place in the presence of catalyst like Ni or Pt.

Change in Physical Properties are:

- 1. Physical State:** Liquid to Solid
- 2. Density:** Increases
- 3. Melting Point:** Increases

115. Answer the following questions:

(i) Explain the formation of scum when hard water is treated with soap. **[NCERT]**

(ii) People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes? **[NCERT]**

Ans. (i) Hard water often contains salts of calcium and magnesium. Soap molecules react with the salts of calcium and magnesium and forms a precipitate. This precipitate begins floating as an off-white layer over water. This layer is called scum. Soaps lose their cleansing property in hard water because of formation of scum.

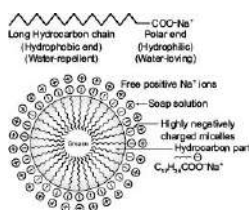
(ii) A soap molecule has two parts namely hydrophobic and hydrophilic. With the help of these, it attaches to the grease or dirt particle and forms a cluster called micelle. These micelles remain suspended as a colloid. To remove these micelles (entrapping the

dirt), it is necessary to agitate clothes.

116. What is the difference between the molecules of soaps and detergents, chemically? Explain the cleansing action of soaps.
[Board Question]

Ans. Difference Soaps: Soaps are water – soluble sodium or potassium salts of fatty acids.

Detergents: Detergents are usually alkyl benzene sulphonate. Soaps are biodegradable while detergents are non-biodegradable.



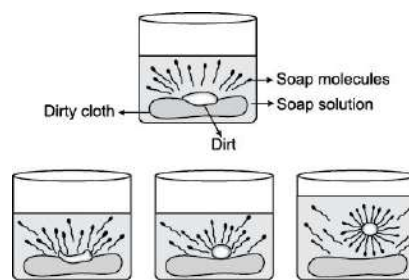
Cleansing Action of soap: Soap molecule has two ends, one polar head (sodium or potassium ion) and a non-polar tail (Chain of fatty acids). The non-polar end is hydrophobic while the polar end is hydrophilic in nature.

When soap is dissolved in water, its hydrophobic end attaches itself to dirt while the hydrophilic end tends to move towards surface of water. The molecules of soap arrange themselves in a micelle formation and trap the dirt at the centre. The overall force on the dirt particle pulls it out from the cloth and takes it towards the surface.

117. Explain the mechanism of the cleansing action of soaps.

Ans. Soaps molecules have two ends, one is hydrophilic, (water loving) while the other end is hydrophobic, (hydrophobic) that is it dissolves hydrocarbons. When soap is at the surface of water the hydrophobic 'tail' of soap will not be soluble in water and the soap will align along the surface of water with the ionic end in water and the hydrocarbon 'tail' protruding out of water. Inside water, these molecules have a unique orientation that keeps the hydrocarbon portion out of the water. This is achieved by forming clusters of

molecules in which the hydrophobic tails are in the interior of the cluster and the ionic ends are on the surface of the cluster. This formation is called a micelle. Soap in the form of a micelle is able to clean, since the oily dirt will be collected in the centre of the micelle. The micelles are large enough to scatter light. Hence a soap solution appears cloudy.



Long Answer Type Questions

118. Explain why carbon forms compounds mainly by covalent bond. Explain in brief two main reasons for carbon forming a large number of compounds. Why does carbon forms strong bonds with most other elements. [Board Question]

Ans. Carbon is tetravalent. Carbon has 4 electrons in its outer most shell. To complete the octet it needs 4 electrons. Thus, it can either gain or lose 4 electrons. But losing or gaining 4 electrons is not possible due to energy consideration. Hence, in place of gaining or losing 4 electrons, carbon does sharing of these 4 electrons and covalent bonds.

Reason for carbon forming a large number of compounds are:

1. Catenation: The tendency of carbon to form chains of identical atoms is known as catenation. Carbon forms long chains by combining with other carbon atoms through covalent bonds.

2. Tetravalency: It has 4 valence electrons, so it can form 4 covalent bonds with four different atoms, or two double bonds or a single and a triple bond with other atoms. This tendency helps carbon to form a large range of compounds.

Carbon forms strong bonds with most of other elements like H, O, S, N, Cl, Br, I etc. due to its small size which helps it to attract more number of electrons.

119. State the reason why carbon can neither form C^{4+} cations nor C^{4-} anions, but forms covalent compounds. Also state reasons to explain why covalent compounds: [\[Board Question\]](#)

(i) Are bad conductors of electricity?

(ii) Have low melting and boiling point?

Ans. Carbon needs 4 electrons to complete its octet. It has 4 electrons in its valence shell. Thus, carbon can either gain or lose 4 electrons. But due to energy consideration, it is not possible. Therefore, in place of gaining or losing 4 electrons, carbon does sharing of these 4 electrons to form covalent bonds. Therefore, carbon can neither form C^{4+} cations nor C^{4-} anions but forms covalent compounds only by sharing of electrons.

(i) Covalent compounds are bad conductors of electricity because they do not contain ions.

(ii) Covalent compounds have usually low melting and boiling point because the force of attraction between the molecules of covalent bond is very weak.

120. Element forming ionic compounds attain noble gas configuration by either gaining or losing electrons from their valence shells. Explain giving reasons why carbon cannot attain such a configuration in this manner to form its compounds. Name the type of bonds formed in ionic compounds and in the compounds formed by carbon. Also explain with reason why carbon compounds are generally poor conductors of electricity. [\[Board Question\]](#)

Ans. Carbon needs 4 electrons to complete its octet. It has 4

electrons in its valence shell. Thus, carbon can either gain or lose 4 electrons. But due to energy consideration, it is not possible. Therefore, in place of gaining or losing 4 electrons, carbon does sharing of these 4 electrons to form 4 covalent bonds.

Electrovalent or ionic bond is present in ionic compounds whereas covalent bond is present in Carbon compounds. Carbon compounds are poor conductors of electricity because of absence of ions.

121. Answer the following questions:

- (i) State any three physical property of carbon compounds.
- (ii) Carbon is a versatile element. Justify this statement. **[Board Question]**
- (iii) Give the structural differences between saturated and unsaturated hydrocarbons with two examples each.
- (iv) What is a functional group? Give examples of four different functional groups.

Ans. (i) The properties of carbon compounds are:

1. Carbon possess property of catenation:
2. Poor conductor of electricity.
3. Low melting and boiling point as compared to ionic compounds.

(ii) Carbon is a versatile element because of its properties. It shows the property of catenation due to which it forms a large number of compounds. Carbon is tetravalent. Due to this, it forms covalent compounds only.

(iii) Saturated hydrocarbons contain carbon – carbon single bonds. Unsaturated hydrocarbons contain atleast one carbon – carbon double or triple bond.

(iv) Functional group – An atom or group of atoms joined in a specific

manner which is responsible for the characteristic chemical properties of the organic compounds. Examples are alcohols ($-\text{OH}$), aldehyde group ($-\text{CHO}$), carboxylic group ($-\text{COOH}$), ketone ($-\text{CO}$) etc.

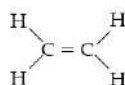
122. Why certain compounds are called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur. [Board Question]

Ans. Compounds containing only carbon and hydrogen are called hydrocarbons.

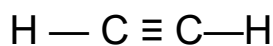
General formula for the homologous series of alkanes is $\text{C}_n\text{H}_{2n+2}$. First member of the alkane family is methane.



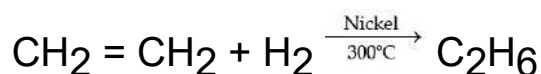
General formula for the homologous series of alkenes is C_nH_{2n} . First member of the alkene family is ethene.



General formula for the homologous series of alkynes is $\text{C}_n\text{H}_{2n-2}$. First member of the alkyne family is ethyne.



Catalytic hydrogenation is the reaction used to convert alkenes to alkanes.



Ethene Ethane

123. Answer the following questions:

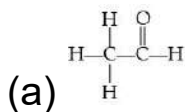
- (i) What is meant by a functional group? Explain with an example.
- (ii) Write three common functional groups present in organic compounds. Give their symbols/formulae.
- (iii) Name the functional groups present in the following compounds:
- (a) CH_3COOH , (b) $\text{CH}_3\text{CH}_2\text{CHO}$, (c) $\text{C}_2\text{H}_5\text{OH}$, (d) $\text{CH}_3\text{COCH}_2\text{CH}_3$.
- (iv) Name the functional group which always occurs in the middle of a carbon chain.
- (v) Draw the structures for the following compounds:
- (a) Ethanal, (b) Propanal, (c) Butanal, (d) Pentanal.

Ans. (i) An 'atom' or 'a group of atoms' which makes a carbon compound (or organic compound) reactive and decides its properties (or functions) is called a functional group. The aldehyde group, $-\text{CHO}$, present in ethanol, $\text{C}_2\text{H}_5\text{CHO}$, is an example of a functional group.

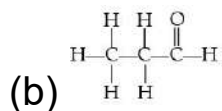
- (ii) 1. Halo group: $-\text{X}$ 2. Aldehyde group: $-\text{CHO}$
3. Alcohol group: $-\text{OH}$

- (iii) (a) Carboxylic acid group
(b) Aldehyde group
(c) Alcohol group
(d) Ketone group

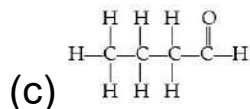
- (iv) Ketone group, $-\text{CO}-$



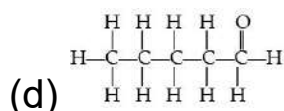
Ethanal



Propanal



Butanal



Pentanal

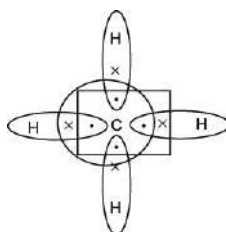
124. What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound. Why are such compounds: [\[Board Question\]](#)

- (i) poor conductors of electricity and
- (ii) have low melting and boiling points? What happens when this compound burns in oxygen?

Ans. Methane is a hydrocarbon formed by the combination of carbon with hydrogen.

Its molecular formula is CH_4 . It is a main greenhouse gas. The type of bond formed in methane is covalent bond.

Electron dot structure of methane (CH_4):

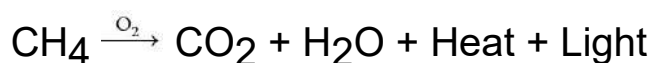


- (i) Covalent compounds are poor conductors of electricity because it

has no free electrons to conduct electricity. Moreover this compound is formed by sharing of electrons. So no electron is available for the conduction.

(ii) They have weak forces of attraction between them so less energy is required to break the force of binding. Thus they have low melting and boiling points.

When this compound burns in oxygen, combustion reaction takes place.



Methane

125. Write the balanced chemical equation for the following:
[Board Question]

- (i) Methane is burned in sufficient air.
- (ii) Ethanol is treated with sodium.
- (iii) Ethanoic acid is reacted with sodium hydroxide.
- (iv) Ethanoic acid is treated with sodium carbonate.
- (v) Ethanol is mixed with ethanoic acid in the presence of an acid.

Ans. (i) $\text{CH}_4 + 5\text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{heat} + \text{Light}$

(ii) $2\text{CH}_3\text{—CH}_2\text{—OH} + 2\text{Na} \rightarrow$

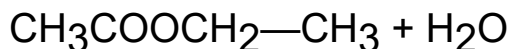
$2\text{C}_2\text{H}_5\text{—ONa} + \text{H}_2$

(iii) $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$

(iv) $\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow$

$2\text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$

(v) $\text{CH}_3\text{COOH} + \text{CH}_3\text{—CH}_2\text{—OH} \rightarrow$



126. Write the chemical formula and name of the compound which is the active ingredient of all alcoholic drinks. List its two uses. Write chemical equation and name of the product formed when this compound reacts with: [\[Board Question\]](#)

(i) sodium metal

(ii) hot concentrated sulphuric acid

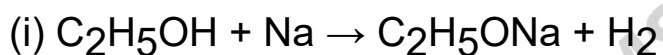
Ans. The name of the ingredient of the alcoholic drink is ethanol.

Its formula is $\text{C}_2\text{H}_5\text{OH}$.

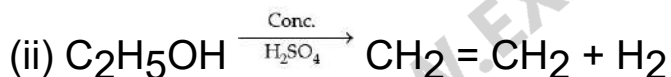
Two uses of ethanol ($\text{C}_2\text{H}_5\text{OH}$) are:

1. It is used as a solvent in various industries.

2. Reaction of ethanol with sodium metal.



Ethanol Sodium ethanoate



Ethanol Ethene

127. An organic compound A is widely used as a preservative in pickles and has a molecular formula $\text{C}_2\text{H}_4\text{O}_2$. This compound reacts with ethanol to form a sweet smelling compound B.

(i) Identify the compound A.

(ii) Write the chemical equation for its reaction with ethanol.

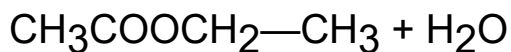
(iii) Name the product formed.

(iv) Name the process involved in the reaction.

(v) How can we get back the compound A from B?

[Board Question]

Ans. (i) The compound A is Ethanoic acid.



(iii) Ethyl ethanoate is formed.

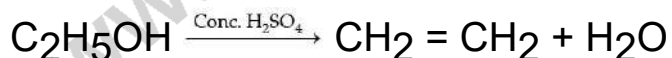
(iv) The process is known as esterification.

(v) By saponification reaction we can get back the compound A from B.

128. A carbon compound 'P' on heating with excess of Conc. H_2SO_4 forms another carbon compound Q which on addition of hydrogen in the presence of nickel catalyst forms a saturated carbon compound 'R'. One molecule of R on combustion forms two molecules of carbon dioxide and three molecules of water. Identify P, Q and R and write the chemical equations involved.

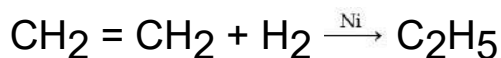
[Board Question]

Ans. P is ethanol, Q is ethene and R is ethane.

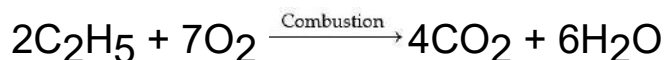


'P' 'Q'

Ethanol Ethene



Ethane



'R'

129. Answer the following questions:

(i) Give a chemical test to distinguish between saturated and

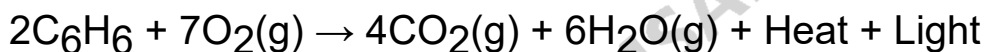
unsaturated hydrocarbon.

(ii) Name the products formed when ethane burns in air. Write the balanced chemical equation for the reaction showing type of energies liberated.

(iii) Why is reaction between methane and chlorine in the presence of sunlight considered a substitution reaction. **[Board Question]**

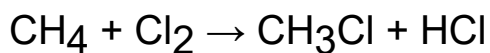
Ans. (i) Bromine water test: Solution of bromine in water is known as Bromine water. It has red brown colour. Take two test tubes, pour bromine water in both the test tubes. Now pass the vapours of given sample of hydrocarbons in both the test tubes. The hydrocarbon which decolourises bromine water is unsaturated and other one is saturated hydrocarbon.

(ii) When ethane burns in air, carbon dioxide and water vapours are formed along with heat and light.



It is an exothermic reaction.

(iii) The reaction between methane and chlorine in the presence of sunlight is considered a substitution reaction because in this reaction, hydrogen is replaced by chlorine. The reaction can be given as:



130. Explain the given reactions with the examples :

(i) Hydrogenation reaction

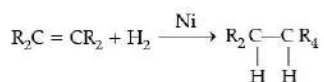
(ii) Oxidation reaction

(iii) Substitution reaction

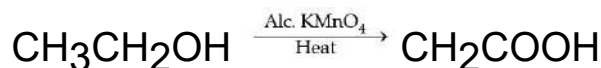
(iv) Saponification reaction

(v) Combustion reaction

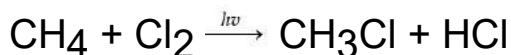
Ans. (i) Unsaturated hydrocarbons add hydrogen in the presence of nickel catalyst to give saturated hydrocarbons.



(ii) Ethanol is oxidised to ethanoic acid in the presence of alkaline $KMnO_4$ on heating.



(iii) In the presence of sunlight, chlorine is added to hydrocarbons.

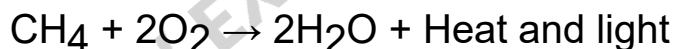


(iv) $CH_3COOC_2H_5 + NaOH \rightarrow$

Ester $CH_3COONa + C_2H_5OH$

Used in the preparation of soap

(v) Most carbon compounds release a large amount of heat and light on burning



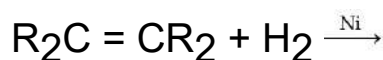
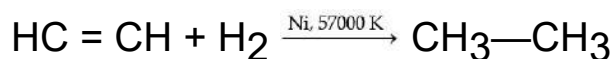
Methane

131. Answer the following questions:

(i) How can we convert unsaturated hydrocarbon into saturated hydrocarbon?

(ii) How would you distinguish experimentally between an alcohol and a carboxylic acid on the basis of a chemical property?

Ans. (i) By the addition reaction of unsaturated hydrocarbon with halo atom in the presence of catalyst.



$R_2HC-CHR_2$ (Vegetable Ghee)

This reaction is known as Hydrogenation reaction.

(ii) Take alcohol and a carboxylic acid in two separate test tubes. Add sodium hydrogen carbonate in both the test tubes. The test tube, from which the effervescence evolves, contains carboxylic acid. The effervescence is due to the evolution of carbon dioxide gas. However, from test tube containing alcohol there is no effervescence, because no carbon dioxide gas is produced there.

132. Answer the following questions:

- (i) Explain the process of preparation of soap in laboratory.
- (ii) Why is common salt (sodium chloride) added during the preparation of soap?
- (iii) Why is soap not suitable for washing clothes when the water is hard?

Ans. (i) Soap can be prepared in the laboratory as follows:

1. Take about 20 ml of castor oil (cottonseed oil, linseed oil or soya bean oil) in a beaker.
2. Add 30 ml of 20% sodium hydroxide solution to it.
3. Heat the mixture with constant stirring till a paste of soap is formed.
4. Then add 5 to 10 grams of common salt (sodium chloride).
5. Stir the mixture well and allow it to cool. On cooling the solution, solid soap separates out.
6. When the soap sets, it can be cut into pieces called 'soap bars'.

(ii) Common salt is added to the mixture to make the soap come out of solution. Though most of the soap separates out on its own but some of it remains in solution. Common salt is added to precipitate

out all the soap from the aqueous solution.

(iii) When soap is used for washing clothes with hard water, a large amount of soap in water reacts with the calcium and magnesium ions of hard water to form an insoluble precipitate called scum, before it can be used for the real purpose of washing.

133. What are detergents chemically? List two merits and two demerits of using detergents for cleansing. State the reason for the suitability of detergents for washing, even in the case of water having calcium and magnesium ions.

[Board Question]

Ans. Detergents are chemically sodium or potassium salts of sulphonic acid of benzene or alkene.

Merits of detergents for cleansing:

1. Detergents can work well with both hard water and soft water.
2. Detergents are more effective than soaps.
3. Detergents contain synthetic chemical so they tend to provide more cleaning power.
4. Detergents are made with chemical substances so they can be modified for specific purposes such as laundry detergents etc.
5. Detergents are more easily soluble in water.

Demerits of detergents for cleansing:

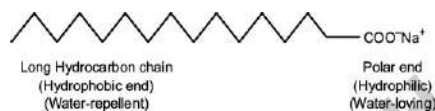
1. They are expensive.
2. They can create water pollution.
3. Detergents are formed with synthetic chemicals with few natural sources therefore they are usually non-biodegradable.
4. They can cause soil pollution.
5. Excessive alkali used in some detergents can damage the fabric.

Detergents are suitable for hard water having magnesium and calcium ions because they do not form insoluble salts with these ions.

134. What is the difference between the chemical composition of soaps and detergents ? State in brief the action of soaps in removing an oily spot from a shirt. Why are soaps not considered suitable for washing where water is hard?

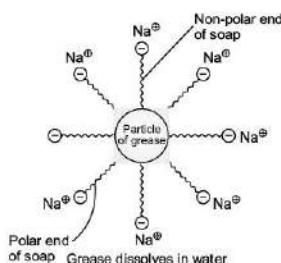
[Board Question]

Ans. Soaps are sodium or potassium salts of fatty acids having COONa group whereas detergents are sodium or potassium salts of sulphonic acids having $\text{—SO}_3\text{Na}$ and $\text{—SO}_4\text{Na}$ group.



Cleansing action of soap: Soap molecules have two ends one is hydrophobic *i.e.*, water repelling and other is water loving *i.e.*, hydrophilic as shown in figure.

When a soap is dissolved in water, the molecules associate together as clusters called micelles in which water molecules, being polar in nature, surround the ions and the hydrocarbon part of the molecule attracts grease, oil and dirt.



Inside water, clusters of molecules are formed in which the hydrophobic tails are in the interior of the cluster and ionic ends are present on the surface of cluster. This formation is called micelle formation.

To wash away the loosened dirt particles in the form of micelles from the surface of the cloth, it is either scrubbed mechanically, beaten or agitated in washing machine. In the form of a micelle, soap is able to clean, since the oily dirt is being collected in the centre of micelle.

135. What are micelles? Why does it form when soap is added to water? Will a micelle be formed in other solvents such as ethanol also? State briefly how the formation of micelle help to clean the clothes having oily spots. [\[Board Question\]](#)

Ans. A soap molecule has two parts; one is non-polar, hydrophobic and other is polar- hydrophilic. When soap is added to it, the polar ends dissolve in water while the non-polar end dissolve in each other. As a result, micelle formation takes place. Since soap is soluble in ethanol, micelle formation does not take place. The micelle formation takes place because their hydrocarbon chains come together and the polar ends are projected outwards. The dirt present on clothes is organic in nature and insoluble in water. Therefore, it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then, the molecules of soap arrange themselves in micelle formation and trap the dirt at the centre of the cluster. These micelles remain suspended in the water. Hence, the dust particles are easily rinsed away by water.

 Differentiate Between 

136. Differentiate between diamond and graphite.

Ans.	Diamond		Graphite	
	Diamond		Graphite	
	Diamond		Graphite	
1.	Diamond has 3-dimensional network structure.		Graphite has hexagonal sheet layer structure.	
2.	Each carbon in diamond is bonded to four other carbon		Each carbon has one free electron with it.	

	atoms.	
3.	No free electron is left.	It is a good conductor of electricity.
4.	It is a bad conductor of electricity.	It is soft and slippery.

137. List two differences between saturated and unsaturated hydrocarbons.

Ans. Two differences between saturated and unsaturated hydrocarbons are:

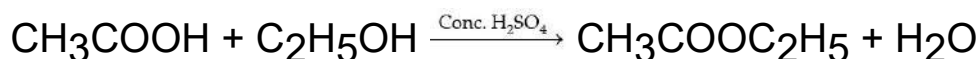
	Saturated Hydrocarbon	Unsaturated Hydrocarbon
1.	In these compounds, there is a single bond between carbon atoms.	In these compounds, there is a double or triple bond between carbon atoms.
2.	They give a clean flame on heating.	They give yellow flame with a lot of black smoke on burning.
3.	On burning, saturated hydrocarbons give a clean flame.	On burning, unsaturated hydrocarbons give yellow flame with lots of black smoke.

138. Give a chemical test to distinguish between butter and cooking oil.

Ans. Alkaline potassium permanganate can be used to distinguish between butter and cooking oil. Cooking oil decolorises the pink colour of alkaline potassium permanganate whereas butter does not. This shows that cooking oil is unsaturated and butter is saturated.

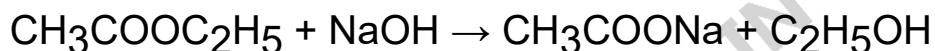
139. Distinguish between esterification and saponification reactions with the help of chemical equations for each. State one use of each: (i) Esters (ii) Saponification. [\[Board Question\]](#)

Ans. Esterification: In this reaction, an alcohol reacts with a carboxylic acid in the presence of Conc. H_2SO_4 to form sweet smelling compounds called esters. This reaction is used in the manufacture of paints, varnishes, lacquers, medicines, dyes, soaps and synthetic rubber.



Ethanoic acid Ethanol Ethyl ethanoate

Saponification: When an ester reacts with sodium hydroxide, sodium salt of acid and alcohol is formed. It is used in preparation of soaps.



Ethyl Sodium Sodium Ethanol

ethanoate hydroxide ethanoate

140. How would you distinguish experimentally between an alcohol and a carboxylic acid?

Ans. We can distinguish between an alcohol and a carboxylic acid on the basis of their reaction with carbonates and hydrogen carbonates. Acid reacts with carbonate and hydrogen carbonate to evolve CO_2 gas that turns lime water milky.

Metal Carbonate / Metal Hydrogen carbonate + Carboxylic acid

↓

Salt + Water + Carbon dioxide

Alcohols, on the other hand, do not react with carbonates and hydrogen carbonates.

141. Give a test to distinguish between:

(i) Ethane and Ethene (ii) Ethanol and Ethanoic acid (iii) Soaps and Detergents.

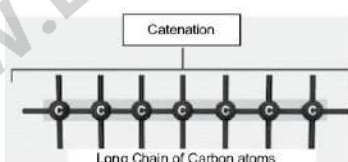
Ans. (i) Ethene decolourizes the Reddish brown colour of Bromine water while ethane does not.

(ii) Ethanoic acid gives a brisk effervescence with sodium hydrogen carbonate while ethanol does not.

(iii) Soaps form curdy white precipitate or scum with hard water while detergents do not form any precipitate.

Analysis and Evaluation Based Questions

142. Carbon is so versatile in nature that organic chemistry forms a separate branch of chemistry which deals mainly with carbon and its compounds. Carbon is an element with symbol “C”, atomic number 6. Carbon element have property of catenation. Carbon has a valency of four. So, it is capable of bonding with four other atoms of carbon or atoms of some other monovalent element. Compounds of carbon are formed with oxygen, nitrogen, hydrogen, sulphur, chlorine and many other elements, giving rise to compounds with specific properties which depend on the elements other than the carbon present in the molecule.



(i) Name the term used to define property of carbon to form bond with another carbon atom.

(ii) Name the group and period to which carbon belong.

(iii) Name the term used for four valency of carbon.

(iv) Which of these statements is incorrect?

(a) Valence electrons of carbon are 4.

(b) Carbon has a valency of four.

(c) Organic chemistry forms a separate branch of chemistry which deals mainly with carbon and its compounds.

(d) Electronic configuration of carbon is 2,6.

Ans. (i) Catenation is the term used to define property of carbon to form bond with another carbon atom.

(ii) Carbon belongs to second period and fourteenth group of periodic table.

(iii) The term used for four valency of carbon is tetravalency.

(iv) Total electrons present in carbon are 6. Out of these 6 electrons, 2 are present in first shell and other four in next shell. This gives electronic configuration of carbon to be 2,4. Hence, the incorrect option is (d).

143. The solid element A exhibits the property of catenation. It is also present in the form of a gas B in the air which is utilised by plants in photosynthesis. An allotrope C of this element is used in glass cutters.

(i) What is element A?

(ii) What is the gas B?

(iii) Name the allotrope C.

(iv) State another use of allotrope C (other than in glass cutters).

(v) Name another allotrope of element A which exists as spherical molecules.

(vi) Name a yet another allotrope of element A which conducts electricity.

Ans. (i) Element A: Carbon

(ii) Gas B: Carbon dioxide

(iii) Allotrope C: Diamond

(iv) Used for making jewellery

(v) Buckminsterfullerene

(vi) Graphite

144. A colourless organic liquid X of molecular formula $C_2H_4O_2$ turns blue litmus to red. Another colourless organic liquid Y of molecular formula C_2H_6O has no action on any litmus but it is used as a nail polish remover. A yet another colourless organic liquid Z of molecular formula C_2H_6O has also no action on litmus but it is used in tincture of iodine.



(i) Name the liquid X. To which homologous series does it belong ? Give the name of another member of this homologous series.

(ii) Name the liquid Y. To which homologous series does it belong ? Write the name of another member of this homologous series.

(iii) Can you name an organic compound having the same molecular formula as liquid Y but which belongs to a different homologous series? What is this homologous series?

(iv) Name the liquid Z. To which homologous series does it belong ? Write the name of another member of this homologous series.

Ans. (i) Liquid X is ethanoic acid; it belongs to homologous series of carboxylic acids. Methanoic acid is another member of this homologous series.

(ii) Liquid Y is Propanone; it belongs to homologous series of ketones. Butanone is another member of this homologous series.

(iii) Propanal; it belongs to homologous series of aldehydes.

(iv) Liquid Z is ethanol; it belongs to homologous series of alcohols. Methanol is another member of this homologous series.

145. An organic compound A having the molecular formula C_3H_8O is a liquid at room temperature. The organic liquid A reacts with sodium metal to evolve a gas which burns causing a little explosion. When the organic liquid A is heated with concentrated sulphuric acid at $170^\circ C$, it forms a compound B which decolourises bromine water. The compound B adds on one molecule of hydrogen in the presence of Ni as catalyst to form compound C which gives substitution reactions with chlorine.

- (i) What is compound A?
- (ii) What is compound B?
- (iii) What type of reaction occurs when A is converted into B?
- (iv) What is compound C?
- (v) What type of reaction takes place when B is converted into C?

Ans. (i) A is propanol, $CH_3-CH_2-CH_2OH$.

(ii) B is propene, $CH_3CH=CH_2$.

(iii) Dehydration reaction.

(iv) C is propane, $CH_3CH_2-CH_3$.

(v) Addition reaction.

146. Two compounds 'X' and 'Y' have the same formula $C_2H_4O_2$. One of them reacts with sodium metal to liberate H_2 and CO_2 with $NaHCO_3$. Second one does not reacts with Na metal and $NaHCO_3$ but undergo hydrolysis with $NaOH$ to form salt of carboxylic acid and compound 'Z' which is called wood spirit. Identify 'X', 'Y', and 'Z' and write chemical equation for

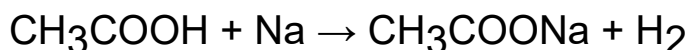
the reaction involved.

Ans. Let us assume that compound X reacts with sodium metal to liberate H₂ and CO₂.

\ 'X' is acetate acid (CH₃COOH)

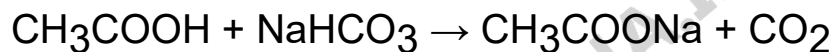
Acetic acid reacts with sodium to liberate H₂

The reaction is as follows:

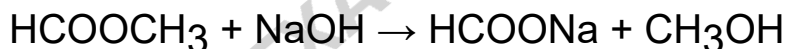


It reacts with NaHCO₃ to liberate CO₂.

The reaction is as follows:



Element 'Y' undergoes hydrolysis with NaOH to form salt of carboxylic acid. It means that 'Y' is an ester, Methyl methanoate. The reaction is as follows:



Methyl Sodium Sodium Methanol

methanoate hydroxide formate

\ Compound 'Z' is methanol.

147. An organic compound X is an essential constituent of wine and bear. X is responsible for intoxication caused by these drinks. X on oxidation gives Y which is present in vinegar.

(i) Identify X and Y. Write the structural formula.

(ii) Write the reaction involved.

Ans. (i) Organic compound 'X' is ethanol (C₂H₅OH) and compound Y is ethanoic acid (CH₃COOH)



148. An organic compound A (molecular formula $\text{C}_2\text{H}_4\text{O}_2$) reacts with Na metal to form a compound B and evolves a gas which burns with a pop sound. Compound A on treatment with an alcohol C in the presence of a little of concentrated sulphuric acid forms a sweet-smelling compound D (molecular formula $\text{C}_3\text{H}_6\text{O}_2$). Compound D on treatment with NaOH solution gives back B and C. Identify A, B, C and D.

Ans. A is ethanoic acid, CH_3COOH .

B is sodium ethanoate, CH_3COONa .

C is methanol, CH_3OH .

D is methyl ethanoate, $\text{CH}_3\text{COOCH}_3$.

149. A hard material X which is mined from the earth is used as a household fuel and also for the generation of electricity at thermal power stations. A soft material Y is also used as a fuel in the form of candles. A gaseous material Z which occurs along with petroleum is increasingly being used as a fuel in running vehicles in its compressed form.

(i) What are materials, X, Y and Z?

(ii) When materials X, Y and Z are burned separately:

(a) Which material burns by producing a yellow, luminous flame?

(b) Which material ultimately burns without producing a flame?

(c) Which material can burn in a gas stove by producing a blue flame?

Ans. (i) X is coal; Y is wax; Z is natural gas.

(ii) (a) Y (wax) (b) X (coal) (c) Z (natural gas)

150. A student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid. List two main observations he must note in his notebook, about the reaction that takes place. Also write the chemical equation for the reaction.

[Board Question]

Ans. When acetic acid is added to NaHCO_3 solution, the two main observations that the student must note in his notebook are as follows:

1. Evolution of carbon dioxide gas with brisk effervescence is observed.
2. Colourless and odourless gas is evolved with the generation of heat.

151. A student is studying the properties of acetic acid. List two physical properties of acetic acid he observes. What happens when he adds a pinch of sodium hydrogen carbonate to this acid. Write any two observations. **[Board Question]**

Ans. Acetic acid is colourless liquid and is soluble in water. When a pinch of sodium hydrogen carbonate is added to it, brisk effervescence with evolution of colourless and odourless gas is observed.

152. A student puts a drop of reaction mixture of a saponification reaction first on a blue litmus paper and then on red litmus paper. Write down the observations. **[Board Question]**

Ans. There is no change in blue litmus paper and red litmus paper turns blue.

153. A student adds 2 mL of acetic acid to a test tube containing 2 mL of distilled water. He then shakes the test tube well and

leaves it to settle for some time. What are the observations after sometime?

[Board Question]

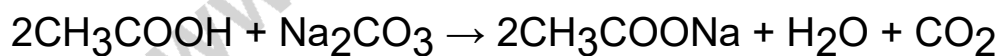
Ans. Acetic acid is soluble in water. Molecules of acetic acid behave like a weak acid and gets dissolved in it to give a clear transparent colourless solution.

154. Take about 3 mL of ethanol in a test tube and warm it gently in a water bath. What happens when 5% solution of alkaline potassium permanganate drop by drop is added to this?

Ans. When potassium permanganate is added drop by drop then its colour disappears initially but more of it is added, then the colour will remain as such.

155. What will be formed when ethanoic acid reacts with sodium carbonate?

Ans. When ethanoic acid reacts with sodium carbonate, a brisk effervescence of carbon dioxide is observed. The salt formed due to this reaction is sodium ethanoate. The chemical reaction is as follows:



156. Ethanoic acid was added to sodium bicarbonate solution and the gas evolved was tested with a burning splinter. The following four observations were reported:

- (i) the gas burns with the pop sound and the flame gets extinguished.
- (ii) the gas does not burn out but the splinter burns with a pop sound.
- (iii) the flame extinguishes and the gas does not burn.
- (iv) the gas burns with a blue flame and the splinter burns brightly.

Which of the following is a correct explanation?

Ans. The flame extinguishes and the gas does not burn.

157. A student prepared 20% sodium hydroxide solution in a beaker to study saponification reaction. Some observation related to this are given below.

- (i) Sodium hydroxide solution turns red litmus blue.
- (ii) Sodium hydroxide readily dissolves in water.
- (iii) The beaker containing solution appears cold when touched from outside.
- (iv) The blue litmus paper turns red when dipped into the solution.

What are the correct observation?

Ans. Sodium hydroxide is a strong base so it turns red litmus blue. It is ionic in nature so readily dissolves in water to give Na^+ and OH^- ions. The process of dissolution of NaOH in water is exothermic so the beaker containing solution appears hot and not cold. The correct observations are only I and II.

158. For preparing a soap in laboratory, we require an oil and a base. Which combinations of an oil and a base would be best suited for the preparation of soap?

Ans. Castor oil and sodium hydroxide are best suited for soap because castor in soaps contributes to fluffy, stable lather, conditioning, moisturizing, quicker trace, softer soap whereas sodium hydroxide is a strong base soluble in water. Hence, castor oil and sodium hydroxide are best oil and base we can use to prepare soap in laboratory.

159. Hard water is not available for an experiment. Some salts are given below : (I) Sodium chloride (II) Sodium sulphate (III) Calcium chloride (IV) Calcium sulphate (V) Potassium chloride (VI) Magnesium sulphate. Select from the following a group of

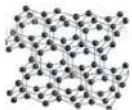


these salts, each member of which may be dissolved in water to make it hard.

[Board Question]

Ans. Hard water is that water which contains salts of calcium and magnesium. Thus, the salts which can be used are Calcium Chloride, Calcium Sulphate and Magnesium Sulphate. i.e., III, IV and VI.

Creating Based Questions

160. From the given table, answer the following questions :

	Column I	Column II
1.		<ul style="list-style-type: none">• Used as gems and for making jewellery.• They can be synthesized by subjecting pure carbon to very high pressure and temperature.
2.		<ul style="list-style-type: none">• Used in several lubricant products, such as grease and forging lubricants, in blast furnace linings.• Its amorphous form is used in the manufacturing of lead used in pencils.
3.		<ul style="list-style-type: none">• Used as an anti-aging and anti-damage agent in the cosmetic sector, and used as antiviral agents.• Poor conductor of electricity.

(i) Identify all three structures mentioned in the table.

(ii) What type of property bound these following structures?

(iii) Which one is the good conductor of electricity?

(iv) What is difference between the first two structures?

Ans. (i) 1. Dimond

2. Graphite

3. Buckminsterfullerene

(ii) Catenation property

(iii) Graphite.

(iv) Diamond is the hardest substance while graphite is smooth and slippery and also graphite is good conductor of electricity.

161. Predict which kind of flame you would probably obtain in following cases :

Substance	Conditions of burning	Type of flame
Oil	Presence of air(i).....
Oil	Absence of air(ii).....
Naphthalene	Presence of air(iii).....
Ethyl alcohol	Presence of air(iv).....

Ans. (i) Clear flame

(ii) Sooty flame

(iii) Sooty flame

(iv) Clear flame

162. Complete the following table given below :

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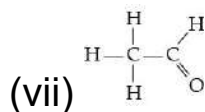
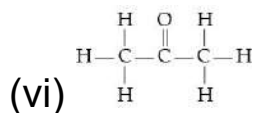
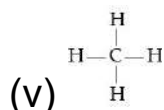
Compounds	Molecular formula	Structural formula
(i) _____	CH ₄	(v) _____
Propanone	C ₃ H ₆ O	(vi) _____
(ii) _____	H ₃ CCHO	(vii) _____
(iii) _____	(iv) _____	H—C ≡ C—H

Ans. (i) Methane

(ii) Ethanal

(iii) Ethyne

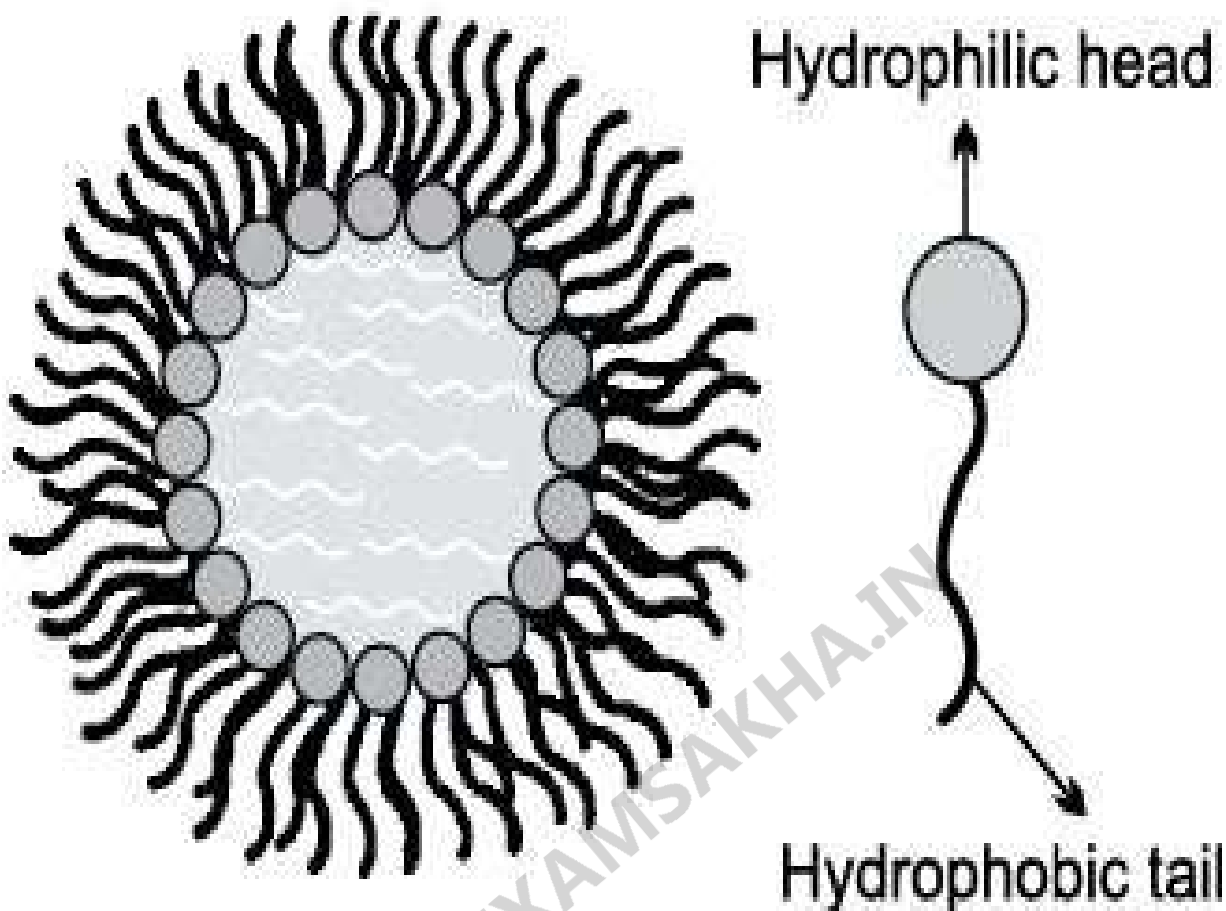
(iv) C₂H₂



163. Answer the following questions:

(i) Draw the structure of the micelle formed upon dissolving a soap in oil medium. Explain the formation of such structure.

(ii) Can you think of a solvent in which soap would not be able to form micelle ?



Hydrophobic medium (organic solvent)

Ans. (i) The molecules of soap are sodium or potassium salts of long chain carboxylic acid. The ionic end (hydrophilic of soap interacts with water and the hydrocarbon chain end (hydrophobic) interacts with oil, dirt or grease to form a spherical structure known as micelle. But when the medium is oil or fat the structure of micelle formed is reversed and the hydrocarbon chain face outward to give reverse micelle, as shown in structure given below :

(ii) Any solvent which interacts with both the hydrophilic and hydrophobic parts of soap would not be able to form micelle. Example – Ethanol.

164. What is catenation?

165. Define allotropy.

166. Which of the following is used in pencil lead?

- (a) Diamond
- (b) Graphite
- (c) Coke
- (d) All of these

167. Which of the following is not a characteristic of graphite?

- (a) Soft and slippery
- (b) Good conductor of electricity
- (c) Heavier than diamond
- (d) Contains free electrons

168. Which one is called buckminsterfullerene?

- (a) C₆₀
- (b) C₇₀
- (c) C₈₀
- (d) C₉₀

169. What are non-crystalline allotropes of carbon?

170. What do you mean by isomers?

171. Which of the following gas is used in welding and cutting metals?

- (a) Ethene
- (b) Ethane
- (c) Ethyne

(d) All of these

172. If hydrocarbon contains three carbon atoms, then the prefix will be:

(a) Eth

(b) Prop

(c) But

(d) Pent

173. Which of the following is an example of triple bond?

C_2H_6 , C_2H_2 , C_2H_4 , C_3H_4

174. Classify the following compounds as alkanes, alkenes and alkynes: C_2H_4 , C_3H_4 , C_4H_8 , C_5H_{12} , C_5H_8 , C_3H_8 , C_6H_6 .

175. Assertion: Carbon and its compounds are used as fuels.

Reason: They give lot of heat and light when burnt in air.

176. Which of the following are called soft soaps?

(a) Sodium salts

(b) Magnesium salts

(c) Calcium salts

(d) Potassium salts

177. Define soaps and detergents.

178. Hard water do not produce foam with soap easily. Why?

179. What is the nature of aqueous solution of soaps?

180. Which types of ends are present in soap molecule?

181. What is the nature of aqueous solution of soaps?

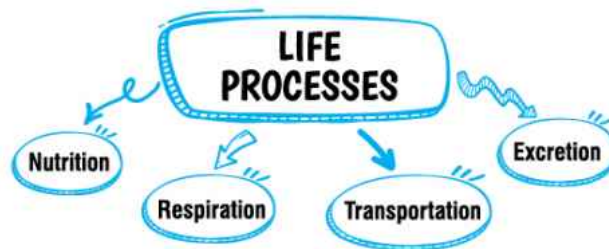
Life Processes

Chapter 6

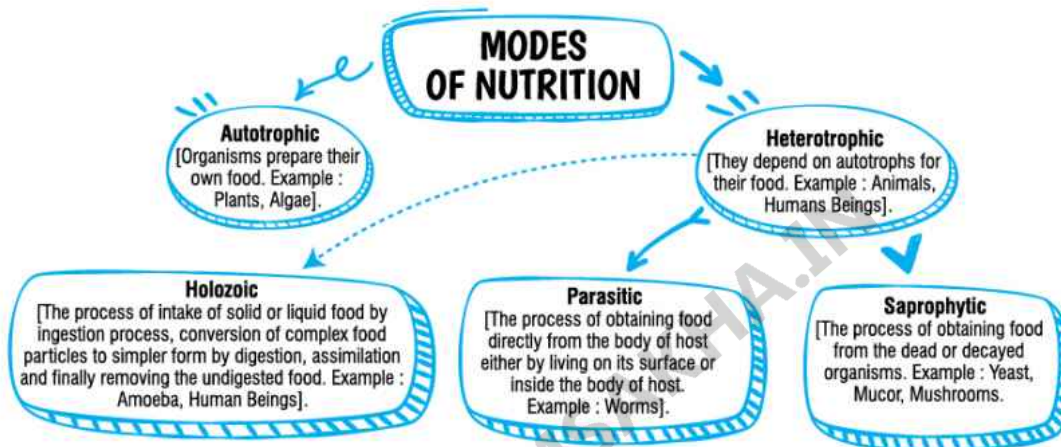
Summary

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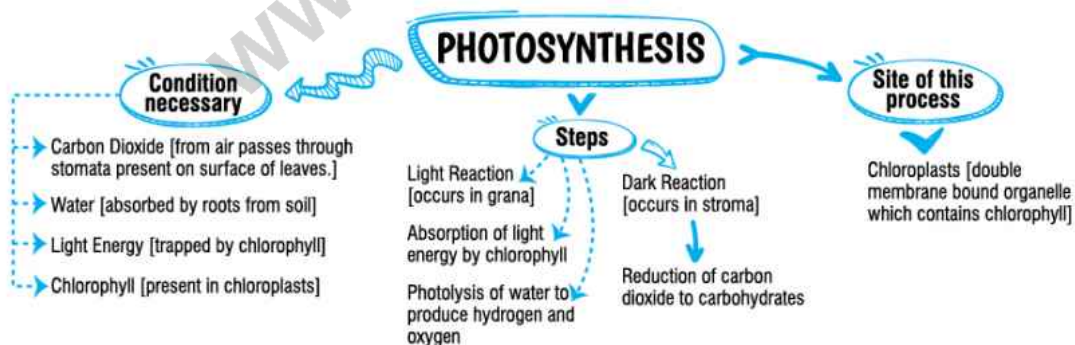
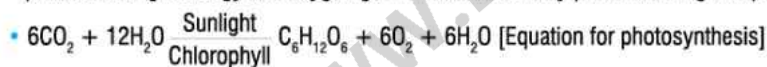
- Living beings are complex organisations of molecules which perform various life processes like growth, respiration, digestion, reproduction, excretion etc., which makes them different from non-living.
- The basic processes or functions performed by living organisms to keep them alive are called life processes.



- Nutrition is defined as the process of intake of nutrients and its utilisation by an organism in various biological activities.

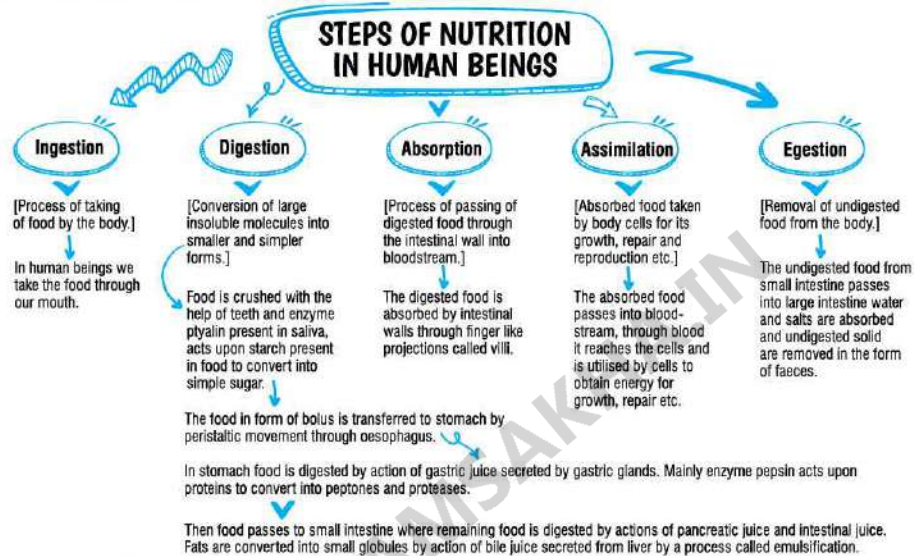


- In autotrophic mode of nutrition, organisms prepare their own food and they are called autotrophs. Organisms prepare food by the process of photosynthesis.
- Photosynthesis is the process by which chlorophyll containing cells prepare glucose using carbon dioxide and water in presence of light energy and oxygen gas is released as a by product during this process.

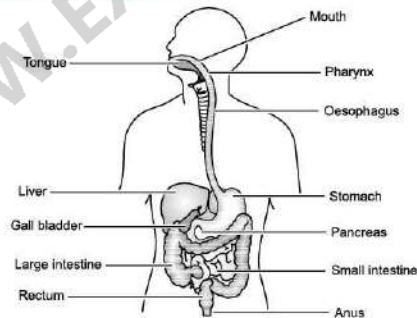


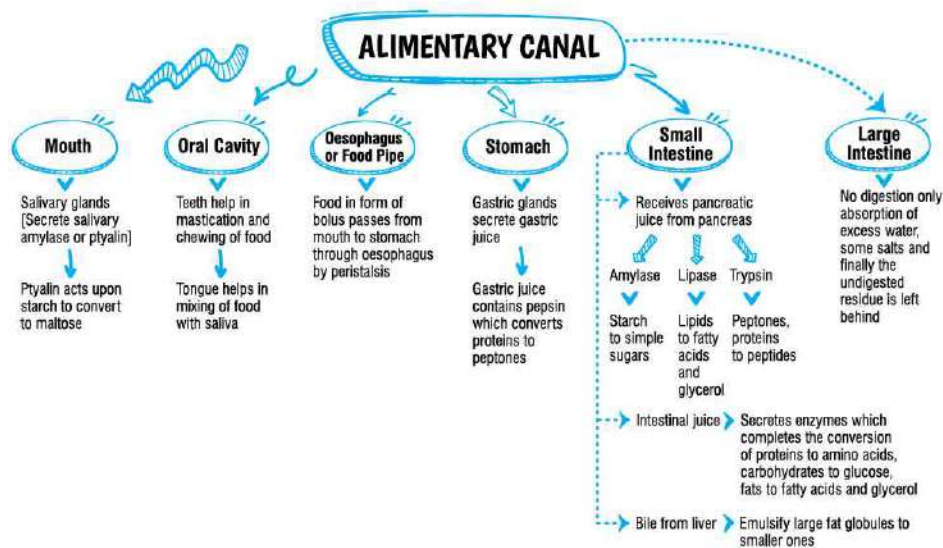


• STEPS OF NUTRITION IN HUMAN BEINGS

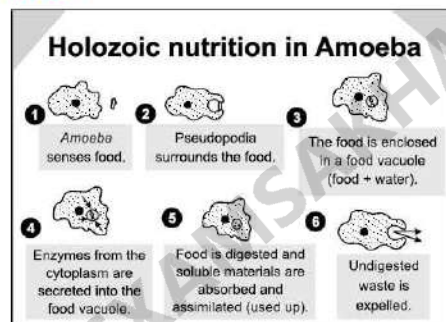


• ORGANS OF THE DIGESTIVE SYSTEM



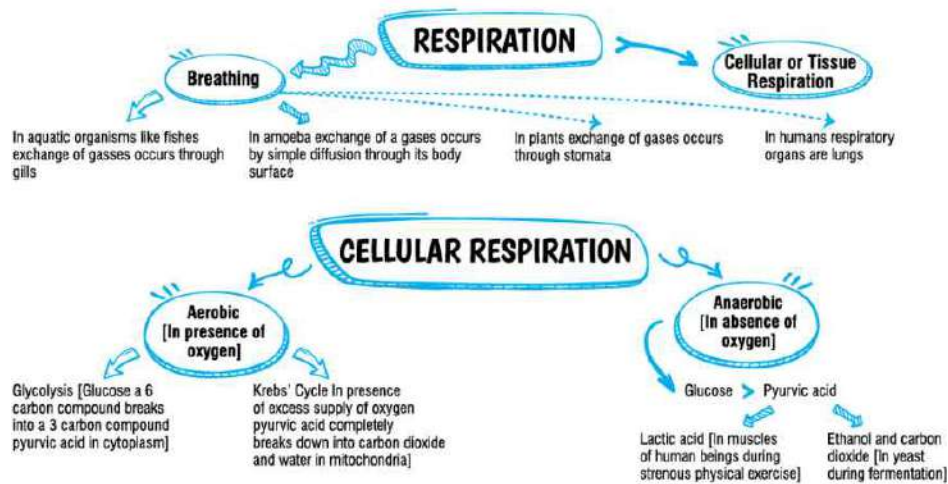


• NUTRITION IN AMOEBIA

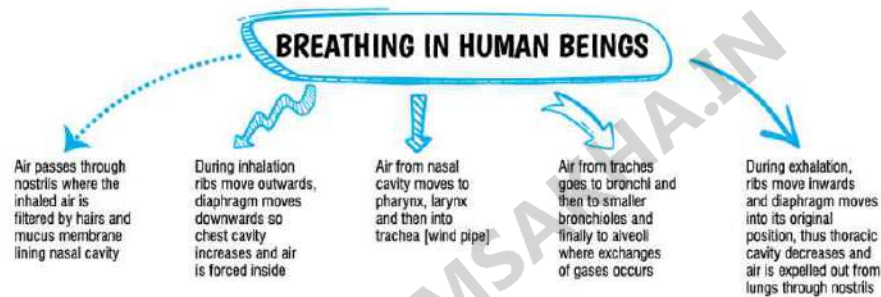


• RESPIRATION

- Respiration is a biological process by which glucose is oxidized to release energy in the form of ATP which is the energy currency of the cell.
- $$C_6H_{12}O_6 + 6O_2 \xrightarrow{\text{Sunlight}} 6CO_2 + 6H_2O + \text{Energy [Equation for respiration]}$$
- During aerobic respiration, 38 molecules of ATP are released whereas during anaerobic respiration only 2 molecules of ATP are released.
- Tobacco is a plant and its leaves are smoked, chewed, or sniffed for a variety of effects. Tobacco contains nicotine, an addictive substance. Smoked tobacco products include cigarettes, cigars, bidis, and kreteks.
- Smoking can destroy the cilia or tiny hairs in the airway that keep dirt and mucus out of lungs.

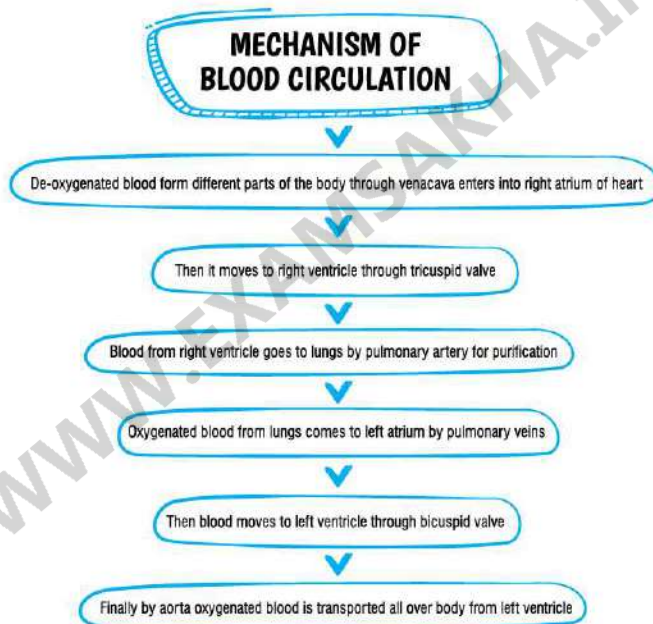
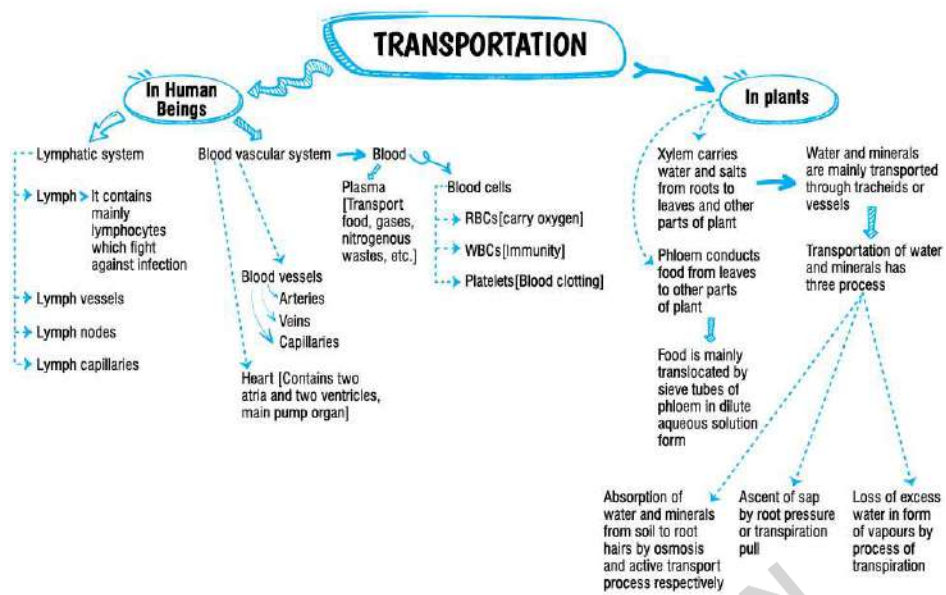


• BREATHING PROCESS IN HUMAN BEINGS

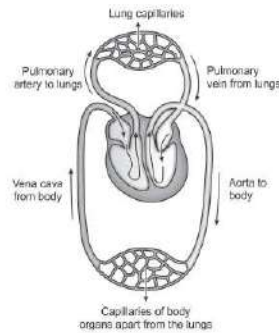


• TRANSPORTATION

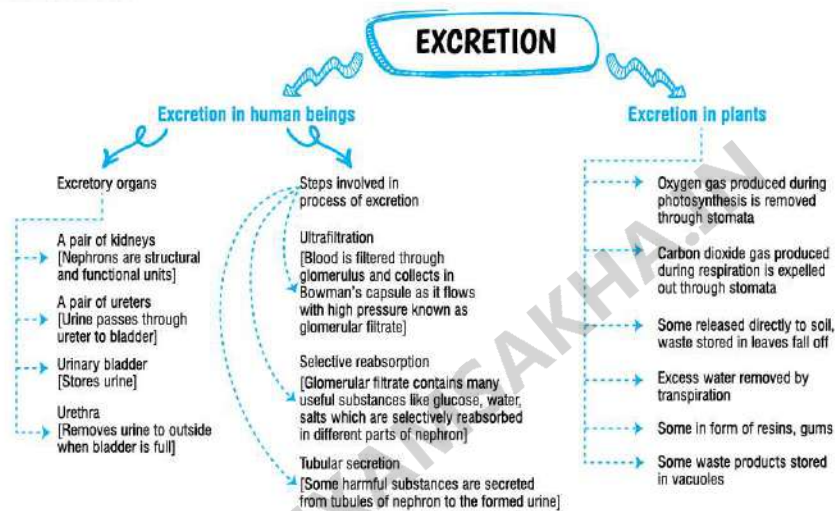
- The essential substances like food, water, oxygen etc., need to be carried from one part of the body to another which is done by transport system.
- Arteries carry oxygenated blood except pulmonary artery.
- Veins carry deoxygenated blood except pulmonary vein.
- Capillaries are thin walled blood vessels where exchange of gases and materials like food occurs.
- Valves allow the blood to flow in one direction i.e., they prevent back flow of the blood.
- When blood flows from atria to ventricles atria contracts and ventricle relaxes, this is called ventricular diastole.
- When blood flows from ventricles to blood vessels, ventricles contract and atrium relaxes, this is called ventricular diastole.
- The force exerted by blood on the walls of blood vessels is called blood pressure.
- The normal blood pressure of human beings is 120/80 mm of Hg.
- As blood flows in our heart twice so circulation in human beings is called double circulation.



• DOUBLE CIRCULATION



• EXCRETION



- The process of removal of mainly nitrogenous waste substances from our body is called excretion.
- In case of kidney failure due to infections or injury or other factors artificial kidney is used.
- Artificial kidney is a device that removes nitrogenous wastes from our body by dialysis.
- Organ donation is the donation of biological tissue or an organ of the human body, from a living or dead person to a living recipient in need of a transplantation. Organ transplantation is the only option to save lives in patients affected by terminal organ failures and improve their quality of life.

Definitions

1. Life Processes: The processes like nutrition, respiration, growth, excretion etc. which together keep the living organisms alive and perform the function of body maintenance are called life processes.

2. Autotrophic nutrition: It is the mode of nutrition in which

organisms prepare their own food by utilising the raw materials from the surroundings and thus, do not depend on others for their food.

3. Photosynthesis: It is a biological process in which organisms prepare their own food by using inorganic raw materials like water, carbon dioxide in presence of chlorophyll and sunlight or light energy and oxygen is evolved as a byproduct during this process.

4. Chlorophyll: It is a green pigment found within the chloroplasts of green plants and some algae which traps solar energy for the process of photosynthesis.

5. Light reaction: The series of reactions which occurs only in presence of light inside the granum of chloroplast where there is formation of oxygen molecule due to photolysis of water and production of assimilatory powers like NADPH and ATP.

6. Dark reaction: The series of reactions in which carbon dioxide is converted to glucose in absence of light utilising the assimilatory powers like NADPH and ATP in stroma of chloroplast.

7. Photolysis: The reaction in which water splits to produce hydrogen , protons, electrons and oxygen by using light energy trapped by chlorophyll.

8. Heterotrophic nutrition: It is the mode of nutrition in which the organisms depends upon other organisms for food *i.e.*, they obtain their food from autotrophs.

9. Holozoic nutrition: It is the mode of nutrition in which an organism feeds on solid food which is a complex organic matter by the process of ingestion, then the food is subsequently digested and absorbed and finally undigested residue is removed from the body.

10. Peristalsis: The contraction and expansion movement of muscular wall of oesophagus when food (bolus) passes from mouth to stomach.

11. Chyme: It is the semi solid paste formed by the churning of partially digested food from the stomach mixed with gastric juice secreted by the stomach.

12. Respiration: It is a complex process which involves gaseous exchange i.e., oxygen is taken in and carbon dioxide is given out as well as oxidation of glucose in cells to release chemical energy in the form of ATP.

13. Transportation: It is a life process in which a substance synthesized or absorbed in one part of the organism is carried to the other parts of the body.

14. Excretion: It is a biological process where there is removal of nitrogenous wastes from our body produced due to metabolism.

15. Osmoregulation: The process of maintaining a constant osmotic condition in the body by regulating the water and solute concentration of body fluids.

16. Dialysis: It is an artificial process of removal of metabolic wastes and excess water from the body by using a machine in order to maintain the normal water and solute concentration in our body.

Multiple Choice Questions

17. The autotrophic mode of nutrition requires : [NCERT]

- (a) carbon dioxide and water
- (b) chlorophyll
- (c) sunlight
- (d) all of the above

Ans. (d) all of the above

Explanation :

In the autotrophic mode of nutrition, the plants can prepare their own food in the presence of sunlight, carbon dioxide, water and

chlorophyll present in the leaves of the plants.

18. A student covered a leaf from a destarched plant with a black paper strip and kept it in the garden outside his house in fresh air. In the evening, he tested the covered portion of the leaf for the presence of starch. By doing so the student was trying to show that: [Board Question]

- (a) CO_2 is given out during respiration.
- (b) CO_2 is necessary for photosynthesis.
- (c) Chlorophyll is necessary for photosynthesis.
- (d) Light is necessary for photosynthesis.

Ans. (d) Light is necessary for photosynthesis.

Explanation :

Only in the presence of sunlight autotrophs can convert carbon dioxide and water into carbohydrates. By covering the leaf by black paper strip the leaf does not get sunlight in the covered part and no photosynthesis takes place and no starch will be present in the leaf thus light is necessary for photosynthesis.

19. A few drops of iodine solution were added to rice water. The solution turned blue-black in colour. This indicates that rice water contains :

[NCERT Exemplar]

- (a) Complex proteins
- (b) Simple proteins
- (c) Starch
- (d) Fats

Ans. (c) Starch

Explanation :

Due to the presence of starch, when iodine solution was added to rice water, the solution becomes blue-black. Iodine forms Starch Iodide complex when it comes in contact of the amylose structure of starch. The blue-black colour comes from the starch iodide complex.

20. The opening and closing of stomatal pores depends upon :
[NCERT Exemplar]

- (a) Oxygen
- (b) Water in guard cells
- (c) Concentration of carbon dioxide in stomata
- (d) Temperature

Ans. (b) Water in guard cells

Explanation :

The entry of water into guard cells aids in the opening of guard cells, the guard cell becomes turgid as a result of this. Water going out from guard cells aids in the closing of guard cells, as a result of this the guard cells become flaccid.

21. In which of the following groups of organisms, food material is broken down outside the body and absorbed ? **[NCERT Exemplar]**

- (a) Mushroom, green plants, amoeba
- (b) Yeast, mushroom, bread mould
- (c) Paramecium, amoeba, cuscutea
- (d) Cuscuta, lice, tapeworm

Ans. (b) Yeast, mushroom, bread mould

Explanation :

Yeast, mushrooms, and bread mould all exhibit a saprophytic mode of nutrition. They use digestive enzymes secreted outside their body to break down complex organic substances and absorb basic

molecules as nutrition.

22. If salivary amylase is lacking in the saliva, which of the following events in the mouth cavity will not take place properly?

- (a) Proteins breaking down into amino acids
- (b) Starch breaking down into sugars
- (c) Fats breaking down into fatty acids and glycerol
- (d) Absorption of vitamins

Ans. (b) Starch breaking down into sugars

Explanation :

Amylase is a starch hydrolase enzyme that catalyses the conversion of starch to simple sugars. As a result, if salivary amylase is lacking in saliva, starch digestion is hampered.

23. Bile from the liver is received in which part of the alimentary canal?

- (a) Stomach
- (b) Small intestine
- (c) Large intestine
- (d) Oesophagus

Ans. (b) Small intestine

Explanation :

Bile is a dark green to yellowish brown fluid produced by the liver. It is stored in the gall bladder and it helps in the digestion of fats in the small intestine.

24. In which part of alimentary canal food is finally digested ?
[NCERT Exemplar]

- (a) Stomach

- (b) Mouth cavity
- (c) Large intestine
- (d) Small intestine

Ans. (d) Small intestine

Explanation :

Food is broken down in the small intestine by enzymes secreted by the pancreas and bile from the liver because it contains all of the enzymes required for the digestion of every type of food, the food is finally digested in the small intestine of the alimentary canal.

25. Choose the function of pancreatic juice from the following.

- (a) Trypsin digests proteins and lipase digests carbohydrates.
- (b) Trypsin digests emulsified fats and lipase digests proteins.
- (c) Trypsin and lipase digest fats.
- (d) Trypsin digests proteins and lipase digests emulsified fats.

Ans. (d) Trypsin digests proteins and lipase digests emulsified fats.

Explanation :

Pancreatic juice contains the digestive enzymes amylases, lipases, and trypsin, which are secreted by the pancreas. Amylase degrades starch, trypsin degrades proteins, and lipase degrades emulsified lipids.

26. The pancreatic juice does not contain one of the following enzymes.

- (a) Trypsin
- (b) Amylase
- (c) Lipase
- (d) Ptyalin

Ans. (d) Ptyalin

Explanation :

The pancreas secretes pancreatic juice, which contains various enzymes like trypsinogen, chymotrypsinogen, elastase, carboxypeptidase, pancreatic lipase, and amylase. Pancreatic juice does not include Ptyalin. It is produced by the gastric glands in the stomach.

27. In human digestive system the enzymes pepsin and trypsin are secreted respectively by :

- (a) Pancreas and liver
- (b) Pancreas and gall bladder
- (c) Stomach and pancreas
- (d) Stomach and salivary glands

Ans. (c) Stomach and pancreas

Explanation :

Pepsin enzyme is secreted by the stomach that breaks down proteins into smaller amino acids. Trypsin enzyme is secreted by the pancreas that breaks down proteins.

28. Which of the following is the correct statement regarding bile ?

- (a) Secreted by bile duct and stored in liver
- (b) Secreted by liver and stored in bile duct
- (c) Secreted by liver and stored in gall bladder
- (d) Secreted by gall bladder and stored in liver

Ans. (c) Secreted by liver and stored in gall bladder

Explanation :

Bile juice is secreted by the liver and stored in gall bladder. It helps in the breakdown of fats into fatty acids.

29. Which of the following components of our food is digested by an enzyme which is present in saliva as well as in pancreatic juice ?

- (a) Proteins
- (b) Fats
- (c) Minerals
- (d) Carbohydrates

Ans. (d) Carbohydrates

Explanation :

Salivary amylase, which is present in saliva, digests carbohydrates such as starch. It is also digested in the pancreas by pancreatic juices.

30. Where are proteins first digested in the alimentary canal ?

- (a) Small intestine
- (b) Oesophagus
- (c) Stomach
- (d) Mouth

Ans. (c) Stomach

Explanation :

Proteins are first broken down in the stomach. Pepsinogen is released by peptic cells in the stomach. Pepsinogen is a proenzyme which is converted into active pepsin. Pepsin breaks down proteins into smaller polypeptides.

31. Which is the first enzyme to mix with food in the digestive tract ? [NCERT Exemplar]

- (a) Amylase
- (b) Pepsin

- (c) Trypsin
- (d) Cellulase

Ans. (a) Amylase

Explanation :

Amylase is the first enzyme in the digestive tract to mix with food. It is secreted in the mouth and acts on starch to break it down into smaller molecules.

32. Which of the following statements are correct ?

- (i) Pyruvate can be broken down into ethanol and carbon dioxide by yeast.
 - (ii) Fermentation takes place in aerobic bacteria.
 - (iii) Fermentation takes place in mitochondria.
 - (iv) Fermentation is a form of anaerobic respiration.
- (a) (i) and (iii)
 - (b) (ii) and (iv)
 - (c) (i) and (iv)
 - (d) (ii) and (iii)

Ans. (c) (i) and (iv)

Explanation :

Fermentation is an anaerobic process in which sugar is converted to acids or alcohol in the absence of oxygen. This process occurs in yeast, bacteria, and oxygen-depleted muscle cells in the same way that lactic acid fermentation does, but it takes place in the cytoplasm rather than in the mitochondria.

33. Choose the correct statements that describe arteries.
[NCERT Exemplar]

- (a) They have thick elastic walls, blood flows under high pressure, collect blood from different organs and bring back to heart.

(b) They have thin walls with valves inside, blood flows under low pressure, carry blood away from the heart to various organs of the body.

(c) They have thick elastic walls, blood flows under low pressure, carry blood from the heart to various organs of the body.

(d) They have thick elastic walls without valves inside, blood flows under high pressure and carry blood away from the heart to different parts of the body.

Ans. (d) They have thick elastic walls without valves inside, blood flows under high pressure and carry blood away from the heart to different parts of the body.

Explanation :

Arteries are thick-walled blood vessels that pumps blood away from the heart at a high pressure because their walls are highly muscular, they do not have valves.

34. The breakdown of pyruvate to give carbon dioxide, water and energy takes place in : [NCERT]

(a) Cytoplasm

(b) Mitochondria

(c) Chloroplast

(d) Nucleus

Ans. (b) Mitochondria

Explanation :

Aerobic respiration is the process of breaking down pyruvate into carbon dioxide, energy, and water in the presence of oxygen. This process takes place in the mitochondria of the cell.

35. When air is blown from mouth into a test tube containing lime water, the lime water turns milky due to the presence of : [NCERT]

- (a) Oxygen
- (b) Nitrogen
- (c) Carbon dioxide
- (d) Water vapour

Ans. (c) Carbon dioxide

Explanation :

Calcium hydroxide solution is the lime water. When it reacts with carbon dioxide, it forms insoluble calcium carbonate, which remains suspended in water and gives it a milky white colour.

36. During deficiency of oxygen in tissues of human beings pyruvic acid is converted into lactic acid in : [\[NCERT Exemplar\]](#)

- (a) Cytoplasm
- (b) Chloroplast
- (c) Mitochondria
- (d) Golgi body

Ans. (a) Cytoplasm

Explanation :

The pyruvate produced during glycolysis usually enters the Krebs's cycle as acetyl coenzyme A in the mitochondrial matrix, where it provides a reservoir of chemical energy (ATP, NADH and FADH_2). Pyruvic acid can be transformed to lactic acid as one of its potential fates in cellular respiration. Under stressful conditions, this often occurs in the cytoplasm of muscle tissue.

37. During respiration exchange of gases takes place in : [\[NCERT Exemplar\]](#)

- (a) Trachea and larynx
- (b) Alveoli of lungs

(c) Alveoli and throat

(d) Throat and larynx

Ans. (b) Alveoli of lungs

Explanation :

The air sacs in lungs are known as alveoli. The alveoli are the sites where exchange of the gases takes place. The concentration of oxygen gas in the alveoli is higher than that in the blood during inhalation, therefore it diffuses into the blood. Concentration of carbon dioxide is more in the blood than that in the alveoli during exhalation, thus it diffuses into the alveoli.

38. The xylem in plants are responsible for : [NCERT]

(a) transport of water

(b) transport of food

(c) transport of amino acids

(d) transport of oxygen

Ans. (a) transport of water

Explanation :

In vascular plants, xylem is a type of tissue that transports water and some nutrients from the roots to the leaves. The other type of transport tissue is phloem, which is responsible for transporting sucrose and other nutrients throughout the plant. The xylem acts as a conducting tissue to transport water and some soluble nutrients such as minerals and inorganic ions from the roots to the rest of the plant.

39. The kidneys in human beings are a part of the system for : [NCERT]

(a) Nutrition

(b) Respiration

(c) Excretion

(d) Transportation

Ans. (c) Excretion

Explanation :

Kidneys are the bean shaped reddish brown paired organs in human beings. These are a part of excretory system that helps in the process of urine formation. Thus kidneys help in excretion.

40. The correct path of urine flow in our body is :

[NCERT Exemplar]

(a) Kidney → Ureter → Urethra → Urinary bladder

(b) Kidney → Urinary bladder → Urethra → Ureter

(c) Kidney → Ureter → Urinary bladder → Urethra

(d) Urinary bladder → Kidney → Ureter → Urethra

Ans. (c) Kidney → Ureter → Urinary bladder → Urethra

Explanation :

Urine from the nephron is transported to the collecting duct, where it enters the ureters. Ureters open from kidney into the urinary bladder. The urinary bladder holds urine, and as the volume of urine collected increases, so does the size of the bladder. When the CNS sends a voluntary message to the bladder, the bladder muscles contract and the bladder sphincter relaxes, allowing urine to pass through the urethra.

41. In the experiment to show that 'CO₂ is released during respiration', the solution in the test tube is chemically: **[Board Question]**

(a) NaOH

(b) KOH

(c) NaCl

(d) KCl

Ans. (b) KOH

Explanation :

For the experiment where CO_2 is given out during respiration, KOH solution or pellets are taken in a test tube and placed in the conical flask. KOH absorbs carbon dioxide and prevents it from being utilised by the plant for the process of photosynthesis.

Assertion and Reasoning Based Questions

Directions : In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as :

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.
- (c) Assertion is true but Reason is false.
- (d) Assertion is false but Reason is true.

42. Assertion: Dark phase is independent of light, hence called light independent phase.

Reason: Dark phase takes place at night.

Ans. (c) Assertion is true but Reason is false.

Explanation :

Dark phase does not take place at night, it takes place independent of light, so light is not a mandatory factor here. Thus, assertion is true but reason is false.

43. Assertion: The rate of photosynthesis will be lowered if the leaves are coated with oil.

Reason: Stomata gets blocked and thus gaseous exchange is affected.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Stomata is a tiny pore in leaves that help in gaseous exchange, so if the stomata gets blocked due to oil, gaseous exchange will be affected and hence rate of photosynthesis gets lowered. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

44. Assertion: Presence of HCl in stomach is necessary for the process of digestion.

Reason: HCl kills and inhibits the growth of bacteria in the stomach.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

Presence of HCl in stomach is necessary for digestion because acidic medium activates the action of gastric juice. HCl maintains a strong acidic pH, of about 1-2 in the stomach. HCl helps to activate Pepsinogen to pepsin which digests proteins to peptones and proteases. HCl inhibits the growth of germs and also kills them those may have entered the stomach along with the food. So, thus it can be said that HCl kills bacteria but that does not help in digestion. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

45. Assertion: Pancreatic amylase digests starch to maltose.

Reason: Pancreatic amylase breaks the peptide bond of protein.

Ans. (c) Assertion is true but Reason is false.

Explanation :

Pancreatic amylase is a starch splitting enzyme like salivary amylase, so it cannot digest proteins. Thus, assertion is true but reason is false.

46. Assertion: Aerobic animals are not truly aerobic.

Reason: They produce lactic acid anaerobically.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

In most animals, tissue oxidation is carried out by aerobic respiration. But sometimes in aerobically respiring organisms, anaerobic metabolism takes place in certain tissues like skeletal muscles which do not get as much as required oxygen and produce lactic acid. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

47. Assertion: Left atrium possesses the thickest muscles.

Reason: Left atrium receives oxygenated blood from the lungs.

Ans. (d) Assertion is false but Reason is true.

Explanation :

Left ventricle has thickest muscles because it pumps the blood to the whole body. Thus, assertion is false but reason is true.

48. Assertion: Doctors can tell by counting the pulse rate and listening to heart beats whether a person is well or not.

Reason: Pulse rate and heart beats change according to the condition of our heart.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Pulse rate is the number of heart beats per minute. So, by counting the pulse rate we can understand the heart beat and in turn understand the working condition of the heart. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

49. Assertion: The effect of root pressure in transport of water is more important at night.

Reason: During day, stomata is open, transpiration takes place which helps in transport of water.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

During the day transpiration becomes the main driving force for pulling up water. But at night since there is no sunlight transpiration does not take place, so water is pulled up due to root pressure. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

50. Assertion: Blood pressure of a normal adult is 120/80.

Reason: Blood pressure is measured by sphygmo-manometer.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

Sphygmomanometer is the instrument used to measure blood pressure. Whatever be the value it will be obtained after measuring with this. This has no relation with the normal adult blood pressure. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

51. Assertion: Urinary bladder and ureters are lined by transitional epithelium.

Reason: Ureters carry the urine to urinary bladder where it is stored temporarily.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

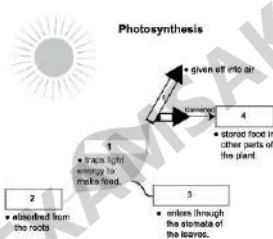
Explanation :

Ureter's function is to carry urine from kidney to the bladder, it does not depend on what lining it has. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

Case Based Questions

52. Look at the passage given below carefully and answer the following questions from (i) to (v).

Photosynthesis is the process used by plants, algae and certain bacteria to turn sunlight, carbon dioxide (CO₂) and water into food (sugars) and oxygen. There are two types of photosynthetic processes: oxygenic photosynthesis and anoxygenic photosynthesis. They both follow very similar principles, but oxygenic photosynthesis is the most common and is seen in plants, algae and cyanobacteria.



(i) What is the name of the pigment that should be filled in the box 1?

(a) chloroplast

(b) chromophyll

(c) chlorophyll

(d) chromoplast

Ans. (c) chlorophyll

(ii) What is the thing that plants absorb through their roots and should be filled in box 2 to complete the picture?

(a) water

(b) mineral nutrients

(c) air

(d) chemicals

Ans. (a) water

(iii) An appropriate entry for the box 3 shown in the figure is:

(a) oxygen

(b) air

(c) carbon dioxide

(d) nitrogen

Ans. (c) carbon dioxide

(iv) Final outputs from the photosynthesis, to be filled in boxes 4 and 5, are:

(a) glucose and oxygen

(b) oxygen and glucose

(c) glucose and carbon dioxide

(d) energy and oxygen

Ans. (a) glucose and oxygen

(v) Overall, what is the energy conversion summary in the process of photosynthesis?

(a) Heat energy is converted into mechanical energy.

(b) Heat energy is converted into chemical energy.

(c) Light energy is converted into chemical energy.

(d) Light energy is converted into mechanical energy.

Ans. (c) Light energy is converted into chemical energy.

53. Refer the passage given below and answer the following questions from (i) to (v).

In a nutshell, digestion involves breaking down large food molecules into water-soluble molecules that can be passed into the blood and

transported to the body's organs. For instance, carbohydrates are broken down into glucose, proteins into amino acids, and fats into fatty acids and glycerol. The digestive system involves "hollow" organs and "solid" organs. Food travels through the hollow organs — mouth, oesophagus, stomach, small intestine, large intestine, and anus. The solid organs — pancreas, liver, and gallbladder — add various products into the mix. Aside from the solid and hollow organs, the nervous and circulatory systems are also important in digestion, as are the bacteria that live in the gut.



(i) The given picture shows a part of :

- (a) human digestive system
- (b) mouse digestive system
- (c) human respiratory system
- (d) mouse alimentary canal

Ans. (a) human digestive system

(ii) Food taken in is processed to generate particles, which are small and of the same texture through:

- (a) biting
- (b) crushing the food with our teeth
- (c) mixing with saliva in the mouth
- (d) licking

Ans. (b) crushing the food with our teeth

(iii) Biological catalysts which help in food disintegration are also known as:

- (a) enzymes

- (b) proteins
- (c) fats
- (d) nucleic acids

Ans. (a) enzymes

(iv) Digestion functions are taken care of by the gastric glands present in the wall of the stomach by releasing the following :

- (a) hydrochloric acid, pepsin, and mucus
- (b) hydrochloric acid, pepsin, and malic acid
- (c) sulphuric acid, pepsin, and mucus
- (d) hydrochloric acid, pepsin and mucus

Ans. (a) hydrochloric acid, pepsin, and mucus

(v) Protein, carbohydrate, and fat components of food are completely digested in the:

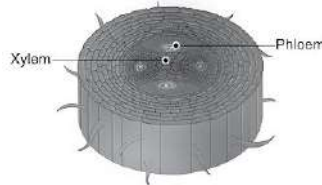
- (a) stomach
- (b) small intestine
- (c) large intestine
- (d) oesophagus

Ans. (b) small intestine

54. Read the passage given below carefully and answer any the following questions from (i) to (v).

Transportation is a vital process in plants. Trees transport all the nutrients and water it needs for survival from its roots to the tips of the leaves. In the case of transportation in plants, the biggest constraint is water as it ends up being a limiting factor in growth. To overcome this problem, trees and other plants have the perfect system for the absorption and translocation of water. Plants contain a vast network of conduits which consist of xylem and phloem. This is more like the circulatory system that transports blood throughout

the human body. Similar to the circulatory system in humans, the xylem and phloem tissues extend throughout the plant. These conducting tissues originate from the roots and move up through the trunks of trees. Later they branch off into the branches and then branching even further into every leaf, like spider webs.



(i) Plant transport systems transports:

- (a) raw materials from roots
- (b) synthesized glucose to leaves
- (c) raw materials to roots
- (d) water from leaves

Ans. (a) raw materials from roots

(ii) The loss of water in the form of vapour from the aerial parts of the plant is known as :

- (a) respiration
- (b) transportation
- (c) transpiration
- (d) translocation

Ans. (c) transpiration

(iii) Tissues responsible for movement of water and minerals from roots to the other parts of plant are known as :

- (a) xylem
- (b) chloroplast
- (c) phloem
- (d) stomata

Ans. (a) xylem

(iv) Phloem tissues transport:

(a) products of photosynthesis, amino acids, and other substances

(b) glucose and amino acids

(c) products of photosynthesis only

(d) water and amino acids

Ans. (a) products of photosynthesis, amino acids, and other substances

(v) Which of the processes does not involve the use of energy?

(a) Transport through xylem

(b) Translocation through phloem

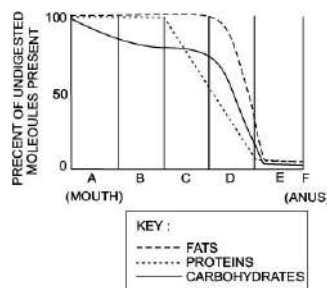
(c) Transport of soluble products of photosynthesis

(d) Photosynthesis

Ans. (a) Transport through xylem

55. Read the passage given below carefully and answer the following questions from (i) to (v).

The graph below shows the percent of undigested carbohydrates, proteins and fats as the food passes through the human digestive tract. X axis represents sequential structure that makes up the digestive tract.



(i) In humans, chemical digestion is accomplished by enzyme action that begins in the mouth and ends in the:

- (a) Oesophagus
- (b) Stomach
- (c) Small Intestine
- (d) Gall bladder

Ans. (c) Small Intestine

(ii) Which of the following is the correct order for process of nutrition?

- (a) Digestion, absorption, assimilation, egestion
- (b) Absorption, assimilation, egestion, ingestion
- (c) Ingestion, digestion, absorption, assimilation
- (d) Digestion, absorption, ingestion, egestion

Ans. (c) Ingestion, digestion, absorption, assimilation

(iii) In which organ does the first digestion of starch occur in humans?

- (a) Stomach
- (b) Small intestine
- (c) Large intestine
- (d) Mouth

Ans. (d) Mouth

(iv) Which of the following converts starch to glucose, proteins to amino acids and fats to glycerol?

- (a) Gastric juice
- (b) Bile salts
- (c) Intestinal juice
- (d) Pepsinogen

Ans. (c) Intestinal juice

(v) Bile juice does not contain any enzyme but bile salts are

important for digestion and absorption of fats. Why?

(a) Bile is alkaline and contains salts which help to emulsify or break the fats (or lipids) present in the food.

(b) Makes the acidic food coming from the stomach alkaline so that pancreatic enzymes can act on it.

(c) Bile salts break the fats present in the food into small globules making it easy for the enzymes to act and digest them.

(d) All of the above

Ans. (d) All of the above

56. Read the passage given below and answer the following questions from (i) to (v).

Traditionally the process of respiration is divided into three phases: (1) ventilation of the gas exchange organs better known as breathing, (2) transport of respiratory gases and (3) cellular respiration. We assimilate chemical energy from the environment and transfer it from molecule to molecule in a stepwise fashion within our cells. Although studied separately, these phases represent a continuum and processes of cellular respiration in all life forms is mostly common.

(i) The energy released during cellular respiration is immediately used to synthesise a molecule called _____ which is used to fuel all other activities in the cell.

(a) ATP

(b) GTP

(c) AGP

(d) APP

Ans. (a) ATP

(ii) The ultimate breakdown products of glucose in our body are:

- (a) carbon dioxide and water
- (b) carbon dioxide, water, and energy
- (c) energy and water
- (d) oxygen, water, and energy

Ans. (b) carbon dioxide, water, and energy

(iii) Which one of the following statements is not true?

- (a) The release of energy in this aerobic process is a lot greater than in the anaerobic process.
- (b) Build-up of lactic acid in our muscles during sudden activity causes cramps.
- (c) Fermentation is a type of aerobic respiration.
- (d) Breakdown of pyruvate using oxygen takes place in the mitochondria.

Ans. (c) Fermentation is a type of aerobic respiration

(iv) Air passages within the lungs terminate in structures called:

- (a) bronchiole
- (b) bronchi
- (c) alveoli
- (d) ribs

Ans. (c) alveoli

(v) What is the function of rings of cartilage present in our throat?

- (a) They ensure smooth flow of food
- (b) They avoid collapse of air passage
- (c) Function is unknown in humans
- (d) They join our lungs with ribs

Ans. (b) They avoid collapse of air passage

57. Read the passage given below and answer the following questions from (i) to (v).

A normal human heart is a strong, hard-working pump made of muscle tissues. It is about the size of a person's fist. The heart comprises four chambers. The upper two chambers are known as atria, and the lower two are known as ventricles. These chambers are separated by a wall of tissue known as the septum. Blood is pumped through the chambers, assisted by four heart valves. The valves open and close to allow blood flow in only one direction.

(i) Blood that is brought back to the heart is rich in :

- (a) oxygen
- (b) carbon dioxide
- (c) both (a) and (b)
- (d) carbon monoxide

Ans. (b) carbon dioxide

(ii) Which one of the two, atria or ventricles, has thicker muscular walls?

- (a) Atria
- (b) Septum
- (c) Ventricles
- (d) Both atria or ventricles have similar thickness of walls

Ans. (c) Ventricles

(iii) Blood is pumped out to the body when:

- (a) left ventricle expands
- (b) left atrium relaxes
- (c) left atrium contracts
- (d) left ventricle contracts

Ans. (d) left ventricle contracts

(iv) Which one of the statements given below is not true?

(a) Valves ensure that blood does not flow backwards when the atria or ventricles contract.

(b) Amphibians or many reptiles have three chambered hearts, but they do not tolerate mixing of the oxygenated and de-oxygenated blood streams.

(c) Vertebrates have double circulation procedure.

(d) De-oxygenated blood comes from the body to the upper chamber on the right.

Ans. (b) Amphibians or many reptiles have three chambered hearts, but they do not tolerate mixing of the oxygenated and de-oxygenated blood streams.

(v) The force that blood exerts against the wall of a vessel is called:

(a) ventricular pressure

(b) blood pressure

(c) atrial pressure

(d) septal pressure

Ans. (b) blood pressure

58. Read the passage given below and answer the following questions from (i) to (v):

As the heart beats, it pumps blood through a system of blood vessels, called the circulatory system. The vessels are elastic, muscular tubes that carry blood to every part of the body. Blood is essential. In addition to carrying fresh oxygen from the lungs and nutrients to the body's tissues, it also takes the body's waste products, including carbon dioxide, away from the tissues. This is necessary to sustain life and promote the health of all parts of the body.

When we are injured and start bleeding, the loss of blood from the system has to be minimised. In addition, leakage would lead to a loss of pressure which would reduce the efficiency of the pumping system.

(i) Which of the following cells present in blood help in clotting of blood at the point of injury?

- (a) R.B.C
- (b) W.B.C
- (c) Platelets
- (d) Mucus cells

Ans. (c) Platelets

(ii) What is the correct representation of normal blood pressure of a human being?

- (a) 180/20 mm of Hg
- (b) 120/80 mm of Hg
- (c) 80/120 mm of Hg
- (d) 20/180 mm of Hg

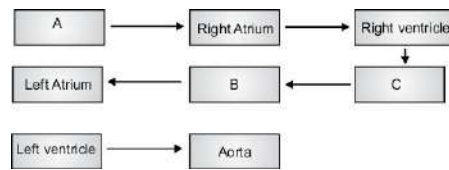
Ans. (b) 120/80 mm of Hg

(iii) Why is it necessary to separate oxygenated and de-oxygenated blood in mammals and birds?

- (a) Mixing of blood would lead to clotting.
- (b) For efficient supply of oxygen and to maintain body temperature.
- (c) Birds need more blood for flying.
- (d) None of these

Ans. (b) For efficient supply of oxygen and to maintain body temperature.

(iv) The given graph represents the blood pressure of 18 years old man taken during sitting, standing and jumping position.



Choose the correct option with respect to blood circulatory system in humans.

- (a) A-Veins, B-Pulmonary artery, C-Pulmonary vein
- (b) A-Vena cava, B-Pulmonary vein, C-Pulmonary artery
- (c) A-Vena cava, B-Pulmonary artery, C-Pulmonary vein
- (d) A-Veins, B-Pulmonary vein, C-Pulmonary artery

Ans. (c) A-Vena cave, B-Pulmonary artery, C-Pulmonary vein

(v) Which of the chamber of heart muscles are thick?

- (a) Ventricles
- (b) Atrium
- (c) Septum
- (d) Right atrium only

Ans. (a) Ventricles

59. Read the passage given below carefully and answer the following questions from 8(i) to 8(v):

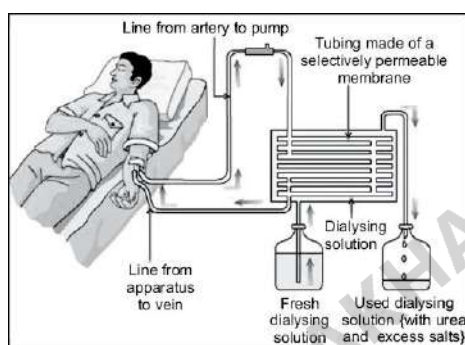
Mr. Prabhakar went on a hiking with his family. He is a patient of renal failure. In the middle of the trip, he fell ill. He had leg cramps and experienced acidity with high blood pressure. He was immediately taken to nearby hospital. Doctor prescribed him antacids and gave him injection for high Blood Pressure (BP). He advised Mr. Prabhakar to rest a while and eat healthy.

(i) Choose the correct option.

- (a) Cramps occurred due to formation of acetic acid in leg muscles.
- (b) Cramps are formed in case of absence of oxygen.
- (c) Cramps occurred due to formation of lactic acid in leg muscles.
- (d) Cramps occurred due to lack of glucose in body.

Ans. (c) Cramps occurred due to formation of lactic acid in leg muscles.

(ii) Study the following diagram:



What does it represent?

- (a) Hemodialysis
- (b) Blood transfusion
- (c) Bypass surgery
- (d) Renal dialysis

Ans. (a) Hemodialysis

(iii) What kind of injection were given to Mr. Prabhakar for high Blood Pressure (BP) condition?

- (a) Insulin
- (b) Glucose
- (c) Saline
- (d) Hydralazine

Ans. (a) Hydralazine

(iv) In a healthy adult, the initial filtrate in the kidneys is about:

- (a) 1-2L daily
- (b) 80L daily
- (c) 180 L daily
- (d) 120L daily

Ans. (c) 180L daily

(v) Which of the following is not the function of hydrochloric acid in the body?

- (a) Creating acidic medium in stomach.
- (b) Digestion of proteins.
- (c) Facilitate the function of pepsin, for digestion of proteins.
- (d) Killing of microbes present.

Ans. (b) Digestion of proteins.

Reasoning Based Questions

60. Why is energy required by an organism even during sleep?

Ans. Even though an organism is asleep, various biological activities like respiration, circulation, digestion etc., occur in the body which need energy. Thus, energy is required by an organism even during sleep.

61. Why do herbivores have longer small intestine than carnivores?

Ans. Herbivores mainly eat plant products like grass which contain maximum cellulose content. The digestion of cellulose takes longer time. But carnivores mainly eat other animals *i.e.*, flesh and meat which are proteins. The digestion of proteins is easier and faster

than that of cellulose. Hence, herbivores have longer small intestine than carnivores.

62. Two green plants are kept separately in oxygen free containers one in the dark and other in the continuous light. Which one will live longer? Give reasons.

Ans. Plant kept in continuous light will live longer because it can produce oxygen by photosynthesis process and this oxygen can be used for respiration process.

63. Why does leaf appears green? [Board Question]

Ans. Leaf appears green due to presence of green pigment chlorophyll. When visible light falls on chlorophyll pigment, it absorbs mainly violet, blue, red, orange colours but reflects green colour hence chlorophyll appears green.

64. Leaves of a healthy potted plant were coated with Vaseline to block the stomata. Will this plant remain healthy for long? Give reasons.

Ans. No this plant will not remain healthy for a longer period as stomata are blocked by Vaseline, the plants cannot take oxygen for respiration. It also cannot take carbon dioxide for photosynthesis process. As stomata are closed transpiration process will also not occur hence conduction of water and minerals from roots to leaves will not be efficient.

65. The pharynx leads to trachea as well as to the oesophagus. The two openings lie very close to each other. Yet the food we swallow does not normally go to trachea. Why?

Ans. The opening of trachea is guarded by a muscular flap like structure called epiglottis. When we swallow our food it closes the opening of trachea thus food goes into oesophagus and not to trachea.

66. Why are dark reaction called so?

Ans. Dark reactions are independent of light *i.e.*, they do not require any light energy and hence, they are named so.

67. Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans? [NCERT]

Ans. Unicellular organisms have only one cell and they do not have any specific organs for diffusion of gases. The cell itself is in direct contact with the environment so they can get oxygen easily by simple diffusion process. But in multicellular organisms large number of cells, tissues and organs are present which are not in direct contact with the environment. So, the requirement of oxygen by each and every cell cannot be fulfilled by simple diffusion process quickly. It has been estimated that in human beings a period of three years is needed to carry a molecule of oxygen from head to toe, if oxygen moves from one cell to another through diffusion process.

68. Why does our blood look red?

Ans. Blood contains haemoglobin which is an oxygen carrying pigment that makes the blood look red.

69. Why is it necessary to separate oxygenated and de-oxygenated blood in mammals and birds? [NCERT]

Ans. Mammals and birds are warm blooded animals so they need to maintain their constant body temperature and they need more energy to maintain their body temperature. The separation of oxygenated and deoxygenated blood allows highly efficient supply of oxygen to the body thus they get more energy which helps them in maintaining their body temperature.

Very Short Answer Type Questions

70. Name the raw materials needed by green plants for photosynthesis?

Ans. Carbon dioxide and water are the raw materials needed by green plants for photosynthesis.

71. How are living things different from non-living things?

Ans. Living things are complex organisation of molecules which perform certain life processes such as growth, metabolism, reproduction etc., that help them in distinguishing themselves from the non-living things.

72. What are the different modes of nutrition?

Ans. There are mainly two modes of nutrition: Autotrophic mode of nutrition and Heterotrophic mode of nutrition.

73. Give the energy transformation that takes place in the process of photosynthesis?

Ans. During the process of photosynthesis, solar energy is converted into chemical energy.

74. What are the types of heterotrophic nutrition?

Ans. Heterotrophic nutrition is mainly of three types: Saprophytic, Holozoic and Parasitic nutrition.

75. What is the source of energy used by plants during photosynthesis?

Ans. Sunlight or light energy is the source of energy used by plants during photosynthesis.

76. In addition to carbon dioxide and water, state two other conditions necessary for the process of photosynthesis to take place?

Ans. Sunlight and chlorophyll are necessary for the process of photosynthesis in addition to carbon dioxide and water.

77. In the chemical reaction of the photosynthesis, which substance is the raw material as well as the product?

Ans. Water is the raw material as well as the product in the chemical reaction of the photosynthesis.

78. Why are minerals essential in photosynthesis?.

Wheat, gram, maize, pea, barley, ground-nut.

Ans. Minerals like magnesium form essential compounds such as chlorophyll. Hence, they are important for photosynthesis.

79. State the form in which the following are stored:

[Board Question]

- (i) Unused carbohydrates in plants
- (ii) The energy derived from food in humans

Ans. (i) In the form of starch

(ii) In the form of ATP or ADP

80. State where are stomata ideally located? Are they cellular structures?**[Board Question]**

Ans. Stomata are generally located at lower epidermis of leaves. Yes, they are cellular structures.

81. Why are green plants called producers?

[Board Question]

Ans. Green plants prepare their own food by the process of photosynthesis using solar energy so green plants are called producers.

82. Identify and observe the various parts of temporary mount of well stained leaf peel when focused under the high power of a microscope.

[Board Question]

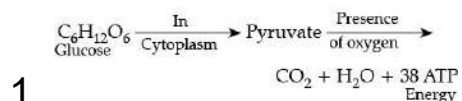
Ans. The various parts observed under high power of a microscope are stomatal aperture (open or close), guard cells, chloroplasts,

nucleus, epidermal cells.

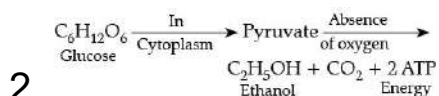
83. Write two different ways in which glucose is oxidised to provide energy in human body. Write the products formed in each case.

[Board Question]

Ans. Glucose is oxidised in two forms to provide energy to the body:



This is an example of Aerobic Respiration that happens in presence of oxygen.



This is an example of Anaerobic Respiration.

84. Write one function of each of the following components of the transport system in human beings: **[Board Question]**

- (i) Blood vessels
- (ii) Lymph
- (iii) Heart

Ans. (i) Blood vessels carry blood from heart to different parts of the body and again back to heart.

(ii) Lymph is a clear fluid which flows through special vessels called lymph vessels, moves within tissues and keeps them dense and firm.

(iii) Heart is the main pumping organ which pumps blood to all parts of the body.

85. List two body functions that will be affected if cerebellum gets damaged. **[Board Question]**

Ans. Body balance and posture will be affected if cerebellum gets damaged.

86. How is O_2 and CO_2 transported in human beings?

[Board Question]

Ans. Oxygenated blood is transported in human beings by the arteries. The deoxygenated blood is carried by the veins.

87. Using only flowchart write the path of oxygen from nostrils to respiring tissue cell.

[Board Question]

Ans. Nostrils → Nasal chamber → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli → Blood capillary → RBC → Haemoglobin → Respiring tissue cell.

88. What is egestion?

Ans. The expelling of undigested wastes from the body in the form of excreta is known as egestion.

89. In higher animals, what does ammonia react with to produce urea?

Ans. Ammonia reacts with carbon dioxide in the liver to form a less toxic substance, urea which is periodically flushed out of the system.

Short Answer Type Questions

90. What criteria do we use to decide whether some-thing is alive? [NCERT & Board Question]

Ans. The following criteria decides whether something is alive:

1. Movement and growth: All living organisms show movement like running, walking. They also show growth. They require energy for cell repair and replacement.

2. Nutrition: They require food to derive energy in order to carry out

their metabolic activities.

3. Respiration: They inhale oxygen to break down glucose to release energy. During this process they exhale carbon dioxide.

4. Reproduction: They reproduce to give birth to their new ones.

5. Excretion: They eliminate waste products in the form of urine, faeces, etc., from their body.

91. What process would you consider essential for maintaining life? [NCERT]

Ans. Processes like nutrition, respiration, transportation, excretion, control and coordination, reproduction, etc., are considered essential for maintaining life.

92. What are the necessary conditions for autotrophic nutrition and what are its byproducts? [NCERT]

Ans. The necessary conditions for autotrophic nutrition are carbon dioxide, water, sunlight energy, chlorophyll. The byproducts are water and oxygen.

93. What are outside raw materials used by an organism? [NCERT]

Ans. The important outside raw materials used by an organism are:

1. Carbon dioxide, water and mineral nutrients are needed by autotrophic plants.
2. Organic nutrients are required by heterotrophic organisms.
3. Oxygen is used for respiration by both autotrophs and heterotrophs for oxidation of glucose to release chemical energy in the form of ATP.

94. Name the following:

- (i) Mode of nutrition of the cuscuta plant.

- (ii) First form of food substance produced during photosynthesis.
- (iii) Organisms which live on or inside the body of another organism and depend on it for food.
- (iv) Small openings present on leaf surface.)

Ans. (i) Parasitic mode of nutrition

(ii) Glucose

(iii) Parasites

(iv) Stomata

95. Where do plants get each of the raw materials required for photosynthesis? [NCERT]

Ans. The following raw materials are required for photosynthesis:

1. Carbon dioxide: Plants take carbon dioxide from air through the stomata present in leaves. Aquatic plants get carbon dioxide found dissolved in water.

2. Water: Plants take in water from the soil through roots.

3. Sunlight energy: It is trapped by chlorophyll present in chloroplasts of leaves.

4. Chlorophyll: It is present in chloroplasts which are found in green portions of the plants like leaves.

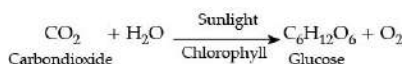
96. What is photosynthesis? Explain its mechanism.

[Board Question]

Ans. The green plants are called autotrophes. They make their own food by the process of photosynthesis. In this process the plants capture the sun rays by the pigment present in the leaves called as chlorophyll.

Then in the presence of carbon dioxide and water they prepare the food in the form of glucose. In this process oxygen gas is evolved.

Equation for photosynthesis:



97. What are the adaptations of a leaf for photosynthesis?

Ans. Some of the adaptations of a leaf for photosynthesis are:

1. Chloroplasts are concentrated more on the upper surface of leaf than the lower surface.
2. Leaves provide large surface area for maximum absorption of sunlight energy.
3. More stomata are present on lower surface of leaves so that more carbon dioxide can enter for efficient photosynthesis.
4. Leaves are arranged at right angles to the light source so that they can get better sunlight.

98. What is the role of the acid in our stomach? [NCERT]

Ans. Hydrochloric acid which is secreted in our stomach has following functions:

1. It makes the medium acidic so that the enzyme pepsin gets activated and acts upon proteins to convert them into peptones and proteases.
2. It also kills the bacteria that might have entered to our body along with the food we eat.

99. What is the function of digestive enzymes? [NCERT]

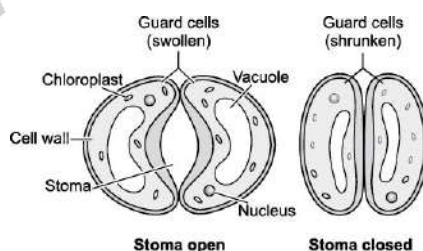
Ans. Digestive enzymes are the biocatalysts which catalyse the biochemical reactions. They help in breaking down larger, insoluble molecules like carbohydrates, fats, proteins into simpler and soluble forms. For example – Lipases act upon fats to convert them into fatty acids and glycerol. Amylases convert carbohydrates to simple sugars. Protein digesting enzymes like pepsin, trypsin convert proteins to smaller peptides and amino acids etc.

100. How is the small intestine designed to absorb digested food? [NCERT]

Ans. Small intestine is the part in which maximum absorption of digested food occurs. It has numerous tiny finger like projections called villi which increase the surface area for maximum absorption of nutrients. The villi are richly supplied with blood vessels where nutrients are absorbed by the process of diffusion into the blood stream.

101. How do the guard cells regulate opening and closing of stomatal pores?

Ans. Guard cells are kidney shaped cells which contain thicker inner walls and thin outer walls. During day time they perform photosynthesis process due to presence of chloroplasts in them. Due to increase in solute concentration inside the guard cells, water from subsidiary cells rushes inside by osmosis process as a result guard cells swell up. The thin outer wall bulges out and thick inner wall is pulled inside thus stomata opens. During night time reverse happens, water rushes out from the guard cells and they become flaccid closing the stomatal pore. Thus turgour pressure of guard cells helps in closing and opening of stomata.



102. How are fats digested in our bodies? Where does this process take place? [NCERT]

Ans. The complete digestion of fats occurs in small intestine. Bile juice secreted by liver acts upon large fats to convert them into small globules by the process of emulsification. Lipase enzyme secreted by pancreas acts upon lipids to convert them into fatty acids and

glycerol.

103. What is the role of saliva in the digestion of food?
[NCERT]

Ans. Saliva is secreted by salivary glands. It contains enzyme ptyalin which acts upon starch to convert them into maltose. This action of ptyalin upon starch occurs in mouth.

104. What are the different ways in which glucose is oxidised to provide energy in various organisms?**[NCERT]**

Ans. Glucose is oxidised in the following ways to provide energy:

1. In cytoplasm glucose is oxidised to pyruvate and it releases energy .
2. In mitochondria [aerobic respiration] pyruvate breaks down to form carbon dioxide and water to releases energy in the form of ATP.
3. In muscles of humans *i.e.*, under anaerobic conditions pyruvate breaks down to lactic acid and releases energy.
4. In yeast *i.e.*, during fermentation process pyruvate converts to ethanol, carbon dioxide, along with it releases certain amount of energy.

105. What advantage over an aquatic organism does a terrestrial organism have with regards to obtaining oxygen for respiration? **[NCERT]**

Ans. Aquatic organisms like fishes take oxygen which is dissolved in water but terrestrial organisms take oxygen directly from air. The amount of oxygen dissolved in water is fairly low as compared to the amount of oxygen present in air. So the rate of breathing in aquatic organisms is much faster as compared to terrestrial organisms.

106. How are the lungs designed in human beings to maximise the area for exchange of gases? **[NCERT]**

Ans. Lungs are elastic, spongy, moist sacs like structures. Gaseous exchange occurs between alveoli and the blood vessels surrounding alveoli. Alveoli are tiny sacs like structures present in lungs which increase the surface area for gaseous exchange and lungs contain about 300-350 million alveoli. They have very thin walls making the diffusion of gases more convenient. They are surrounded by numerous tiny blood capillaries which facilitate for efficient gaseous exchange. During inhalation the ribs move outward and diaphragm moves downwards so the space inside the thoracic cavity increases letting more amount of oxygen to diffuse inside.

107. (i) Explain the excretory system in human beings.

(ii) List four strategies used by plants for excretion.

Ans. (i) In human beings, the excretory system consists of a pair of kidneys, a pair of ureters, a urinary bladder and a urethra. Kidneys are a pair of reddish brown bean-shaped structures that lie dorsally in the abdominal cavity. A renal artery and a renal vein occur on the concave hilus region of each kidney. About a million structural and functional units called nephrons occur in each kidney. Blood is filtered in the glomerular region of a nephron. Useful substances (e.g. glucose, amino acids, salts, water) are reabsorbed and urine passes into collecting ducts. Ureters are pulsatile drainage tubes that carry urine from the kidneys to the urinary bladder. Urinary bladder is a pear-shaped distensible sac that stores urine till its volume becomes 300-800 ml. Urethra is a fine tube that carries urine from urinary bladder to the outside.

(ii) Excretion Strategies in Plants: Excess water is passed out through transpiration, excess O_2 formed during the day diffuses out of the leaves. Alkaloids, organic acids and tannins are the common secondary metabolites. Some of these are stored in the cell vacuoles of leaves which when old fall down. Resins and gums along with other wastes are also deposited in old non-functional xylem.

108. How is oxygen and carbon dioxide transported in human beings? [NCERT]

Ans. Oxygen from air enters through nostrils, nasal passage, pharynx, larynx, trachea, bronchi, bronchioles and finally to alveoli during inhalation. Alveoli are surrounded with blood vessels where gaseous exchange occurs *i.e.*, oxygen diffuses inside the blood vessels and carbon dioxide diffuses out from the blood vessels into alveoli. Oxygen then combines with haemoglobin present in blood to form oxyhaemoglobin and is carried to heart by pulmonary veins and then it is transported to the rest parts of the body.

Carbon dioxide is transported mainly in dissolved form in the blood stream given out by tissues during cellular respiration and is carried to the alveoli present in lungs where it diffuses out to the alveoli from blood stream and is exhaled out through the nostrils.

109. How does transpiration help in upward movement of water from roots to leaves?

Ans. Water is transported through xylem from roots to leaves forming a continuous column due to adhesion force [between water molecules and walls of xylem vessels] and cohesion force [between water molecules]. Due to transpiration from leaves a suction force is created which helps in drawing water from the bottom which is called transpiration pull. Thus, transpiration helps in upward movement of water from roots to leaves.

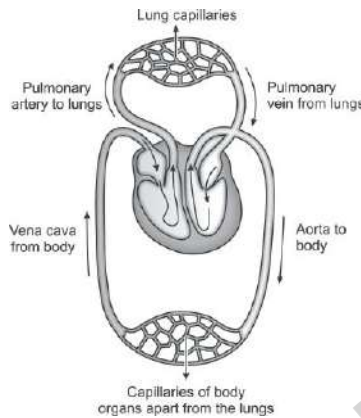
110. What would be the consequences of deficiency of haemoglobin in the body? [NCERT]

Ans. Haemoglobin is the respiratory pigment found in RBCs of blood which carries oxygen in the form of oxyhaemoglobin to different parts of the body. If there is deficiency of haemoglobin, the oxygen that is required by our body cannot be supplied *i.e.*, there would be less supply of oxygen to the body. So person will tired, feel weak, tired, look pale and cannot do heavy work. This condition of person is

called anemia.

111. Describe double circulation in human beings? Why is it necessary?[\[NCERT\]](#)

Ans. In human beings, the blood passes through our heart twice so this type of circulation is called double circulation. It consists of:



1. Pulmonary circulation: Here deoxygenated blood from whole parts of body through venacavas comes to right atrium. Then it passes to right ventricle. Pulmonary artery carries this blood to lungs for oxygenation. Then pulmonary veins carry oxygenated blood back to left atrium of heart from lungs. This is called pulmonary circulation.

2. Systemic circulation: Here oxygenated blood from left atrium moves to left ventricle and finally by aorta gets distributed to whole parts of the body. This is called systemic circulation.

It is necessary because both oxygenated and deoxygenated blood are separated from each other. This makes the circulatory system more efficient which provides more energy that is required to maintain constant body temperature.

112. What are the components of the transport system in human beings? What are the functions of these components?[\[NCERT\]](#)

Ans. The components of the transport system in human beings are:

1. Heart: It is the central pumping organ which pumps blood to

various parts of the body.

2. Blood: It is a mobile, red coloured fluid that circulates within the blood vessels in the body. It supplies nutrients and oxygen to all the living cells and removes waste products and carbon dioxide from them.

3. Blood vessels: They are elastic muscular tubes which carry blood. There are three kinds of blood vessels:

(a) Arteries: They carry oxygenated blood from heart to different parts of the body except pulmonary artery.

(b) Veins: They carry de-oxygenated blood to heart from different parts of the body except pulmonary vein.

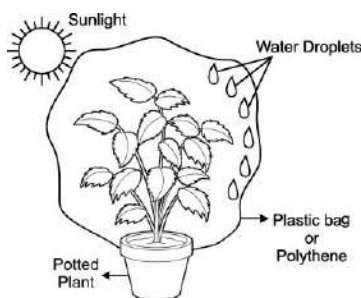
(c) Capillaries: They are thin walled, narrow blood vessels which connect arteries and veins. Through capillaries exchange of gases, diffusion of nutrients, waste products etc., occur between body cells and blood.

(d) Lymph: It carries digested and absorbed fat from intestine to other tissues as well as drains excess fluid from extracellular space back into the blood.

113. What are the components of the transport system in highly organised plants?[\[NCERT\]](#)

Ans. The components of the transport system in highly organised plants are xylem and phloem. Xylem consists of tracheids, vessels, xylem parenchyma, xylem fibres. Phloem consists of sieve tubes, companion cells, phloem fibres, phloem parenchyma.

114. Define the term transpiration. Design an experiment to demonstrate this process.[\[Board Question\]](#)



Ans. Loss of excess water from the leaves of plants with the help of stomata is called as transpiration.

Experiment to demonstrate Transpiration

Material Required: A potted plant, A polythene, Tape.

Procedure:

- (a) Take a potted plant and enclose the leaves of the plant with a big plastic or polythene bag.
- (b) Now keep the plant in sunlight for two hours.
- (c) After sometime you will observe the water droplets on the polythene sheet.
- (d) It depicts the loss of water from the leaves of the plant depicting transpiration.

115. What is transpiration? List its two functions.

[Board Question]

Ans. The evaporation of water from the leaves of a plant is called transpiration.

Functions of transpiration are:

- (i) It helps in the upward movement of water and minerals from root to the leaves through the stem.
- (ii) Helps in cooling the plant surface.

116. Answer the following questions:

(i) What is translocation? Why is it essential for plants? **[Board Question]**

(ii) Where do the substances in plants reach as a result of translocation? **[Board Question]**

Ans. (i) The transport of food from leaves to other parts of the plant is called translocation. Translocation is essential for plants because without it food prepared by the leaves cannot reach other parts of the plant for their growth and development.

(ii) The substances in plants reach to other tissues in plants from the leaves as a result of translocation.

117. List two types of the transport system in human beings and write the functions of any one of these.

[Board Question]

Ans. Lymphatic system and blood circulatory system are two types of the transport system in human beings.

Functions of blood circulatory system are:

1. It carries nutrients and oxygen to all cells in the body.
2. Removes CO₂ from the body cells.
3. It carries digested food from the small intestine to other parts of the body.
4. It carries hormones from endocrine glands to different organs for the body.

118. What are the methods used by plants to get rid of excretory products? **[NCERT]**

Ans. The methods used by plants to get rid of excretory products are:

1. Oxygen produced by photosynthesis process and carbon dioxide

produced by respiration process are removed through stomata.

2. Excess water is lost through aerial parts of the plant like leaves by transpiration process.
3. Some wastes are transferred to soil through roots.
4. Many cytoplasmic wastes are shifted to vacuoles.
5. Some plants excrete in form of gums, resins, latex etc.
6. Some wastes are stored in dried leaves which eventually fall.
7. Some wastes are stored in barks of stem which are removed periodically.

119. How is the amount of urine produced regulated? [NCERT]

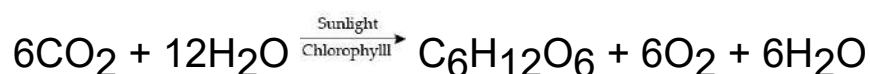
Ans. The amount of urine produced depends upon the amount of excess water and dissolved wastes present in the body. If the amount of excess water and wastes is more urine produced will be more and vice-versa. The hormone ADH secreted by posterior pituitary gland also regulates the amount of urine produced.

Long Answer Type Questions

120. Explain the mechanism of photosynthesis.

Ans. Photosynthesis is the biological process in which autotrophs prepare their own food. The process of photosynthesis occurs in two phases – Photochemical phase and Biosynthetic phase.

The overall photosynthesis process can be represented in the form of a chemical reaction as:



1. Photochemical phase or Light dependent phase: It occurs in thylakoid or grana of chloroplast. Chlorophyll molecules absorb sunlight energy which leads to photolysis of water molecule. The hydrogen produced due to splitting of water is carried by NADP forming NADPH. Oxygen is produced as byproduct during this

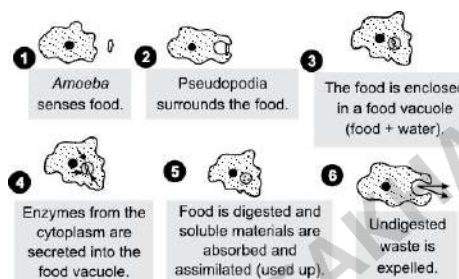
phase.

2. Biosynthetic phase or Light independent phase: It occurs in stroma of chloroplast. This phase does not require light. Here, carbon dioxide is converted to glucose using energy molecule ATP and NADPH.

121. Explain the nutrition process in amoeba.

[Board Question]

Ans. Amoeba follows holozoic nutrition. It involves the following steps:



1. **Ingestion:** Amoeba engulfs the food by using its temporary finger like projections called pseudopodia. This process is called ingestion.

2. By phagocytosis process it engulfs its food.

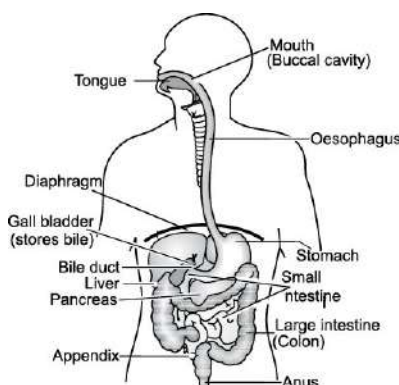
3. **Digestion:** The food which is taken inside the amoeba forms a food vacuole. Many enzymes are secreted into the food vacuole and the complex food molecule is converted into simple and diffusible form.

4. **Absorption and assimilation:** The digested food is absorbed by the cell by diffusion process.

5. **Egestion:** The undigested residue which remains in vacuole is expelled out.

122. Describe the alimentary canal of human beings.

Ans. The alimentary canal of human beings start with mouth and ends in anus.



1. Mouth: We ingest food through the mouth. Teeth are present in mouth which help in chewing and mastication of food. Tongue helps in mixing the food with saliva. Mouth has salivary glands which secrete saliva. Saliva contains the enzyme ptyalin or salivary amylase.

2. Oesophagus: The food in the form of bolus passes from mouth to stomach through oesophagus by peristalsis. It acts as a passage of food from mouth to stomach.

3. Stomach: Stomach is a bag like J shaped structure. Gastric glands present in stomach secrete gastric juice. Gastric juice contains HCl, mucus and enzyme pepsin. Pepsin is a protein digestive enzyme. Food in the form of chyme passes to the small intestine.

4. Small intestine: It is the longest part of the alimentary canal with many folds. It is a coiled like structure. It secretes intestinal juice which contains many enzymes like amylase, lipase, maltase, lactase etc. The complete digestion of food occurs here. It contains finger like projections called villi which absorb the digested food. It receives pancreatic juice from pancreas and bile juice from liver.

5. Large intestine: It receives the undigested and unabsorbed food from small intestine. Most of the water is absorbed here and the remaining is converted into a semi-solid waste material called faeces. The faecal matter is stored in rectum and is removed through anus from time to time.

123. Explain the digestion process in human beings?

Ans. Carbohydrates, proteins and fats present in food are digested in different parts of the alimentary canal as follows:

1. Mouth: Salivary glands are present in mouth which secretes saliva that contains the enzyme salivary amylase or ptyalin. Ptyalin acts upon starch to convert into maltose.



2. Oesophagus: No digestion occurs in this part. Only food in the form of bolus passes through it by peristalsis to reach the stomach.

3. Stomach: Gastric glands present in stomach secrete pepsin which is a protein digestive enzyme.



4. Small intestine: It receives bile juice from liver, pancreatic juice from pancreas and intestinal juice secreted by intestine.

Bile helps in emulsification of fats so that lipase enzyme can easily act upon fats to convert into fatty acids and glycerol.



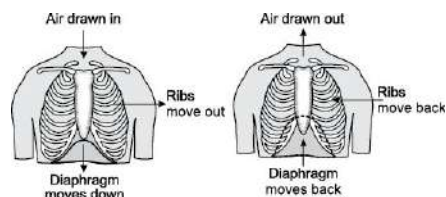
Trypsin found in pancreatic juice acts upon peptones and proteoses and converts to peptides.



The complete digestion of carbohydrates to glucose, proteins to amino acids and lipids to fatty acids and glycerol is done by intestinal juice in small intestine.

124. Explain the process of breathing in human beings.

Ans. Breathing process occurs by inhalation and exhalation.

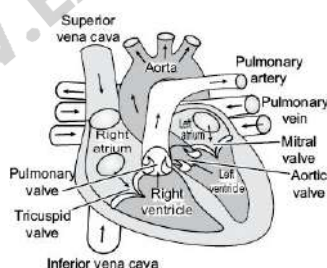


1. Inhalation: It is the process by which oxygen is taken in through nostrils. During inhalation process, the ribs move upwards and outwards due to contraction of intercostal muscles. The diaphragm is lowered so that the volume of thoracic cavity increases. As a result air is forced inside the lungs through nostrils.

2. Exhalation: It is the process by which carbon dioxide is exhaled out from lungs through nostrils. During this process the ribs moves inwards and diaphragm comes back to its original position. The volume of thoracic cavity decreases so air is forced out through the lungs.

125. Describe the internal structure of human heart.

Ans. 1. Human heart is four chambered. It consists of two upper chambers called auricles or atrium and two lower chambers called ventricles.



2. The right atrium receives deoxygenated blood from all parts of the body through two venacavas – superior and inferior. The opening between right atrium and right ventricle is guarded by tricuspid valve which prevents back flow of the blood.

3. Pulmonary artery carries deoxygenated blood from right ventricle to lungs for oxygenation.

4. Left atrium receives oxygenated blood from lungs through

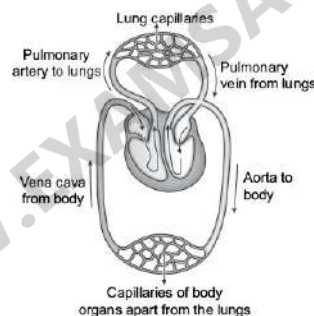
pulmonary veins. The opening of left atrium and left ventricle is guarded by bicuspid valve.

5. From left ventricle arises aorta which carries oxygenated blood to whole parts of the body.

6. Human heart is enclosed by pericardium membrane.

126. Describe the flow of blood in human heart with proper diagram.

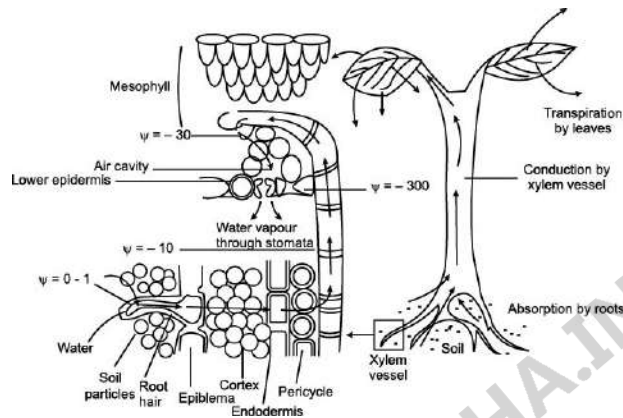
Ans. Blood flows through our heart twice so it is also called **double circulation**. Deoxygenated blood from all parts of the body is carried by venacava to right atrium of heart. Then it passes to right ventricle. Pulmonary arteries carry the deoxygenated blood to lungs for purification. Pulmonary veins carry the oxygenated blood from lungs to left atrium of heart. Then it passes to left ventricle. Aorta carry this oxygenated blood to different parts of the body.



127. How are water and minerals transported in plants?
[NCERT]

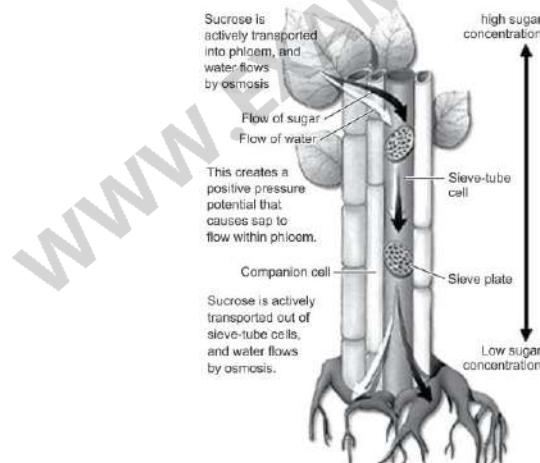
Ans. Water and minerals are transported in plants by xylem. Water containing minerals is called sap which is carried by xylem vessels to all parts of the plant from the roots. Root hairs absorb water from the soil by the process of osmosis whereas mineral salts are absorbed from the soil by the process of active transport. Water and minerals absorbed by the root hairs pass from cell to cell through epidermis, root cortex, endodermis and root xylem. The xylem vessels of the root of the plant are connected to xylem vessels of the stem so water

pass from root to stem and finally to leaves. Water is used up for photosynthesis and some of water is also lost through leaves by the process of transpiration. The pressure at the xylem vessels of leaves is reduced due to transpiration so it creates a suction force and water rises from xylem vessels of stems and roots thus forming a continuous flow of water and mineral salts.



128. How is food transported in plants? [NCERT]

Ans.



The transport of food from the leaves to the other parts of the plant is called translocation. Food is transported in plants through phloem. Phloem has sieve tubes which are the living cells. Sieve tubes are connected to each other by sieve plates which have small holes in them and which allows the food in solution form to pass through them. Interconnected phloem tubes are present in all parts of the

plant so food is carried from leaves to all the parts of the plant. The translocation process requires energy in the form of ATP. The glucose which is made in leaves is loaded into sieve tubes of phloem tissue by using ATP, water enters into this tissue by osmosis now high pressure is created which helps in movement of food to low pressure region.

129. Answer the following questions:

(i) Mention any two components of blood.

[Board Question]

(ii) Trace the movement of oxygenated blood in the body.

(iii) Write the function of valves present in between atria and ventricles.

(iv) Write one structural difference between the composition of artery and veins.

Ans. (i) Red blood cells, white blood cells and platelets are the components of blood.

(ii) The oxygenated blood goes into the left atrium from there it goes to the left ventricle and then to all the body organs.

(iii) Valves prevents the backflow of blood from the ventricles to the atrium.

(iv) Walls of arteries are thick and they carry oxygenated blood whereas walls of veins are thin and they carry deoxygenated blood.

130. Describe the structure and functioning of nephrons?

[NCERT]

Ans. Nephron is the structural and functional unit of life. It has the following parts:

1. Bowman's capsule: It is a thin walled cup like structure which contains a knot like mass of blood capillaries called glomerulus. Both

Bowman's capsule and glomerulus are together called Malpighian capsule.

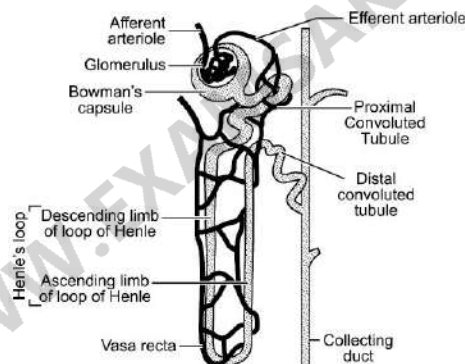
2. Proximal Convoluted Tubule (PTC): It is a convoluted region found near Bowman's capsule.

3. Loop of Henle: It lies next to Proximal Convoluted Tubule which is U shaped structure.

4. Distal convoluted tubule: It is the end part of the nephron which opens to collecting duct.

Functions of nephron: The formation of urine occurs in three steps:

1. Ultrafiltration: Blood flows under high pressure in glomerulus and the liquid portion of the blood filter out from glomerulus and passes to the cup shaped cavity of Bowman's capsule and this process is called ultrafiltration.



2. Selective reabsorption: It is the process of selective absorption of useful substances like glucose, water, some salts etc., from glomerular filtrate which is obtained from ultrafiltration by different parts of nephron.

3. Tubular secretion: Some harmful substances like chemicals, drugs like penicillin, potassium ions etc., are released by renal tubule to the forming urine called tubular secretion.

131. Describe the process of urine formation in kidneys.

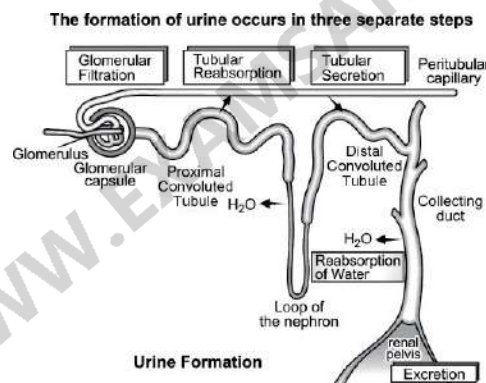
Ans. Urine formation occurs in three steps:

1. Ultrafiltration: Blood containing nitrogenous wastes flows with a great pressure through glomerulus. The liquid portion of the blood gets filtered through glomerulus and collects in the Bowman's capsule which is called glomerular filtrate. This process is called ultrafiltration.

2. Selective reabsorption: The glomerular filtrate contains a lot of useful substances like glucose, water, salts etc., which gets selectively reabsorbed by different parts of renal tubule. This process is called selective reabsorption.

3. Tubular secretion: Distal Convolved Tubule part of nephron secretes some harmful substances like salts, antibiotics like penicillin etc., to the forming urine which is called tubular secretion.

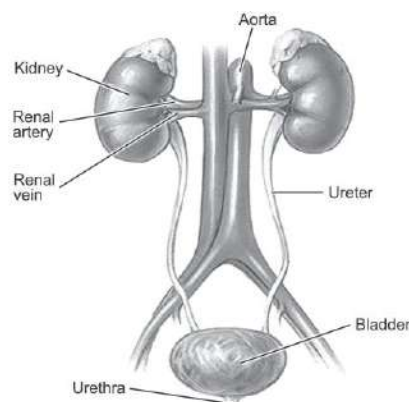
The formed urine is then received by collecting ducts which pours into the pelvis of kidney.



132. Describe the excretory system in human beings.

Ans. The human excretory system consists of two kidneys, a pair of ureter, urinary bladder and urethra.

1. Kidneys: They are a pair of excretory organs which are bean shaped. Nephrons are structural and functional units of kidneys where urine is formed. They are located in the abdomen on either side of the vertebral column.



2. Ureter: A pair of muscular tube like structure called ureter runs from kidneys to urinary bladder. They carry the formed urine from kidneys to urinary bladder.

3. Urinary bladder: It is a muscular sac like structure which stores the urine.

4. Urethra: It is a tube like structure which removes the urine stored in bladder from time to time.

133. Answer the following questions:

(i) Define excretion. **[Board Question]**

(ii) Name the basic filtration unit present in the kidney.

(iii) Draw excretory system in human beings and label the following organs of excretory system which perform the following functions:

(a) forms urine.

(b) is a long tube which collects urine from kidney.

(c) Store urine until it is passed out.

Ans. (i) The process of removing toxic waste from the human body is called excretion.

(ii) Nephron is the basic filtration unit present in the kidney.

(iii) (a) Kidney (b) Ureter

(c) Urinary Bladder.

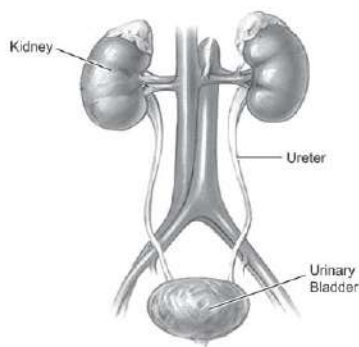
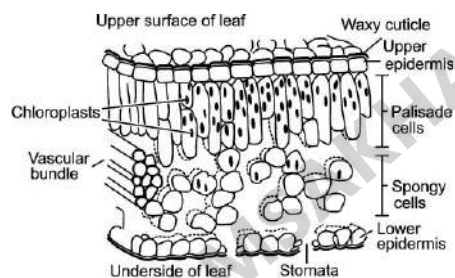


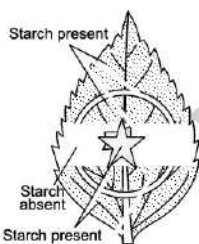
Diagram Based Questions

134. Draw a labelled diagram of a cross-section of a leaf?
[Board Question]

Ans.

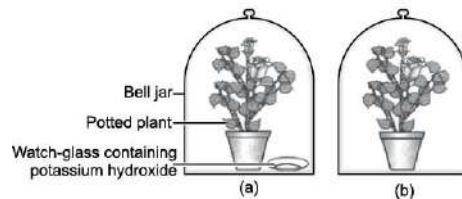


135. What does the below figure represent during the process of photosynthesis?



(i)

(ii)



(iii) What is the role of KOH kept in watch glass given in figure above?

Ans. (i) Light is necessary for photosynthesis.

(ii) Carbon dioxide is necessary for photosynthesis.

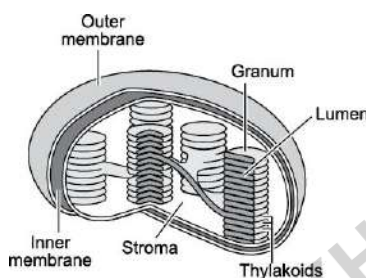
(iii) KOH absorbs carbon dioxide.

136. Draw a well labeled diagram of:

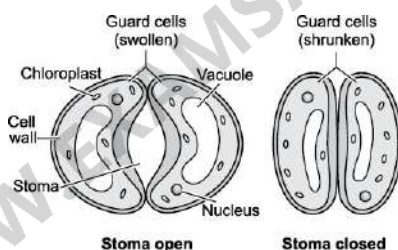
(i) Chloroplast

(ii) Open and closed stomata

Ans. (i)



(ii)



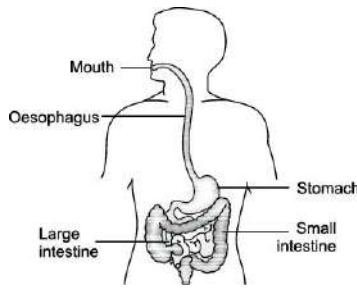
137. Answer the following questions:

(i) Draw the diagram of alimentary canal of man and label the following parts:

Mouth, Oesophagus, Stomach, Intestine

(ii) In case of diarrhoea name the major process which occurs in large intestine which is no longer occurring normally.

Ans. (i)



(ii) In case of diarrhoea absorption of water in large intestine will not occur normally.

138. Draw a diagram of alimentary canal labelling the following:

- (i) Organ which secretes bile.
- (ii) Organ which stores bile.
- (iii) Organ which behaves as an exocrine as well as endocrine gland.
- (iv) Part where maximum absorption of water occurs.
- (v) Part where digested food is absorbed.
- (vi) Organ where protein digestion first begins.

Ans. (i) Liver

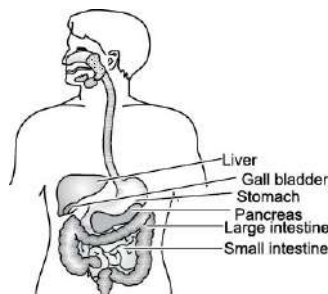
(ii) Gall bladder

(iii) Pancreas

(iv) Large intestine

(v) Small intestine

(vi) Stomach



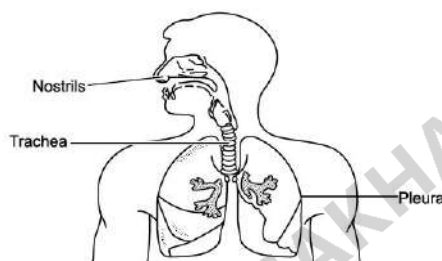
139. Draw diagram of human respiratory system and label the following:

- (i) Organ that is surrounded by cartilaginous rings.
- (ii) Part through which air is taken in.
- (iii) Part which protect the lungs.

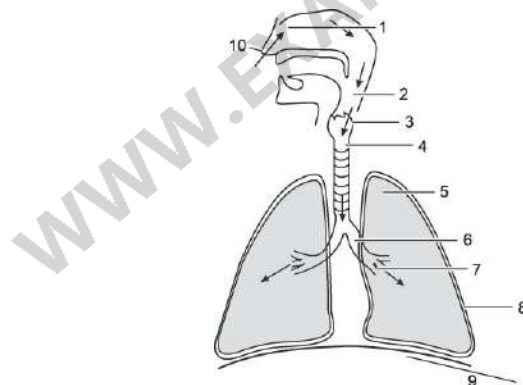
Ans. (i) Trachea

(ii) Nostrils

(iii) Pleura



140. Study the diagram given below and answer the following:



- (i) Label the parts numbered 1 – 10. What does the figure represent?
- (ii) Name all the parts in a sequence through which air from outside reaches the last part of lungs.
- (iii) What is the structural and functional unit of lungs? What important role is played by them?

Ans. (i) 1 – Nasal cavity, 2 – Pharynx, 3 – Larynx,

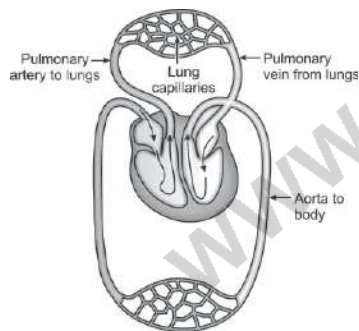
4 – Trachea, 5 – Lungs, 6 – Bronchus,
7 – Bronchioles, 8 – Pleura, 9 – Diaphragm
10 – Nostrils

The figure represents pathway of air through human respiratory system.

(ii) Nostrils → Nasal cavity → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli.

(iii) Alveoli are the structural and functional unit of lungs. They are the site of exchange of gases between blood capillaries and lungs *i.e.*, oxygen is taken in and carbon dioxide is given out.

141. Draw a schematic representation of transport and exchange of oxygen and carbon dioxide during transportation of blood in human beings and label the following parts on it. Lung capillaries, Pulmonary artery to lungs, Aorta to body, pulmonary veins from lungs.

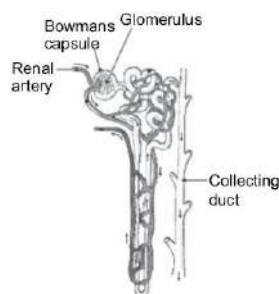


Ans.

142. Draw the diagram of an excretory unit of a human kidney and label the following:

- (i) Bowman's capsule
- (ii) Glomerulus
- (iii) Collecting duct
- (iv) Renal artery

Ans. The excretory unit of kidney is nephron.



Differentiate Between

143. List in tabular form three distinguishing features between autotrophic nutrition and heterotrophic nutrition?

[Board Question]

Ans.	Autotrophic Nutrition	Heterotrophic Nutrition
	In this mode of nutrition, organisms make their own food.	In this mode of nutrition the organisms do not make their own food.
	CO ₂ and H ₂ O are required for the preparation of food as raw materials.	They depend on autotrophs for their food either directly or indirectly.
	Chlorophyll and sunlight are essentially needed and they store the food in the form of starch.	Chlorophyll and sunlight are not needed and they store the food in form of glycogen.

144. What are the differences between aerobic and anaerobic respiration? Name some organisms that use the anaerobic mode of respiration? [NCERT]

Ans.	Aerobic Respiration	Anaerobic Respiration
	This process occurs in presence	This process occurs in absence of oxygen.

of oxygen.	
During this process glucose is completely oxidised to release carbon dioxide and water.	Glucose is incompletely oxidised. In yeast the products are ethanol and carbon dioxide. In human beings under anaerobic conditions the products are lactic acid and carbon dioxide.
More amount of energy is released during this process.	Less amount of energy is released during this process.
It takes place in mitochondria.	It takes place in cytoplasm. Mitochondria is not involved during this process.

Some organisms that use the anaerobic mode of respiration are yeast, some bacteria, some parasitic worms, etc.

145. What are the differences between transport of materials through xylem and phloem? [NCERT]

Ans.	Transport in Xylem	Transport in Phloem
	It transports water and mineral salts.	It transports manufactured food from leaves.
	Mainly the transport is unidirectional.	The transport is in different directions.
	Transport occurs by tracheids and vessels.	Transport occurs in sieve tubes with help of companion cells.
	It does not require energy.	ATP is required for this transport.

Transport by xylem mainly occurs by transpiration pull. It is also called ascent of sap.

Transportation of phloem occurs by the process known as translocation.

146. Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning? [NCERT]

Ans.	Alveoli in Lungs	Nephrons in Kidneys
	Alveoli are tiny sacs like structures having thin walls present in lungs.	Nephrons are long tubules like structures present in kidneys.
	Alveoli are surrounded by blood capillaries.	Nephrons have a knot of blood capillaries in Bowman's capsule called glomerulus and a network of capillaries surround the tubule called vasa recta.
	They provide large surface area for exchange of gases inside lungs.	In nephrons urine formation occurs by three steps <i>i.e.</i> , ultrafiltration, selective reabsorption, tubular secretion.
	They are the site for gaseous exchange.	They serve as filtration unit of waste materials from the body.

Analysis and Evaluation Based Questions

147. If the teeth are not cleaned regularly, they become covered with a sticky yellowish layer W of food particles and bacteria. Since layer W covers the teeth the alkaline liquid X secreted by glands Y inside the mouth cannot reach the teeth surface to neutralize the acid formed by the action of

organisms Z on sugary food and hence tooth decay sets in.

(i) What is W known as?

(ii) What is X and Y?

(iii) What are organisms Z?

(iv) State one way of removing layer W from the teeth.

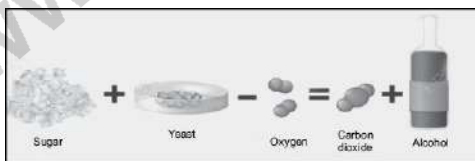
Ans. (i) W is known as dental plaque.

(ii) X is saliva and Y is salivary glands.

(iii) Organisms Z are bacteria.

(iv) Dental plaque can be removed by brushing teeth twice daily.

148. The breakdown of complex substances into simpler substances by action of enzymes released by anaerobic bacteria is called fermentation. By this method we can prepare only ethanol. In this, firstly, sugarcane juice and water are mixed and heated to form sweet liquid called molasses. Then, it breaks into glucose and fructose and then further, glucose and fructose break into further simpler substances. This method is generally carried out in breweries.



(i) Name the enzyme that converts sugarcane juice into glucose and fructose.

(ii) Which enzyme is responsible for conversion of glucose and fructose into ethanol and carbon dioxide?

(iii) What is the condition for fermentation?

(iv) Which of these statements is incorrect?

(a) Sugarcane juice and water are mixed and heated to form sweet

liquid called molasses.

(b) Breakdown of complex substances into simpler substances by anaerobic bacteria is called fermentation.

(c) Glucose and fructose are the final products of fermentation.

(d) Zymase converts glucose and fructose into ethanol and carbon dioxide.

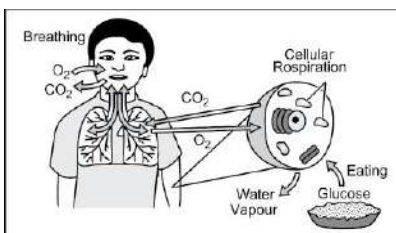
Ans. (i) An enzyme that changes cane sugar into glucose and fructose is known as invertase.

(ii) Zymase converts glucose and fructose into ethanol and carbon dioxide.

(iii) Fermentation occurs in absence of oxygen that is in anaerobic conditions.

(iv) In fermentation, glucose and fructose formed by molasses is further converted into ethanol and carbon dioxide. Hence, the incorrect option is (c), i.e.; Our glucose and fructose are the final products of fermentation.

149. Cellular respiration, the process by which organisms combine oxygen with food stuff molecules, diverting the chemical energy in these substances into life-sustaining activities and discarding, as waste products, carbon dioxide and water.



(i) What is the product of cellular respiration?

(ii) The production of ATP is dependent on two components. What are these two components?

(iii) What amount of energy is released by ATP during an exothermic reaction?

(iv) What are the functions that are performed by ATP?

Ans. (i) Adenosine Tri-Phosphate is the major and the key product of cellular respiration. It is generated at the end of the respiration. ATP plays an important role in the vital processes of life. It acts as a connecting link between anabolism and catabolism.

(ii) The ATP is produced from two components these two components are Adenosine D-Phosphate (ADP) and phosphate.

(iii) The ATP releases the energy during an exothermic reaction.

(iv) The functions performed by ATP are:

1. It helps in the process of muscle contraction, synthesis of proteins.
2. It is an important factor for the conduction of nerve impulses.

150. Smoking is the leading cause of lung cancer. Cigar smoke may contain even more toxic substances than cigarettes. Cigarette smoking can have major consequences on the lungs at all ages.

(i) What developmental defects can babies suffer if pregnant mothers smoke?

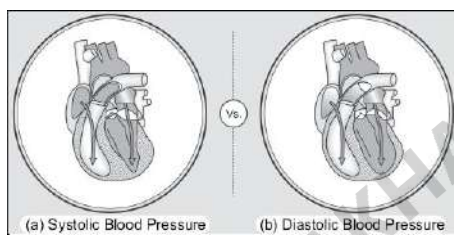
(ii) What is Smokers cough?

Ans. (i) Babies whose mothers smoked during pregnancy may have lungs that develop abnormally.

(ii) Smoking can destroy the cilia or tiny hairs in the airway that keep dirt and mucus out of lungs. The cilia sweep out mucus and dirt so that our lungs stay clear. Smoking temporarily paralyzes and even kills cilia. This makes us more at risk for infection. Smokers get more colds and respiratory infections than non-smokers.

151. Blood is an important fluid connective tissue. It is mainly

composed of plasma and blood cells. There are three types of blood cells namely red blood cells, white blood cells, and blood platelets. The RBCs have haemoglobin, an iron containing complex protein. The WBCs are the cells that help in fighting diseases and attack any foreign bodies in the blood. The blood platelets are the ones that help in clotting of blood. Blood pressure is a serious health problem which affects nearly 40 to 50 percent of the total population. Blood is a fluid connective tissue which is carried to all parts of our body with the help of the blood vessels called arteries. It plays a key factor in providing blood (thus oxygen and energy) to organs.



- (i) What is the normal blood pressure of an adult person?
- (ii) Name the blood pressure measuring instrument for the human beings.
- (iii) What do you mean by systolic pressure?
- (iv) What do you mean by diastolic pressure?

Ans. (i) The normal blood pressure is 120/80 mm of Hg.

(ii) Sphygmomanometer is used for measuring blood pressure.

(iii) The pressure of blood inside the artery during ventricular systole is called systolic pressure. The normal systolic pressure is 120 mm of Hg.

(iv) The pressure of blood inside the artery during ventricular diastole is called diastolic pressure. The normal diastolic pressure is 80 mm of Hg.

152. The process of photosynthesis occurs in:

- (a) UV radiation
- (b) Infrared radiation
- (c) Dark
- (d) Visible light

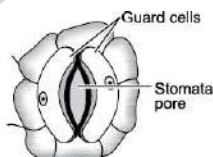
Ans. (d) Visible light

153. To observe stomata under microscope Swati took the leaf peel from *Tradescantia* leaf from lower surface of leaf:

- (a) She should take from upper surface.
- (b) She should take from tip of the leaf.
- (c) She had taken the correct surface for leaf peel.
- (d) She should not take from leaf surface.

Ans. (c) She had taken the correct surface for leaf peel.

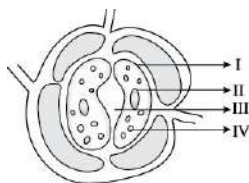
154. Mohit prepared temporary mount of a leaf peel and drew the following diagram. The missing part in the diagram is:



- (a) Epidermal cells
- (b) Nucleus
- (c) Chloroplasts
- (d) Cell wall

Ans. (c) Chloroplasts

155. In the below sketch of the stomatal apparatus the parts I, II, III and IV were labelled differently by four students. The correct labelling out of the four is:



- (a) I – Guard cell; II– Nucleus; III– Stomata; IV – Chloroplasts
- (b) I – Stomata; II – Guard cell; III – Chloroplasts; IV – Nucleus
- (c) I – Guard cell; II – Stomata; III – Nucleus; IV – Chloroplast
- (d) I – Cytoplasm; II – Nucleus; III – Chloroplasts; IV – Stomata

Ans. (a) I – Guard cell; II– Nucleus; III– Stomata; IV – Chloroplasts

156. A student covered a leaf from a de-starched plant with a black paper strip and kept it in the garden outside his house in fresh air. In the evening, he tested the covered portion of the leaf for the presence of starch. By doing so the student was trying to show that: [\[Board Question\]](#)

- (a) Carbon dioxide is given out during respiration.
- (b) Carbon dioxide is necessary for photosynthesis.
- (c) Chlorophyll is necessary for photosynthesis.
- (d) Light is necessary for photosynthesis.

Ans. (d) Light is necessary for photosynthesis.

157. In the experiment to show that carbon dioxide is released during respiration the small test tube of KOH solution is suspended inside the conical flask to absorb the:

- (a) Air of the flask.
- (b) Moisture of the flask.
- (c) Oxygen of the flask.
- (d) Carbon dioxide of the flask released by the seeds.

Ans. (d) Carbon dioxide of the flask released by the seeds.

158. A student while observing an embryo of a pea seed in the laboratory listed various parts of the embryo as given below:

[Board Question]

Testa, Tegmen, Radicle, Plumule, Micropyle, Cotyledon.

Teacher on examining listed that only three parts are correct. Which are they?

Ans. Radicle, Cotyledon, Plumule

159. After examining a prepared slide under the high power of a compound microscope, a student concludes that the given slide shows the various stages of binary fission in a unicellular organism. Write two observations on the basis of which such a conclusion may be drawn.**[Board Question]**

Ans. 1. A single parent divides to form two daughter cells.

2. The nucleus of mature cell seems elongated and a groove is formed in cell which divides the nucleus.

160. List in proper sequence four steps of obtaining germinating dicot seeds.**[Board Question]**

Ans. 1. The root is formed when radicle of seed grows.

2. The root grows downward into the soil and absorbs water and minerals from the soil.

3. The shoot is formed from the upward growth of plumule.

4. The green leaves are developed when shoot comes above the ground.

161. In the experimental set up to show that “CO₂ is given out during respiration”, name the substance taken in the small test tube kept in the conical flask. State its function and the consequence of its use.

[Board Question]

Ans. The chemical kept in the test tube is KOH–Potassium Hydroxide. The function of this chemical is to absorb the vapours of CO₂.

Application Based Questions

162. During the experiment to demonstrate that carbon dioxide is produced during respiration, why do we use:

- (i) KOH pellets
- (ii) Germinating seeds

Ans. (i) KOH pellets absorb the carbon dioxide gas produced by the process of respiration by germinating seeds.

(ii) Germinating seeds are in active growth phase and they produce carbon dioxide gas due to respiration.

163. Why should we place a plant in dark for at least for 24–48 hours before performing photosynthesis experiment?

Ans. When a plant is placed in dark for 24–48 hours it uses up all the stored starch so that it will not give incorrect results during the photosynthesis experiment.

164. Why should we keep the germinating seeds moist while carrying out experiment on respiration?

Ans. Germinating seeds require moisture for their growth and hence show active respiration process and in absence of moisture they will dry and will not show any growth as well as respiration process.

165. Study the table given below and answer the questions.

Category	Systolic	Diastolic
Optimal	<120	<80
Normal	120-129	80-84

High	130-139	85-89
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- (i) What are systolic and diastolic blood pressures?
- (ii) Which blood vessel is known to have the lowest blood pressure?
- (iii) Define the term sphygmomanometer.
- (iv) What is the meaning of blood pressure?

Ans. (i) The pressure with which blood moves due to contraction of ventricles is termed as the systolic pressure (upper value) and the pressure of the blood when ventricles relax is known as diastolic pressure (lower value).

(ii) The blood vessel that has the lowest blood pressure is vein.

(iii) The sphygmomanometer is a device that is composed of an inflatable cuff, a measuring unit, and a valve. It is a device that is used for measuring blood pressure.

(iv) The blood exerts a certain amount of pressure on these blood vessels. This exerted pressure on the wall of arteries is termed as blood pressure. The normal blood pressure of a person is 120/80 mm Hg.

166. Why does an artificial kidney contain a number of tubes with a semipermeable lining?

Ans. Artificial kidney contains a number of tubes with a semipermeable lining so that when the patient's blood is passed through these tubes, the waste products from the blood pass into dialysing fluid by diffusion and the purified blood is pumped back into the patient.



167. Delete the word or words which are inappropriate from the following reactions:

(i) Starch + proteins $\xrightarrow{\text{Salivary amylase}}$ Maltose

(ii) Pepsinogen $\xrightarrow{\text{HCl}}$ Peptides + Pepsin

Ans. (i) Proteins

(ii) Peptides

168. Using the following information form a pathway showing the flow of blood through heart. And also include information that are not mentioned below to complete it.

Left ventricle, inferior vena cava, superior vena cava, tricuspid valve, left auricle, bicuspid valve, right auricle, lungs, right ventricle, pulmonary vein.

Ans. Right side of the heart:

Inferior + superior vena cava → brings **deoxygenated blood** from the body → enters right auricle → through tricuspid valve enters right ventricle → through **pulmonary artery** enters lungs for purification of blood.

Left side of heart:

Oxygenated blood enters from lungs → left auricle via pulmonary vein → left ventricle via bicuspid valve → **aorta** → rest of the body.

169. If a person has a systolic pressure of 140 mm of Hg and the pulse pressure is 40 mm of Hg. Solve it with the help of this information and find out the diastolic pressure.

Ans. We know that pulse pressure is the difference between systolic and diastolic pressure. So, let us take diastole pressure as X.

Systole pressure – Diastole pressure = Pulse pressure

$$140 - X = 40$$

$$\text{So, } X = 140 - 40 = 100 \text{ mm of Hg.}$$

170. (i) Why there is difference in the volume of filtrate formed and the concentration of urine excreted?

(ii) In some people glucose is detected in urine. Explain.

(iii) Reabsorption of chloride ions from glomerular filtrate in kidney tubule occurs by_____.

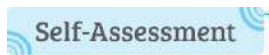
Ans. (i) There is difference in the volume of filtrate formed and the concentration of urine excreted due to selective reabsorption and tubular secretion of the constituents.

(ii) The maximum capacity of the kidney for reabsorption is known as transport maximum or renal threshold. If glucose level in the body rises above its transport maximum then glucose is found in the urine. The transport maximum for some substances is regulated by the body needs while for some constituents it is regulated by hormones.

(iii) Glomerular filtration is the first step in urine formation. Glomerular blood is filtered through filtration slits present in Bowman's capsule. The Bowman's capsule collects the filtrate and it enters the tubules of the nephron. From the tubules, the chloride ions from the glomerular filtrate are reabsorbed by diffusion.

171. Ravi was diagnosed with kidney failure. He was advised to undergo dialysis for twice in a week. After undergoing dialysis for a month he was unable to continue the treatment as it is very painful. What alternative treatment solution can you suggest for Ravi other than dialysis.

Ans. A person diagnosed with kidney failure can undergo kidney transplantation other than dialysis. It is the transplant of a kidney into a patient with end-stage renal disease. A healthy donor can donate his or her kidney to the patient via surgery.

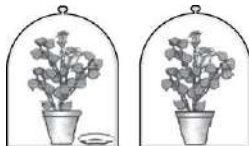


172. Why is it necessary to destarch a plant before photosynthesis process?

173. All plants give out oxygen during day and carbon dioxide during night. Do you agree with this statement? Give reason.

174. In which form do most plants absorb nitrogen?

175. Given below is the experimental set up to establish that one of the atmospheric gases is essential for photosynthesis in plants.



(a) (b)

(i) Name the atmospheric gas which is essential for photosynthesis.

(ii) Which is kept in watch glass in figure (a) and why?

176. State the three common features of all the respiratory organs like skin, gills and lungs?

177. What is Smokers cough?

178. Differentiate between blood and lymph.

179. What substances are contained in gastric juice? What are their functions?

180. Explain how the separation of oxygenated and deoxygenated blood is useful in humans? Why is double circulation of blood necessary in humans?

181. Assertion: Presence of HCl in stomach is necessary for the process of digestion.

Reason: HCl kills and inhibits the growth of bacteria in the stomach.

182. Which organs can be donated by a brain-dead patient?

183. Describe the structure of human kidney.

184. What is the main nitrogenous waste in our body? Where is it formed?

185. A dialysis machine contains long tubes coiled in a tank containing dialyzing solution:

- (i) Of what substances are the tubes made.
 - (ii) What does the dialyzing solution contain?
 - (iii) Name the main waste which passes into the dialyzing solution.
- 186.** What is the main function of kidneys?

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Control and Coordination

Chapter 7

Summary

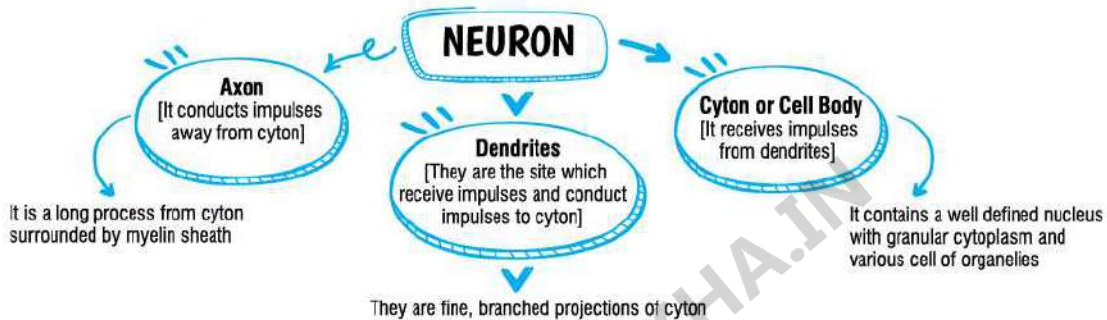
WWW.EXAMSAKHA.IN

- Movements is one of the important characteristics of living beings.
- Changes in the environment to which the organisms respond and react are called stimuli.
- Various organs or parts of the body of an organism works in a coordinated and proper manner to produce a reaction to the given stimulus which is called coordination.
- Nervous system and endocrine system are the two systems which play a major role in control and coordination.

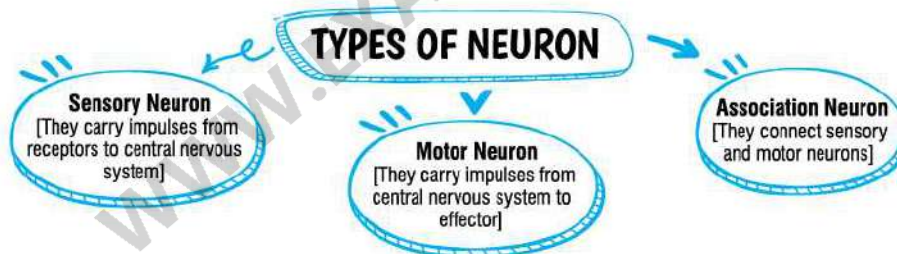
• COORDINATION IN ANIMALS

Human Nervous System

- Nervous system coordinates and controls all the voluntary and involuntary actions by transmitting nerve impulses to and from different parts of the body.
- Neuron is the structural and functional unit of nervous system.

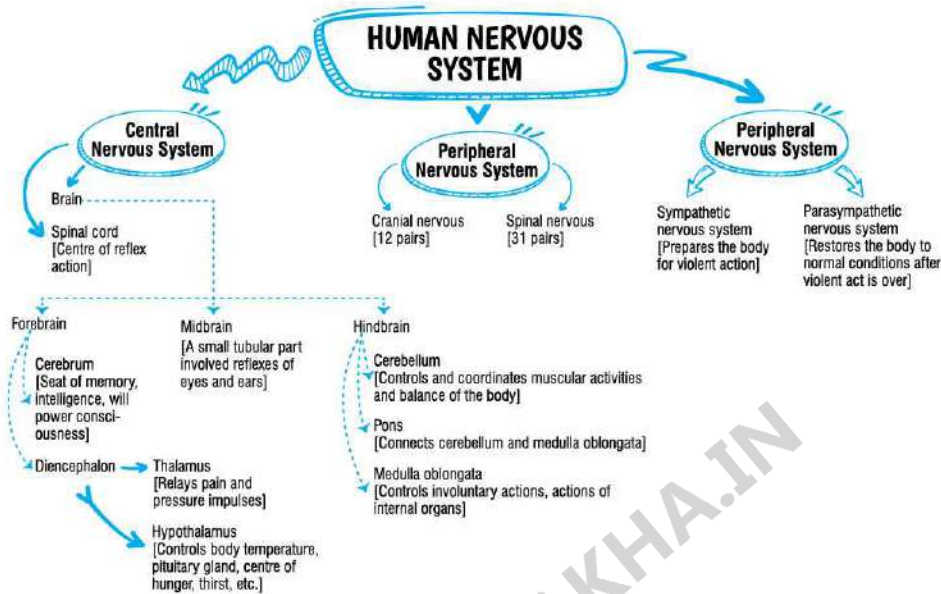


- Synapse is a point of contact between axon terminals of one neuron with dendrites of another neuron separated by a minute gap.
- The terminals of axon have swollen ends which contain a chemical called acetylcholine – a kind of neurotransmitter.

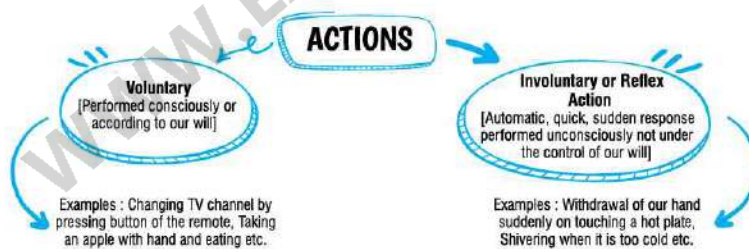


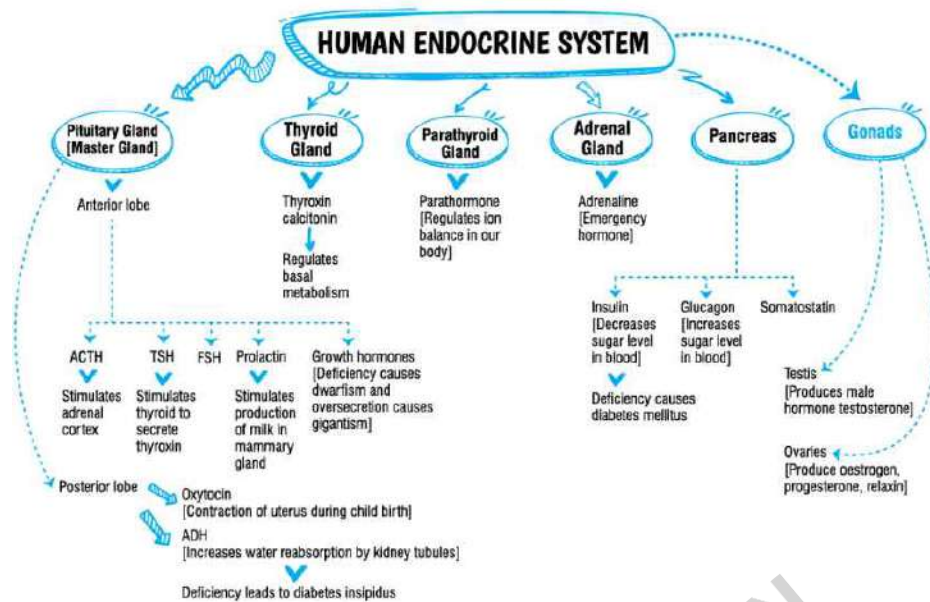
- Brain is protected inside cranium of skull.
- Brain and spinal cord are protected by a three membranous layer called meninges.
- The three layers of meninges are Dura mater, Arachnoid, Pia mater.

- Space between covering membrane is filled with a fluid called cerebrospinal fluid which protects brain and spinal cord from shock or injury.
- Cerebrum of brain is divided into four lobes – Frontal lobe, parietal lobe, temporal lobe and occipital lobe.
- There are 31 pairs of spinal nerves – 8 pairs in neck region, 12 pairs in thorax, 5 pairs in lumbar, 5 pairs in sacral and 1 pair in coccygeal region.



- Sympathetic and parasympathetic nervous system are antagonistic in functions.
- Spinal cord is the extension of medulla oblongata which runs through our vertebral column along the whole length of backbone.
- Reflex arc is the shortest route taken by an impulse from receptor to effector.
- Stimulus → Receptors → Sensory neuron → Brain or Spinal cord → Motor neuron → Effector organ → Response.

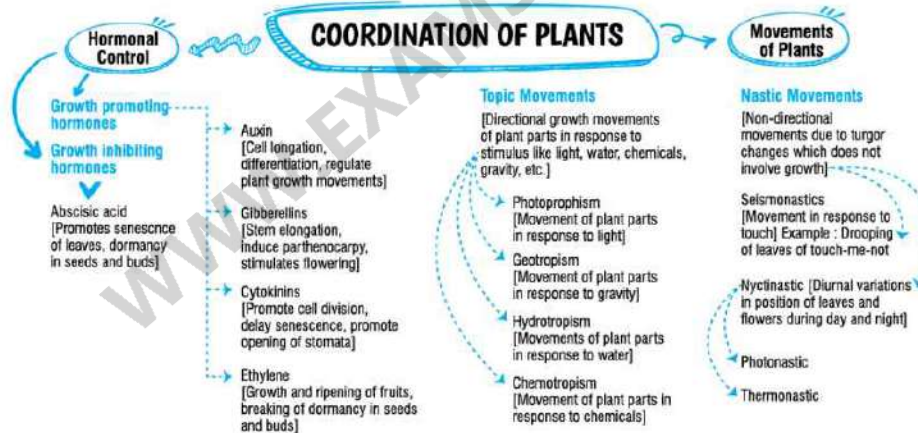




- Hypothalamus secretes neurohormones and it also controls secretions of pituitary gland.
- The body has to maintain a normal state because too much or very less secretions of hormones is not good. If there is a rise in hormonal level the hormones secretion has to be reduced. Similarly if there is low hormonal level, its secretion has to be increased which is maintained by feedback mechanism.

• COORDINATION IN PLANTS

- There are two types of movements : (i) Growth dependent movement. (ii) Growth independent movement.
- Curvature movements are changes in orientation of some plant parts in response to stimulus.



Definitions

1. Tropic movements: These are directional movements of plant parts which involve growth in response to stimuli.

2. Movements of curvature: These are changes in orientation of some plant parts in relation to others caused by external or internal

stimuli.

3. Nastic movements: These are non-directional induced variation movements that do not involve growth which occurs due to change in turgour pressure in response to stimuli.

4. Hormones: Hormones are chemical messengers secreted by endocrine glands which regulate various physiological processes in living organisms.

5. Phytohormones: Phytohormones are naturally occurring organic chemical substances present in plants which control and coordinate various activities in them and are called as growth regulators.

6. Coordination: The working together of various organs of the body of an organism in a proper manner to generate a proper reaction in response to a stimulus is called coordination.

7. Stimuli: The changes in the environment to which the organisms respond and react are called stimuli.

8. Sensory neurons: Sensory neurons receive stimuli through their dendrites and transmit impulses towards central nervous system from receptors.

9. Motor neurons: Motor neurons transmit impulses from central nervous system to effectors.

10. Receptors: Receptor is a sensory nerve cell or a group of sensory nerve cells which is sensitive to a specific stimulus or to a specific change in the environment.

11. Reflex actions: It is a spontaneous, quick, automatic response to a stimulus acting on a specific receptor without the will of an animal.

12. Reflex arc: It is the shortest route taken by a nerve impulse from receptor to effector during a reflex action.

13. Cerebrospinal fluid: It is a clear, colourless, slightly alkaline

fluid present in ventricles of brain, central canal of spinal cord and spaces between meninges which protects brain and spinal cord from injury and shocks.

14. Endocrine glands: These are ductless glands which pour their secretion directly into blood stream and are carried by blood to the site of action or target organs.

Multiple Choice Questions

15. The shape of guard cells changes due to change in the:
[NCERT Exemplar]

- (a) protein composition of cells.
- (b) temperature of cells.
- (c) amount of water in cells.
- (d) position of nucleus in cells.

Ans. (c) amount of water in cells.

Explanation :

The amount of water in guard cells causes change in their shape. When water enters into the guard cell, it causes the stomatal pore to open. Similarly, if the guard cells shrink as a result of water loss, the pore closes.

16. Which of the following statements are true ?

- (i) Sudden action in response to something in the environment is called reflex action.
 - (ii) The path through which signals are transmitted from a receptor to a muscle or a gland is called reflex arc.
 - (iii) Motor neurons carry signals from spinal cord to effector organs.
 - (iv) Sensory neurons carry impulses from effectors to receptors.
- (a) (i) and (ii)

- (b) (iii) and (iv)
- (c) (i), and (iv)
- (d) (i), (ii) and (iii)

Ans. (c) (i) and (iv)

Explanation :

Statements (ii) and (iii) are wrong in their sense because sensory neurons carry signals from receptors to spinal cord and motor neurons carry signals from spinal cord to the muscles. Thus, statement (i) and (iv) are true.

17. Which of the following is a plant hormone?

[NCERT]

- (a) Insulin
- (b) Thyroxine
- (c) Oestrogen
- (d) Cytokinin

Ans. (d) Cytokinin

Explanation :

Cytokinin is a plant hormone that plays an important role in plant growth and development. In plants, it aids embryogenesis, cell division, chloroplast differentiation, and a variety of other processes.

18. Cretinism results due to :

- (a) excess secretion of growth hormone.
- (b) under secretion of thyroxine.
- (c) excess secretion of adrenaline.
- (d) under secretion of growth hormone.

Ans. (b) under secretion of thyroxine.

Explanation :

The excess secretion of thyroxine hormone in babies causes cretinism. Slow heartbeat, low blood pressure, low body temperature, stunted growth, mental retardation, awkward body with a pot belly, protruding tongue, pigeon breast, and retarded sexual development are all symptoms of this condition.

19. The brain is responsible for : [NCERT]

- (a) thinking
- (b) regulating the heart beat
- (c) balancing the body
- (d) all of the above

Ans. (d) all of the above

Explanation :

The cerebellum of the brain is involved in muscle coordination, muscle tone, and balance. The medulla oblongata regulates heartbeat and controls consciousness and arousal. The cerebrum is the centre of brain for higher-order thinking functions such as learning, memory, language, and speech.

20. Involuntary actions in the body are controlled by:[NCERT Exemplar]

- (a) Medulla in fore brain
- (b) Medulla in mid brain
- (c) Medulla in hind brain
- (d) Medulla in spinal cord

Ans. (c) Medulla in hind brain

Explanation :

The involuntary activities are controlled by the medulla oblongata in

the hind brain. Involuntary movements have a slower speed than voluntary movements. The beating of the human heart is the best example of this.

21. Which one of the following pairs of brain part and its functions is not correctly matched?

- (a) Pons – Consciousness
- (b) Cerebrum – Memory and intelligence
- (c) Cerebellum – Balance and posture
- (d) Medulla Oblongata – Involuntary activities

Ans. (a) Pons – Consciousness

Explanation :

Pons is involved in respiratory control, communication between different areas of the brain, and perceptions including hearing, taste, and balance, but not in overall consciousness. The brain stem controls consciousness.

22. In humans, the life processes are controlled and regulated by:

- (a) Reproductive and endocrine systems
- (b) Respiratory and nervous systems
- (c) Endocrine and digestive systems
- (d) Nervous and endocrine systems

Ans. (d) Nervous and endocrine systems

Explanation :

The nervous and endocrine systems in humans work together to control and coordinate all activities. Both of these systems are made up of a number of organs that work in coordinated manner.

23. Choose the incorrect statement about insulin.

[NCERT Exemplar]

- (a) It is produced from pancreas.
- (b) It regulates growth and development of the body.
- (c) It regulates blood sugar level.
- (d) Insufficient secretion of insulin will cause diabetes.

Ans. (b) It regulates growth and development of the body.

Explanation :

Growth hormone is a peptide hormone that promotes growth, cell reproduction, and regeneration. Insulin is made in the pancreas by beta cells found in the Islets of Langerhans. It is essential for the absorption of blood sugar by the cells. Along with glucagon, it regulates blood sugar levels.

24. Select the mismatched pair. [NCERT Exemplar]

- (a) Adrenaline : Pituitary gland
- (b) Testosterone : Testes
- (c) Estrogen : Ovary
- (d) Thyroxine : Thyroid gland

Ans. (a) Adrenaline : Pituitary gland

Explanation :

The adrenal glands produce adrenaline, which activates the body's fight-or-flight response. The testes, which are responsible for the development of male sexual traits, produce testosterone. The ovaries, which are responsible for the development of female sexual traits, produce oestrogen. Thyroxine is a hormone generated by the thyroid gland to accelerate the production of oxidative metabolism in cells.

25. Rhythms of sleep in our body are controlled by:

- (a) Thymus gland

(b) Pineal gland

(c) ACTH

(d) ADH

Ans. (b) Pineal gland

Explanation :

The pineal gland is a tiny gland located in the brain. Melatonin, a hormone that helps regulate sleep and wakefulness, is produced by this gland.

26. Which statement is not true about thyroxine?

(a) Thyroxine regulates the basal metabolism of our body.

(b) Iodine is an important component required for synthesis of thyroxine.

(c) Under secretion of thyroxine causes simple goitre.

(d) Iron is essential for synthesis of thyroxine.

Ans. (d) Iron is essential for synthesis of thyroxine.

Explanation :

Iodine, not iron, is required for the synthesis of thyroxine. It controls the glucose, protein, and fat metabolism of the body. The thyroid gland produces thyroxine, which is also known as thyroid hormone.

27. Axon is:

(a) Impulse

(b) Cytoplasmic extension

(c) Muscle parts

(d) All of the above

Ans. (b) Cytoplasmic extension

Explanation :

Axons are one of two forms of cytoplasmic protrusions from a neuron's cell body; dendrites are the other. In vertebrates, an axon is a long, slender projection of a nerve cell that conducts electrical impulses.

28. Dramatic changes of body features associated with puberty are mainly because of secretion of: [\[NCERT Exemplar\]](#)

- (a) Estrogen from testes and testosterone from ovary
- (b) Estrogen from adrenal gland and testosterone from pituitary gland.
- (c) Testosterone from testes and estrogen from ovary.
- (d) Testosterone from thyroid gland and estrogen from pituitary gland.

Ans. (c) Testosterone from testes and estrogen from ovary.

Explanation :

The release of oestrogen and testosterone is associated to puberty changes. In females, oestrogen is secreted from the ovary, while testosterone is secreted from the testes in males.

29. CNS consists of:

- (a) brain
- (b) spinal cord
- (c) only cerebrum
- (d) both (a) and (b)

Ans. (d) both (a) and (b)

Explanation :

The central nervous system consists of the brain and spinal cord. The spinal cord is a long, tubular bundle of neurons that connects the brain to the rest of the body and transmits information.

30. Olfactory reception is related to sense of:

- (a) smelling
- (b) tasting
- (c) vision
- (d) none of these

Ans. (a) smelling

Explanation :

The olfactory neurons have olfactory receptors on their surfaces. Their primary function is to detect odours.

31. Which of the following endocrine glands is unpaired?

[NCERT Exemplar]

- (a) Adrenal
- (b) Pituitary
- (c) Testes
- (d) Ovary

Ans. (b) Pituitary

Explanation :

The pituitary gland, also known as the hypophysis, is a pea-sized endocrine gland. It is a protrusion at the base of the brain, at the bottom of the hypothalamus. It is a gland which is not paired. Adrenal, ovary and testes are paired glands.

32. Receptor for stimulus are present in:

- (a) stomach
- (b) response
- (c) sense organs
- (d) hot objects

Ans. (c) sense organ

Explanation :

Receptor cells, which are specialised cells that produce electrical impulses in response to certain stimuli, are found in the sense organs.

33. When a person is suffering from severe cold, he or she can not: [NCERT Exemplar]

- (a) differentiate the taste of an apple from that of an ice-cream.
- (b) differentiate the smell of a perfume from that of an agarbatti.
- (c) differentiate red light from green light.
- (d) differentiate a hot object from a cold object.

Ans. (b) differentiate the smell of a perfume from that of an agarbatti.

Explanation :

Mucus in the nasal passages thickens during a cold, preventing scent molecules from reaching the olfactory receptor cells. As a result, the brain receives no information identifying the odour, making it impossible to distinguish the smell of a perfume from that of an agarbatti.

34. The structural and functional unit of nervous system is:

- (a) Nephron
- (b) Neuron
- (c) Cyton
- (d) Axon

Ans. (b) Neuron

Explanation :

Neurons are the structural and functional unit of nervous system. They generate electrical signals called action potentials that allow them to quickly send information over large distances.

35. Body coordination is exhibited by:

- (a) nervous system
- (b) endocrine system
- (c) neuro-endocrine system
- (d) blood vascular system

Ans. (c) neuro-endocrine system

Explanation :

The neuroendocrine system, which consists of the nervous and endocrine systems, keeps the body coordinated. The nerve impulse generated by the neurological system activates the endocrine glands.

36. Which of the following is not strictly considered as a part of the neuron?

- (a) axon
- (b) dendrites
- (c) nissl bodies
- (d) myelin sheath

Ans. (d) myelin sheath

Explanation :

A cell body (also known as a soma), dendrites, and an axon are all parts of a neuron. Nerve fibres have axons and dendrites. Nissl granules, as well as other cell organelles, are found in the cytoplasm of the cell body of neurons. Myelin sheath is not a part of the neuron.

37. Cranium is related to:

- (a) head
- (b) thorax
- (c) abdomen

(d) limbs

Ans. (a) head

Explanation :

Cranium is related to head. Cranial bones (bones that surround and protect the brain) and facial bones make up the cranium (bones that form the eye sockets, nose, cheeks, jaw, and other parts of the face).

38. Name the layer of brain from inside towards the outside:

(a) Duramater, Arachnoid and Piamater

(b) Arachnoid, Duramater and Piamater

(c) Piamater, Arachnoid and Duramater

(d) Arachnoid, Piamater and Duramater

Ans. (c) Piamater, Arachnoid and Duramater

Explanation :

The brain is protected by cranial meninges, which are made up of three layers: an outside layer called duramater, a very thin middle layer called arachnoid, and an inner layer called piamater (which is in contact with the brain tissue).

39. Hypothalamus is a part of:

(a) Fore brain

(b) Mid brain

(c) Hind brain

(d) Medulla

Ans. (b) Mid brain

Explanation :

The hypothalamus is a tiny structure of the brain. It is located near the pituitary gland at the base of the brain. The hypothalamus plays a significant part in a variety of tasks, including hormone release,

controlling one's body temperature.

40. Which of the following is not a reflex action?

- (a) Knee jerk
- (b) Boxing
- (c) Coughing
- (d) Eye lid closing

Ans. (b) Boxing

Explanation :

Reflex action is an automatic (involuntary) neuromuscular activity triggered by specific stimuli. Knee jerk, coughing and eyelid closing are reflex actions. Boxing is not a reflex action.

41. Which among them is a reflex action?

- (a) Sensory neuron – Motor neuron – Relay neuron
- (b) Motor neuron – relay – Motor neuron
- (c) Sensory – relay – motor neuron
- (d) Relay – Motor –Sensory

Ans. (c) Sensory – relay – motor neuron

Explanation :

When a receptor is triggered, it sends a signal to the brain, which coordinates the response. However, sometimes a speedy response is required that does not need the use of the brain. This is referred to as a reflex action. In a simple reflex action: Sensory neuron -> Relay Neuron -> Motor neuron.

42. While touching a hot plate, a reflex action is seen what is the effector in it?

- (a) skin
- (b) spinal cord

(c) muscles

(d) brain

Ans. (c) muscles

Explanation :

The reflex movements are controlled by the spinal cord and the brain stem in a reflex action. The glands and muscles that respond to stimuli are known as effector organs.

43. Impulse is generated when:

(a) response is over.

(b) response is going on.

(c) stimulus is gained.

(d) stimulus is over.

Ans. (c) stimulus is gained.

Explanation :

When the stimulus is gained, a nerve impulse is produced. The electrical and chemical changes in the cell are triggered by this stimulation.

44. Which among them is not a voluntary action of body?

(a) Writing

(b) Talking

(c) Walking

(d) Breathing

Ans. (d) Breathing

Explanation :

The Autonomic Nervous System (ANS) controls visceral activity in the body, such as blood pressure, urinary bladder action, and body temperature regulation, etc. The autonomic nervous system causes

involuntary responses such as breathing. Writing, talking and walking are voluntary actions that we do when we are aware of what we are doing

Assertion and Reasoning Based Questions

Directions : In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as :

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.
- (c) Assertion is true but Reason is false.
- (d) Assertion is false but Reason is true.

45. **Assertion:** In spite of not having nervous system, plants can sense things.

Reason: Plants can sense things with the help of hormones.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Plant hormones help them to sense changes in the environment even if they do not have eyes, ears or nose. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

46. **Assertion:** Cytokinins promote cell division in plants.

Reason: Full form of ABA is abscisic acid.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

Both the statements are true, but full form of ABA has no relation with the function of cytokinin. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

47. **Assertion:** Auxin is responsible for the phototropic and geotropic responses of plants.

Reason: Thigmonasty is the movement of a plant part in response to the water.

Ans. (c) Assertion is true but Reason is false.

Explanation :

Assertion is true, but thigmonasty is the movement of plant part in response to the touch of an object. Thus, assertion is true but reason is false.

48. **Assertion:** Damage to the medulla oblongata causes death.

Reason: Medulla oblongata controls involuntary functions of the body.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Medulla controls circulation, respiration, reflexes like swallowing, coughing, peristaltic movement of gut. So, damage to the medulla will stop circulation and respiration and eventually cause death. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

49. **Assertion:** Cerebrum controls the body posture.

Reason: Cerebrum is not connected to internal ear.

Ans. (d) Assertion is false but Reason is true.

Explanation :

It is the cerebellum which controls body posture and cerebrum is not connected to internal ear. Thus, assertion is false but reason is true.

50. **Assertion:** Synapse is a gap through which nerve impulse pass from one neuron to the next.

Reason: Neuron is the functional unit of nervous system.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

Synapse and neuron has no relation regarding function. Neuron is the functional unit but that does not define synapse. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

51. **Assertion:** Neurons transmit messages all across different parts of the body.

Reason: Acetylcholine is a neuro inhibitor.

Ans. (c) Assertion is true but Reason is false.

Explanation :

Acetylcholine is a neurotransmitter, not neuro inhibitor. Thus, assertion is true but reason is false.

52. **Assertion:** It is advised to have iodised salt in our diet.

Reason: It prevents us from goitre.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Iodine is very necessary for the production of the hormone thyroxine, lack of thyroxine causes goitre in the body. So, iodine is necessary to prevent goitre. Thus, both assertion and reason are correct and

reason is the correct explanation of the assertion.

53. Assertion: Adrenaline is called the emergency hormone.

Reason: It prepares the body to fight away the emergency situation.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Adrenaline prepares the body to function at maximum efficiency during emergency situations like danger, anger, excitement. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

54. Assertion: Diabetes mellitus is caused due to lack of insulin in the body.

Reason: Insulin helps in utilisation of glucose in the body.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Insulin is a hormone released by the beta cells of the pancreas. It maintains the blood glucose level in the body, by its proper utilisation. So, lack of insulin causes accumulation of glucose in the blood and hence a disease called diabetes mellitus is caused. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

Case Based Questions

55. Read the passage given below and answer the following questions from (i) to (v).

Hormones act as chemical messengers that are released into the blood stream to act on an organ in another part of the body. Endocrine systems, also referred to as hormone systems, are found

in all mammals, birds, fish, and many other types of living organisms. They are made up of: (a) glands located throughout the body, (b) hormones that are made by the glands and released into the bloodstream or the fluid surrounding cells, and (c) Receptors in various organs and tissues that recognise and respond to the hormones.

(i) Name the hormone that regulates carbohydrate, protein, and fat metabolism in the body so as to provide the best balance for growth.

- (a) Thyroid
- (b) TSH
- (c) Thyroxine
- (d) Altroxin

Ans. (c) Thyroxine

(ii) Name the hormone that can make the heart beat faster, resulting in supply of more oxygen to our muscles.

- (a) insulin
- (b) thyroxine
- (c) nor-adrenaline
- (d) adrenaline

Ans. (d) adrenaline

(iii) Which one of the following statements is not true?

- (a) Growth hormone is one of the hormones secreted by the pituitary.
- (b) Changes associated with puberty are because of the secretion of testosterone in males and oestrogen in females.
- (c) Hormones help in coordinated growth.
- (d) Control and coordination in human body depends only upon

endocrine system.

Ans. (d) Control and coordination in human body depends only upon endocrine system.

(iv) In humans, the timing and amount of hormone released are regulated by:

- (a) flight mechanisms
- (b) feedback mechanisms
- (c) loop mechanisms
- (d) feeding mechanisms

Ans. (b) feedback mechanisms

(v) Insulin injections are given to the patients suffering with:

- (a) diabetes
- (b) nervous disorder
- (c) hyperactivity disorder
- (d) gastrointestinal diseases

Ans. (a) diabetes

56. Read the passage given below and answer the following questions from (i) to (v).

Plant hormones are a group of organic substances that occur naturally and influence plant physiological processes. Plant hormones are also called phytohormones and work as growth regulators. Main processes affected are growth, differentiation, and development. It is well known that several plant hormones are involved in the regulation of fruit development and ripening across fleshy and dry fruits.

(i) Concentration of which plant hormone stimulates the cells to grow longer on the side of the shoot which is away from light?

- (a) Renin
- (b) Auxin
- (c) Gibberellin
- (d) Cytokinin

Ans. (b) Auxin

(ii) Which hormone is likely to be present in greater concentration in the areas of rapid cell division, such as in fruits and seeds?

- (a) Pheromone
- (b) Auxin
- (c) Cytokinin
- (d) Gibberellin

Ans. (c) Cytokinin

(iii) Function of the plant hormone abscisic acid is to:

- (a) inhibit plant growth
- (b) help in flowering
- (c) promote plant height
- (d) control diseases in plants

Ans. (a) inhibit plant growth

(iv) Which one of the following statements is true?

- (a) When light is coming from one side of the plant, auxin diffuses towards the illuminated side of the shoot.
- (b) Plant hormones are synthesized at places away from where they act and simply diffuse to the area of action.
- (c) Cytokinin is involved in wilting of the

leaves.

(d) Electrical impulses cannot travel rapidly.

Ans. (b) Plant hormones are synthesized at places away from where they act and simply diffuse to the area of action.

(v) Growth-related movements of plants are _____ the movements done in response to day and night.

(a) slower than

(b) faster than

(c) equal to

(d) likewise

Ans. (a) slower than

57. Read the passage given below and answer the following questions from (i) to (v).

Human brain, the most complex organ in the human body, and is the controller of behaviour, seat of intelligence, interpreter of the senses, and initiator of body movements. Brain is still seen as an incomprehensible part of our body, and researchers are doing enough efforts to discover its secrets. Different parts of the brain have different and specific functions. Researchers have now gained enough insights into the healthy functioning of brain and reasons of malfunctioning in case of diseases related to the brain.

(i) Our hind brain has these three parts:

(a) pons, medulla, and cerebellum

(b) mid-brain, medulla, and cerebellum

(c) spinal cord, cerebellum, and medulla oblongata

(d) hypothalamus, cerebrum, and cerebellum

Ans. (a) pons, medulla, and cerebellum

(ii) Involuntary muscular actions are controlled by:

(a) Medulla

(b) Cerebrum

(c) Cerebellum

(d) Hypothalamus

Ans. (a) Medulla

(iii) _____ responsible for precision of voluntary actions and maintaining the posture and balance of the body.

(a) medulla

(b) cerebrum

(c) cerebellum

(d) hypothalamus

Ans. (c) cerebellum

(iv) Blinking of eyes is a type of:

(a) reflex action

(b) voluntary action

(c) skeletal movement

(d) locomotor action

Ans. (a) reflex action

(v) Peripheral nervous system consists of _____ arising from the brain and _____ arising from the spinal cord.

(a) spinal nerves, spinal cord

(b) cranial nerves, spinal nerves

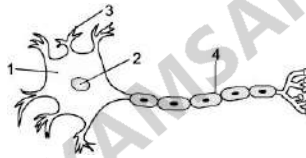
(c) cranium, spinal nerves

(d) cranium, spinal cord

Ans. (b) cranial nerves, spinal nerves

58. Read the passage given below and answer the following questions from (i) to (v).

These highly specialized nerve cells which are responsible for communicating information in both chemical and electrical forms. These are of different types. It is the basic building block of the nervous system. They are similar to other cells in the human body in a number of ways, but there is one key difference between them and other cells. They are specialized to transmit information throughout the body.



(i) The figure depicts structure of a:

(a) neuron

(b) nervous system

(c) CNS

(d) nerve ending

Ans. (a) neuron

(ii) The annotations 1 and 2 in the figure depict:

(a) nerve cell body and nucleus respectively.

(b) nucleus and nerve cell body respectively.

(c) neuron cell and nucleon respectively.

(d) nucleus and nucleon respectively.

Ans. (a) nerve cell body and nucleus respectively.

(iii) In a neuron conversion of electrical signal to a chemical signal occurs at:

(a) Cell body

(b) Dendritic end

(c) Axonal terminals

(d) Axon

Ans. (c) Axonal terminals

(iv) The gap between two neurons is known as:

(a) axon

(b) dendrite

(c) synapse

(d) cytoplasm

Ans. (c) synapse

(v) Information is acquired by the _____ of a neuron.

(a) dendritic tip

(b) axon

(c) synapse

(d) neuromuscular junction

Ans. (a) dendritic tip

59. Read the passage given below and answer the following questions from (i) to (v).

A system of control and coordination is essential in living organism to

maintain homeostasis as well as to respond to various stimuli. The working together of various organs in an organism, to produce a proper response to a stimulus is called coordination. In animals, control and coordination is done by the nervous system and endocrine system. Hormones in animals conduct a variety of functions like growth, sexual development, vegetative development, cellular respiration, metabolism, thermal production etc. While the nervous system coordinates activities of animals like movement, hormones integrate the coordination. Larger complex animals like vertebrates have endocrine glands to produce hormones.

(i) Which of the following statement is incorrect regarding Thyroid gland?

- (a) Present in the neck region.
- (b) Produces Thyroxine.
- (c) Responsible for metabolic rate, healthy hair and skin.
- (d) Regulates blood sugar level.

Ans. (d) Regulates blood sugar level.

(ii) Which endocrine gland controls development of female sex organs, regulates menstrual cycle, etc?

- (a) Pituitary
- (b) Thyroid
- (c) Ovaries
- (d) Pancreas

Ans. (c) Ovaries

(iii) Deficiency of which hormone leads to dwarfism?

- (a) Adrenaline
- (b) Thyroxine

(c) Growth Hormone

(d) Somatostatin

Ans. (c) Growth Hormone

(iv) _____ is a hormone produced by the beta cells of the pancreas.

(a) Insulin

(b) Glucagon

(c) Glycogen

(d) Oxytocin

Ans. (a) Insulin

(v) Growth hormone is secreted by:

(a) Pituitary gland

(b) Thyroid gland

(c) Pancreas

(d) Testes

Ans. (a) Pituitary gland

60. Read the passage given below and answer the following questions from (i) to (v).

Our nervous system is responsible for coordinating human body behaviour and transmitting signals between different body parts. In vertebrates it consists of two main parts known as the Central Nervous System (CNS) and the Peripheral Nervous System (PNS). The CNS consists of the brain and spinal cord. The PNS consists of nerves that are long fibers connecting the CNS to every other part of the body.

(i) Which one of the following statements about the nervous system

is not correct?

(a) The process of detecting the signal or the input and responding to it by an output action might be completed quickly.

(b) At the end of the axon, the electrical impulse sets off the release of some chemicals.

(c) Nervous tissue is made up of an organised network of nerve cells or neurons.

(d) An impulse need not to be converted into a chemical signal for onward transmission.

Ans. (d) an impulse need not to be converted into a chemical signal for onward transmission.

(ii) Those actions when we do something without thinking about it, or without feeling in control of our reactions are known as:

(a) motor actions

(b) reflex actions

(c) nervous actions

(d) hallucination

Ans. (b) reflex actions

(iii) Which one is the correct sequence of event when bright light falls on our eyes?

(a) Sensory neuron → Brain → Motor neuron → Effector muscles in the eye → Eye muscle contracts → Receptors in eyes

(b) Receptors in eyes → Brain → Sensory neuron → Motor neuron → Effector muscles in the eye → Eye muscle contracts

(c) Receptors in eyes → Effector muscles in the eye → Sensory neuron → Brain → Motor neuron → Eye muscle contracts

(d) Receptors in eyes → Sensory neuron → Brain → Motor neuron → Effector muscles in the eye → Eye muscle contracts

Ans. (d) Receptors in eyes → Sensory neuron → Brain → Motor neuron → Effector muscles in the eye → Eye muscle contracts

(iv) The largest part of the brain comprising two hemispheres is known as:

(a) cerebellum

(b) cerebrum

(c) CNS

(d) cranium

Ans. (b) cerebrum

(v) Muscle cells have special _____ that change both their shape and their arrangement in the cell in response to nervous electrical impulses.

(a) proteins

(b) nerves

(c) amino acids

(d) membranes

Ans. (a) proteins

Reasoning Based Questions

61. Why *Mimosa pudica* leaves dropped down when touched?

Ans. Due to changes in turgour pressure when we touch the leaves of *Mimosa pudica* plant leaves drop down. The stimulus of touch leads to loss of turgour at the base of leaflets and petioles leading to dropping down of leaves.

62. Why do stem and root show unilateral growth towards light and earth's gravity respectively?

Ans. Stem is positively phototropic and root is positively geotropic. Plant hormone auxin is synthesised at the root tips as well as by the shoot apex. In stem growth is more at the shaded region due to more accumulation of auxins on that side as a result shoot bends towards light. Whereas in root, growth is more on light receiving side as auxins get accumulated on shaded side of root tip which inhibits the growth of that side. So, there is greater growth in the upper side resulting in growth of root apex towards earth's gravity.

63. Why are the electrochemical signals not an efficient means of communication in plants?

Ans. Plants do not have nervous system i.e., specialised tissues like neurons as in case of animals nor do they have endocrine system to carry electrochemical signals. So, electrochemical signals are not an efficient means of communication in plants.

64. What will happen if a ripened fruit is kept in a basket of raw fruits?

Ans. If a ripened fruit is kept in a basket of raw fruits it will help in ripening of other raw fruits as the ripened fruit contains ethylene hormone which is responsible for ripening of fruits.

65. Why is abscisic acid known as stress hormone?

Ans. Abscisic acid induces various responses in plants against stress conditions. For example—It promotes closure of stomata when there is water shortage, promotes dormancy in seeds and buds and inhibits growth under unfavourable conditions. Thus abscisic acid is known as stress hormone.

66. Taking the example of heart beat, justify the antagonistic action of the sympathetic and the parasympathetic nerves.

Ans. Sympathetic nerves accelerate the heart rate whereas

parasympathetic nerves retard the heart rate as both the functions of sympathetic and parasympathetic nerves are antagonistic action so we can say that they are opposite to each other in action.

67. Why the hormones secreted by pancreas are antagonistic in action. Justify the statement.

Ans. Pancreas contains special hormone secreting cells called Islets of Langerhans. Alpha cells of Islets of Langerhans secrete glucagon which increases blood glucose level by converting glycogen to glucose when there is shortage of glucose in the body. Similarly beta cells secrete insulin that lowers blood glucose level by converting glucose to glycogen. Hence, we can say the hormones secreted by pancreas are antagonistic in action.

68. Why are some patients of diabetes treated by giving injections of insulin? [NCERT]

Ans. Insulin is secreted by beta cells of Islets of Langerhans of pancreas. They convert excess glucose to glycogen stored in liver thus lowering glucose level in the blood. In diabetes patients, the sufficient amount of insulin is not secreted by pancreas so they have high sugar level in their blood. To control the sugar level they are treated by giving insulin injections.

69. Pancreas and gonads perform dual functions. Give reasons to justify the statement.

Ans. Pancreas secretes hormones as well as various digestive enzymes *i.e.*, they are associated with both digestive and endocrine system. Similarly gonads produce male and female gametes along with male and female sex hormones *i.e.*, they are associated with both reproductive and endocrine system. Hence, we can say that pancreas and gonads perform dual functions.

Very Short Answer Type Questions

70. A potted plant is made to lie horizontally on the ground.

Which part of the plant will show:

- (i) Positive geotropism
- (ii) Negative geotropism

Ans. (i) Root will show positive geotropism.

(ii) Stem will show negative geotropism.

71. Name one movement in plants which is fast?

Ans. The movement of sunflower in the direction of sun is fast.

72. Name one plant hormone which inhibits growth. Write its one more function. [Board Question]

Ans. Absciscic acid inhibits growth. It promotes dormancy in seeds and buds, promotes wilting of leaves, and promotes closing of stomata.

73. What is the general name of chemical substances which brings about control and coordination in plants?

Ans. Phytohormones is the general name of chemical substances which brings about control and coordination in plants.

74. Name one example of the movement of the plant part which is very quick and can be observed very easily?

Ans. Thigmonastic movement in the leaves of Touch-me-not plant, is very quick and can be observed very easily.

75. Give an example of plant hormone that promotes growth? [NCERT]

Ans. Auxin is a plant hormone that promotes growth.

76. Which part of the brain maintains posture and equilibrium of the body? [NCERT]

Ans. Cerebellum of the hind brain maintains posture and equilibrium of the body.

77. Which signals will get disrupted in case of a spinal cord injury? [NCERT]

Ans. Spinal cord controls mainly the reflex actions. So, reflex actions and involuntary actions will get disrupted.

78. Give one function of hypothalamus?

Ans. Hypothalamus regulates the secretion of hormones from pituitary gland.

79. What is a neuron?

Ans. Neuron is the structural and functional unit of nervous system which consists of a cyton, axon and dendrites.

80. List two body functions that will be affected if cerebellum gets damaged? [Board Question]

Ans. Body's posture and equilibrium will be affected if cerebellum gets damaged.

81. Answer the following questions:

(i) Name one gustatory receptor and one olfactory receptor present in human beings.

(ii) Write a and b in the given flow chart of neuron through which information travels as an electrical impulse. [Board Question]

Dendrite → a → b → End point of Neuron

Ans. (i) Tongue is the gustatory receptor present in the human body. Nasal cavity is the olfactory receptor present in the human body.

(ii) Dendrite → Cell body → Axon → End point of Neuron.

82. Name the hormones in humans which regulate carbohydrate, protein and fat metabolism in the body. Mention the site where it is synthesised.

Ans. Thyroxine regulates carbohydrate, protein and fat metabolism

in the body. It is synthesised by thyroid gland.

83. List two different functions performed by pancreas in our body. [Board Question]

Ans. 1. Pancreas makes two hormones i.e., insulin and glycogen that regulate blood sugar level.

2. It secretes pancreatic juice that aids in the digestion of food.

84. Name the types of glands present in human body.

Ans. There are two types of glands present human body.

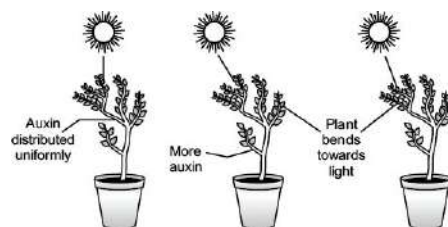
1. Endocrine Glands: The glands that do not have ducts and transport their secretions directly to the site of action through the blood, e.g. adrenal glands, pituitary glands, etc.

2. Exocrine Glands: The glands which have ducts to pass their secretions, e.g., sweat, liver, etc.

Short Answer Type Questions

85. How does phototropism occur in plants? [NCERT]

Ans. The directional movement or orientation of plant parts in response to stimulus light is called phototropism. Shoot of the plant shows positive phototropism whereas roots show negative phototropism. Bending of shoot towards light is brought about by the action of auxin hormones. Auxin hormone is synthesised by the meristematic tissue which is present at the tip of the stem. When a plant receives sunlight from above auxin gets distributed uniformly on both the sides of plant and plants grow straight. But if we keep a plant near a window it receives light from one side. Auxin which is secreted at the tip of shoot diffuses to the parts which do not receive sunlight. Hence the parts in shady regions grow faster due to more auxin concentration than the parts which receive sunlight. So, stem bends towards light.



86. Define tropism? What are different types of tropism?

Ans. Tropism is the directional movement of the part of the plant in response to external stimulus. There are different types of tropism:

1. Phototropism: It is the directional movement of the plant part in response to light stimulus. Example: Shoots of plant bend towards light, roots of plants bend away from the light.

2. Geotropism: It is the orientation of the plant part in response to earth's gravity.

Example: Roots of plants grow downwards in the soil in the direction of gravity.

3. Chemotropism: It is the directional movement or orientation of plant part in response to chemicals. Example: During fertilisation process, pollen tube grows towards ovule in the ovary.

4. Hydrotropism: It is the directional movement or orientation of plant part in response to water stimulus. Example: Bending of roots of the plant towards water.

87. What are plant hormones? [NCERT]

Ans. Plant hormones or phytohormones are the chemical substances present in plants which coordinate and control various activities of plants like growth, development, response to stimuli etc. There are different types of hormones like auxins, gibberellins, cytokinins, abscisic acid, ethylene etc.

88. How do auxins promote the growth of a tendril around a support? [NCERT]

Ans. The movement of tendril around a support is caused by the action of auxin hormone. Auxin which is synthesised at the tip diffuses from the tip to the region that is away from the support. The region containing more auxin will grow faster than the part which is

in contact with the support causing the tendril to curl around the support.

89. How does chemical coordination occur in plants? [NCERT]

Ans. Chemical coordination occurs in plants with the help of phytohormones also called plant hormones. They bring about control and coordination in various activities which occur in plants. They are synthesised in minute quantities in one part and diffuse to other part of plants where they show their effect. There are various types of phytohormones like auxins, gibberellins, cytokinins, ethylene, abscisic acid etc. These phytohormones bring about various activities in plants like cell elongation, differentiation, fruits ripening, opening and closing of stomata, promotes growth, overcomes dormancy in seeds, senescence of leaves etc.

90. Name the plant hormones responsible for the following functions: [Board Question]

- (i) Growth of the stem
- (ii) Promotes cell division
- (iii) Wilting of leaves
- (iv) Inhibits growth

Ans. (i) Auxin or Gibberellin

(iii) Absciscic acid

(ii) Cytokinin

(iv) Absciscic acid

91. What is the need for a system of control and coordination in an organism? [NCERT]

Ans. Multicellular organisms are highly complex. Every activity needs to be regulated so that the activities can occur in proper time and correct sequence. Various organs and parts of the body should work together in a coordinate manner to perform a particular function. For proper control and coordination in higher organisms both nervous and endocrine system play the major role. For

example: While riding a bicycle there should be proper coordination between our hands and handle of our cycle.

92. What are the major regions of the human brain? Give the parts that are found in the region named by you?

Ans. The major regions of human brain are forebrain, mid brain and hind brain.

Forebrain contains cerebrum, diencephalon. Mid brain contains a tubular part which involves reflexes of eyes and ears. Hind brain contains cerebellum, pons, medulla oblongata.

93. What happens at the synapse between two neurons?
[NCERT]

Ans. Synapse is a point of contact between the axon terminals of one neuron with the dendrite of another neuron. The terminals of axon are swollen which contains a chemical called acetylcholine which is a neurotransmitter, which induces impulses in the dendrites of next neuron. Synapse acts as one way valve which prevents the back flow of impulses from axon terminals. So impulse moves from dendrites through cyton to axon. It allows the nerve impulses in one direction.

94. Name the system which facilitates communication between central nervous system and the other parts of the body. Mention two types of nerves it consists of along with their organs of origin.

[Board Question]

Ans. Peripheral nervous system facilitates communication between central nervous system and the other parts of the body. The two types of nerves are cranial nerves which arise from brain and spread throughout the head and spinal nerves which arise from spinal cord and spread throughout the body except head.

95. What is the role of brain in reflex action? **[NCERT]**

Ans. Reflex actions are mainly controlled by spinal cord. For quick response to the stimulus spinal cord is generally involved but the information also reaches the brain where the thinking process

occurs. Brain does not play any role for quick response to reflex action. But some reflex actions are only controlled by brain called cerebral reflexes like salivation at the sight of tempted food.

96. What is autonomic nervous system? Which are the divisions of autonomic nervous system?

Ans. Autonomic nervous system consists of a pair of chains of nerves and ganglia on either side of the backbone which operates automatically or involuntarily. It controls and coordinates all involuntary actions of internal organs like breathing, heart beating etc. The divisions of autonomic nervous system are sympathetic and parasympathetic nervous system.

97. What do you mean by voluntary and involuntary actions? Categorise the following actions as voluntary or involuntary.

- (i) Shivering when it is too cold.
- (ii) Peristaltic movement in oesophagus when swallowing food.
- (iii) Changing channels on TV to watch your favourite programme.
- (iv) Tears flushing out from eyes when foreign particles fall on them.

Ans. The actions that are performed according to our will and are controlled by our conscious thoughts are called voluntary actions. The actions that are performed unconsciously and are not controlled by our will are called involuntary actions.

- (i) Involuntary action
- (ii) Involuntary action
- (iii) Voluntary action
- (iv) Involuntary action

98. How do we detect the smell of an agarbatti (incense stick)?
[NCERT]

Ans. Olfactory receptors present in the nose detect the smell of incense stick. Impulse is generated in response to this stimuli and it is carried by sensory neuron to the olfactory lobes of forebrain.

There the impulses are interpreted and we can easily detect the smell of incense stick.

99. What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to rise?

[NCERT]

Ans. Receptors are specialised cells in our body which respond to the changes that occur in our body i.e., stimulus. They pass the information in the form of sensory impulses to central nervous system through sensory nerves. If receptors do not work properly impulses will not be generated in response to the stimuli and our body cannot provide an appropriate response to the changing environment. For example, if olfactory receptors do not work properly we cannot detect any smell whether it is good or bad.

100. Nervous and hormonal systems together perform the function of control and coordination in human beings. Justify this statement with the help of an example.**[Board Question]**

Ans. The nervous system controls and coordinates all the functions in the body. It carries out its function in close coordination with hormonal system. Nerves do not reach every hook and corner of body, hence need assistance from hormones to control all the parts of body. Nervous control is faster.

Hormonal control is slower. Hormonal control is based on feedback mechanism and tells body to pace up or slow down. Nervous control is on other hand, a direct control. So we can say that both system work in harmony.

101. Why is the use of iodised salt advisable? **[NCERT]**

Ans. Iodine is an essential component for synthesis of thyroxin hormone. Thyroxin hormone is secreted by thyroid gland which regulates the basal metabolism of our body by oxidation of carbohydrates, proteins and fats. It regulates the general growth of our body and deficiency of this hormone leads to disorders like simple goitre, cretinism, myxedema etc. So it is advised to use iodised salt in the food.

102. How does our body respond when adrenaline is secreted into the blood? [NCERT]

Ans. Adrenaline is an emergency hormone secreted by adrenal glands to deal with emergency situations. When adrenaline is secreted in large amounts under situations like stress, anger, fear etc. it increases our heart beat, increases breathing rate, raises blood pressure, more glucose is released to blood stream to provide energy to face the emergency situation.

103. What is feedback mechanism of Hormonic regulation. Take the example of insulin to explain this phenomenon.[Board Question]

Ans. Hormones control many cell activities, so they are very important for homeostasis, most hormones are regulated by feedback mechanisms. A feedback mechanism is a loop in which a product feeds back to control its own production. Most hormone feedback mechanism involves negative feedback loops. Negative feedback keeps the concentration of a hormone within a narrow range.

For example, The control of blood sugar by insulin is an example of a negative feedback mechanism. When blood sugar rises, receptors in a body sense a change. In turn the control center secretes insulin into the blood effectively lowering the blood sugar level.

104. How does chemical coordination take place in animals? [NCERT & Board Question]

Ans. Chemical coordination in animals is brought about by hormones. Hormones are secretions of endocrine glands which are poured directly into the blood stream. They are carried by blood to the target organs. Target organs have specific receptor which identifies the specific hormones and coordinates or regulates their specific functions. They transmit the information and brings about the effect.

105. Name the hormones secreted by the following endocrine glands and specify one function of each:

[Board Question]

- (i) Thyroid
- (ii) Pituitary
- (iii) Pancreas

Ans. (i) Thyroid gland secretes thyroxine. It regulates the metabolism and blood pressure of human beings.

(ii) Pituitary secretes growth hormone. It helps the bones and other body organs to grow properly.

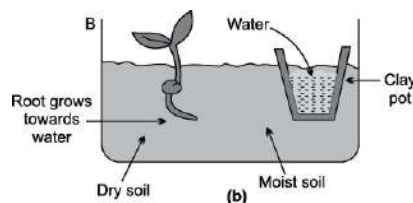
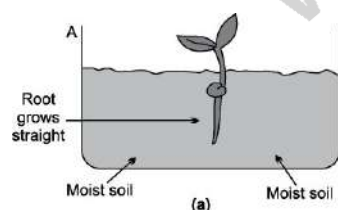
(iii) Pancreas secrete insulin. Insulin helps to lower blood sugar level.

Long Answer Type Questions

106. What is hydrotropism? Design an experiment to demonstrate this phenomenon. [Board Question]

Ans. The movement of root of plants towards water is called hydrotropism.

Take two glass troughs A and B, fill each one of them two-thirds with soil. In trough A plant a tiny seedling figure (a). In trough B plant a similar seedling and also place a small 'clay pot' inside the soil figure (b). Water the soil in trough A daily and uniformly. Do not water the soil in trough B but put some water in the clay pot buried in the soil. Leave both the troughs for a few days.



Now, dig up the seedlings carefully from both the trough without damaging their roots. We will find that the root of seedling in trough

A is straight. On the other hand, the root of seedling in trough B is found to be bent to the right side (towards the clay pot containing water) figure (b). This can be explained as follows.

In trough A, the root of seedling gets water from both sides (because the soil is watered uniformly) in trough B, the roots gets water oozing out from the clay pot which is kept on the right side. So, the root of seedling in trough B grows and bends towards the source of water to the right side. The experiment shows that the root of a plant grows towards water. In other words, the root of a plant is positively hydrotropic.

107. Name various plant hormones. Give their physiological effects on plant growth and development?

Ans. The various plant hormones are auxins, gibberellins, cytokinins, ethylene, abscisic acid.

Hormones	Physiological effects
Auxins	It promotes cell growth, stem and fruit growth, regulates growth movements <i>i.e.</i> , tropism, induces parthenocarpy.
Gibberellins	Promotes growth in stems and fruits, induces parthenocarpy, stimulates flowering, enhances seed germination.
Ethylene	Promotes growth and ripening of fruits, helps in breaking dormancy of seeds and buds.
Cytokinins	Promotes cell division, delay senescence of leaves, promotes opening of stomata, overcomes dormancy of seeds.
Absciscic acid	Promotes dormancy in seeds, inhibits growth, promotes senescence of leaves, promotes closing of

stomata.

108. Nervous and hormonal systems together perform the functions of control and coordination in human beings. Justify the statement?

Ans. The function of nervous system is to control and coordinate all the voluntary and involuntary actions in our body. Similarly hormonal system coordinates some functions of our body by secreting chemicals called hormones by various endocrine glands. The coordination between nervous and hormonal system is brought by hypothalamus which secretes neurohormones. These neurohormones regulate the secretion of pituitary gland which in turn regulates the activities of other endocrine glands. For example: In case of emergency situation stimulus is perceived by receptors where impulse is carried to CNS and message is conveyed. Effectors respond to the stimulus. Simultaneously, sympathetic nervous system stimulates adrenal gland to release adrenaline which increases our heart beat, breathing rate etc. Thus, from the above example we can say nervous and hormonal systems together perform the functions of control and coordination in human beings.

109. What are reflex actions? Give examples? Explain reflex arc with an example with labelled diagram?

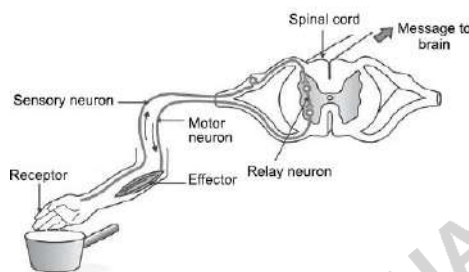
Ans. Reflex action is a quick, automatic, involuntary, unconscious response in the body brought about by a stimulus. Examples of reflex action:

1. Withdrawal of hand suddenly on touching a hot plate.
2. Withdrawal of finger suddenly when pricked by a thorn.
3. Shivering of the body on feeling cold.
4. Sudden closure of the eyelids when bright light falls on the eye.

Reflex arc: It is the shortest route taken by impulse from receptor to

effector.

Example: When we touch a hot plate by our finger, we instantly withdraw our hand. Here stimulus is touching a hot plate, receptors are our fingers. The specialised epithelial cells of our fingers respond to stimulus and convert into impulse. This impulse is carried by sensory neuron to spinal cord which generates a motor impulse. This impulse is carried by motor neuron to effector organ i.e., muscles of hand. Response is withdrawal of our hand.



110. Answer the following questions:

- (i) Why is the use of iodised salt advisable? Name the disease caused due to deficiency of iodine in our diet and state its one symptom.
- (ii) How do nerve impulses travel in the body? Explain. **[Board Question]**

Ans. (i) Iodised salt is advisable because iodine is necessary for the formation of thyroxine hormone by thyroid gland. Goitre is the disease caused due to its deficiency.

Symptom: The neck of the person appears to be swollen due to the enlargement of thyroid gland.

(ii) Two neurons are not joined to one another completely. There is a small gap between a pair of neuron. This gap is called synapse. The nerve impulses are carried out to this gap by the help of neuro transmitter (chemical substance). The conduction of nerve impulse through the synapse takes place in the form of electrical nerve

impulse. When a stimulus acts on the receptor, an electrical impulse is produced with the help of chemicals through the synapse and then to the other neuron. Thus, in this way nerve impulses travel in the body.

111. What are the major parts of the brain? Mention the function of different parts?

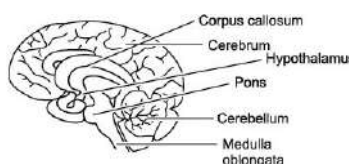
Ans. Brain is a component of central nervous system. Brain is divided into three regions – Forebrain, Midbrain, Hindbrain.

1. Forebrain: It comprises of cerebrum and diencephalon.

(a) Cerebrum is the seat of intelligence, memory, will power, consciousness. It controls voluntary actions. It is the largest portion of the brain. It is divided into two halves called cerebral hemispheres which are connected by a sheet of fibres called corpus callosum.

(b) Diencephalon consists of thalamus and hypothalamus. The centre of hunger, thirst is located in hypothalamus. Hypothalamus controls body temperature and pituitary gland. Thalamus relays pain and pressure impulses to the cerebrum.

2. Midbrain: It is a small tubular part which controls reflexes involving eyes and ears.



3. Hindbrain: It comprises of cerebellum, pons, medulla oblongata.

(a) Cerebellum controls and coordinates muscular activity and maintains the posture and balance of the body.

(b) Pons regulate rate of respiration and body heat.

(c) Medulla oblongata controls functioning of internal organs and involuntary actions like beating of heart, breathing movement, peristalsis movement etc.

112. Answer the following questions:

Mention one function for each of these hormones:

- (i) Thyroxin
- (ii) Insulin
- (iii) Adrenaline
- (iv) Growth hormone
- (v) Testosterone

Ans. (i) Thyroxin regulates the basal metabolism by oxidation of carbohydrates, fats, proteins. It influences general growth of body, body temperature, mental development etc.

(ii) Insulin converts excess glucose to glycogen and stores it in liver thus lowers down the glucose level in blood.

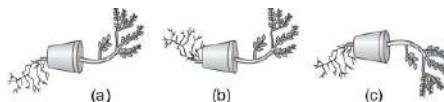
(iii) Adrenaline is the emergency hormone which prepares the body to fight or flight away from the emergency situation. It increases heart-beat, breathing rate etc.

(iv) Growth hormone is essential for normal growth and development of the body.

(v) Testosterone is a male hormone which stimulates the development of secondary sexual characters in males at the time of puberty.

Diagram Based Questions

113. From the figure (a), (b), (c) given below which appears more accurate and why?



Ans. Figure (a) is more accurate as roots are positively geotropic so they move towards the ground [earth's gravity] and shoots are

negatively geotropic so they move away from the ground [earth's surface].

114. Give a schematic diagram to explain the effect of auxins in different parts of the plant.

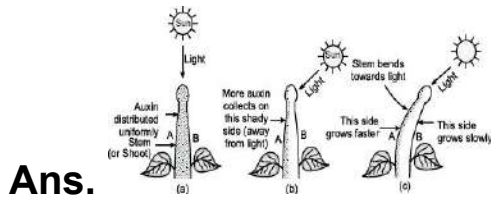


Fig: Role of auxin in bending of shoot towards light.

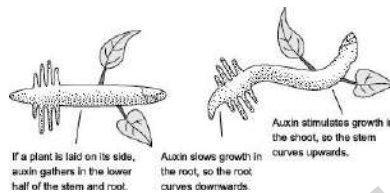
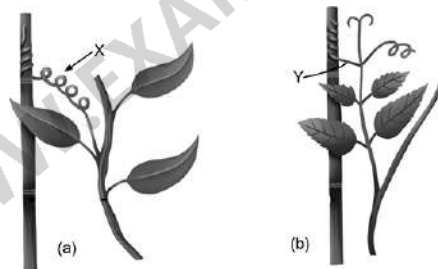


Fig : Role of auxin in root and shoot growth

115. Study the diagrams given below and answer the following questions:



- Name the structures shown as X and Y in the figures (A) and (B), respectively.
- Write the functions performed by the structures X and Y.
- Name the phenomenon depicted and define it.
- How do the structures X and Y differ from each other?
- Give examples of the plants which show the said phenomenon.

Ans. (i) X: Stem tendrils, Y: Leaf tendrils.

(ii) Functions of X and Y: Stem and leaf tendrils enable the plant to climb up a support.

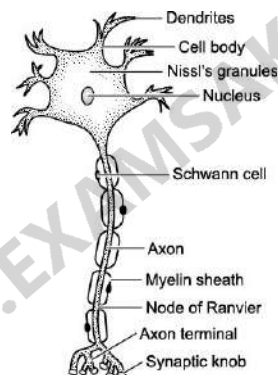
(iii) Thigmotropism is depicted here in the figure. It is the growth movement of plant parts in response to touch stimulus.

(iv) Stem tendrils (X) arise from the stem while leaf tendrils (Y) arise from the leaf of the plant.

(v) Sweet pea, vines and Cuscuta.

116. Draw the structure of a neuron and explain its functions?
[NCERT]

Ans. Neuron or nerve cell is the structural and functional unit of nervous system. The three parts of the neuron are cyto or cell body, dendrites and axon.

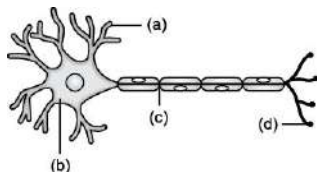


1. Dendrites are fine, branched cytoplasmic projections of cyton which are the site of receiving information and they conduct these impulses to cyton.

2. Cyton receives impulses from dendrites and passes through axon. Cyton contains nucleus, nissl's granules and other cell organelles.

3. Axon is a long process from cyton which is surrounded by an insulating sheath called myelin sheath. Axon conducts nerve impulses away from cyton. The terminals of axon are swollen which contains chemicals called neurotransmitters. This chemical sends a new impulse in the dendrites of adjacent neurons.

117. Study the figure given below and answer the following:



(i) What does the figure represent?

(ii) Name the parts a, b, c and d in the diagram given above?

Ans. (i) The figure represents structure of a neuron or nerve cell.

(ii) (a) Dendrite (b) Cyton

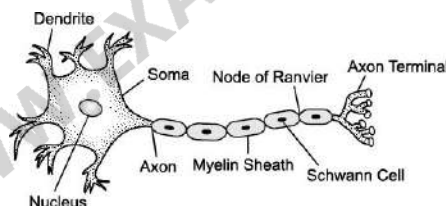
(c) Axon (d) Nerve ending

118. Draw a well-labelled diagram of a neuron. Name the part of a neuron:

(i) Where information is acquired.

(ii) Through which information travels as an electrical impulse.

Ans.



(i) Information is acquired at dendrites.

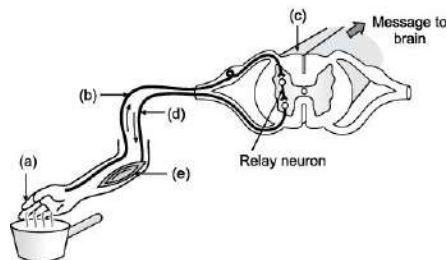
(ii) Through axon information travels as an electrical impulse.

119. The figure given below represents certain phenomenon pertaining to the nervous system.

(i) What does the figure represent?

(ii) Name the parts labeled a, b, c, d and e.

(iii) Give the function of parts labeled a, b, d.



Ans. (i) The figure represents reflex arc.

(ii) a – Receptor, b – Sensory neuron, c – Spinal cord, d – Motor neuron and e – Effector.

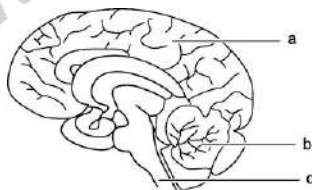
(iii) Receptor is a group of cells or organ that receives the stimuli and converts it to an impulse.

Sensory neuron carries the impulses from receptors to the central nervous system *i.e.*, brain or spinal cord. Motor neuron carries impulses from central nervous system to the effector organs.

120. The figure represents human brain. Study the figure given below and answer the following:

(i) Name the parts labeled (a), (b) and (c)

(ii) Give one function of parts (a), (b) and (c)



Ans. (i) (a) – Cerebrum, (b) – Cerebellum, (c) – Medulla oblongata

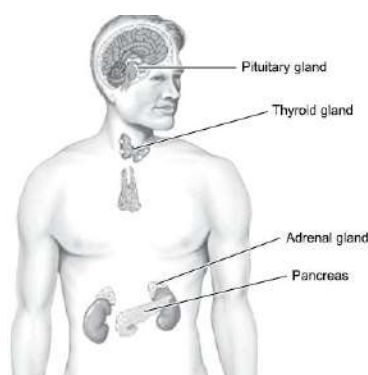
(a) Cerebrum is the seat of intelligence, consciousness, will power. It controls all voluntary actions.

(b) Cerebellum maintains posture and balance of the body. It coordinates muscular activity.

(c) Medulla oblongata controls the activities of internal organs like beating of heart, peristaltic movement etc.

121. Draw a diagram showing the correct positions of pancreas, thyroid gland, pituitary gland, adrenal gland in human beings. [\[Board Question\]](#)

Ans.



Differentiate Between

122. Differentiate between photonastic and thigmonastic movements giving an example?

Ans.	Photonastic movement	Thigmonastic movement
	<p>The non-directional movement of plant parts in response to light and it does not involve growth. Such movements are called photonastic movements.</p> <p>Example: Dandelion flower opens up in morning while closes at night.</p>	<p>The non-directional movement of plant parts in response to touch and it also does not involve growth. Such movements are called thigmonastic movements.</p> <p>Example: The leaves of <i>Mimosa pudica</i> closes up when touched.</p>

123. Explain the difference between nastic movements and tropic movements in plants?

Ans.	Tropic movements	Nastic movements
	These are directional	The non-directional movements that

	movements or orientations in response to external stimuli like light, gravity, water, chemicals etc.	occur due to change in turgour pressure and it does not involve growth.
	They are of different types like phototropism, geotropism, hydrotropism, chemotropism.	They are of two types—seismonastic and nyctinastic movements.
	Movement occurs due to stimulus <i>i.e.</i> , it may move towards stimulus or move away from the stimulus.	They are non-directional movements and are independent of stimulus.
	The response to the stimulus is slow and it involves growth. Examples: Bending of roots towards water, bending of shoot towards light etc.	The response to the stimulus is quick and it does not involves growth. Examples: Dropping of leaves of touch-me-not plant on touching, Dandelion flower opens up in morning in bright sunlight and closes in evening when there is no sunlight.

124. How is the movement of leaves of the sensitive plant different from the movement of shoot towards light?

[NCERT]

Ans.	Movement of leaves of	Movement of shoot towards light
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	sensitive plant	
	It is an example of nastic movement.	It is an example of tropic movement.
	It does not involve growth and movement is fast.	It involves growth and movement is slow.
	It occurs due to changes in turgour pressure in the cells of the leaves.	Auxin hormone plays an important role in phototropism movement. It occurs due to differential growth because of unequal distribution of auxins.
	It occurs due to stimulus of touch.	It occurs due to stimulus of light.

125. Compare and contrast nervous and hormonal mechanisms for control and coordination in animals?

Ans.	Hormonal control	Nervous control
	Hormonal control is usually slow.	It is immediate.
	It is transmitted chemically through blood.	It is transmitted electrochemically through neurons.
	Its effects are generally long lasting.	Its effect is short lived.
	Information travels slowly.	Information travels rapidly.
	Timing and amount of hormones is regulated by feedback mechanism.	Feedback mechanism is absent.

126. What is the difference between a reflex action and walking?
[NCERT]

Ans.	Reflex Action	Walking
	It is an involuntary action which is not under the control of our will.	It is a voluntary action which is under the control of our will.
	Spinal cord controls the reflex action.	Cerebellum of hind brain controls walking.
	It is a spontaneous, automatic, quick response to a stimulus performed unconsciously.	It is under conscious control and it takes longer time.
	It occurs suddenly and we do not have to learn it.	We have to learn it as we grow up.

127. Difference between cerebrum and cerebellum?

Ans.	Cerebrum	Cerebellum
	It is the largest part of the forebrain.	It is a smaller part of the hind brain.
	It is the seat of memory, will power, consciousness, intelligence.	It coordinates muscular activities and controls posture and balance of the body.
	It has many convolutions and has ventricles.	Convolutions and ventricles are absent.
	It is divided into four major lobes – parietal, frontal, temporal and occipital lobe.	No lobes are present in cerebellum.

It forms the front, lateral and superior sides of the brain.

It lies in the posterior region of the brain.

Analysis and Evaluation Based Questions

128. Give one example of plant part:

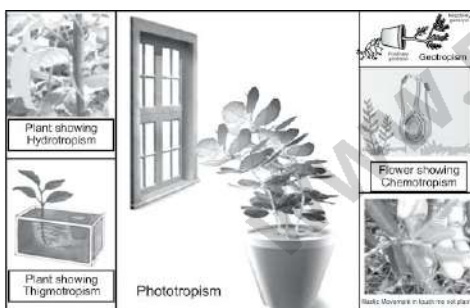
(i) Which is positively hydrotropic and geotropic?

(ii) Which is negatively geotropic and positively phototropic?

Ans. (i) Roots

(ii) Stem

129. Nastic movements in plants are not directional movements. They are not dependent on stimulus and are growth independent. Depending on the quantity, they either swell up or shrink. Plant hormones or phytohormones are responsible for the control and coordination of plants. These hormones are diffused around the plant cells. They have a role to play in the cell division, cell enlargement, cell differentiation, fruit growth, etc.



(i) Name the phenomenon for the movement in growth of plants.

(ii) What do you mean by Nastic movement?

(iii) What are the different types of hormones of plants?

(iv) The plant hormones which help in the cell growth at the shoot tips by elongating the cells and help in the growth process is:

(a) Auxins

(b) Gibberellins

(c) Cytokinins

(d) Absciscic acid

Ans. (i) Growth-dependent movements are called the Tropic Movements (towards or away from a stimulus).

(ii) Non-growth dependent movements called the Nastic Movements (independent of stimulus).

(iii) The different types of phytohormones are:

1. Auxins

2. Gibberellins

3. Cytokinins

4. Absciscic acid

(iv) (a) Auxins help in the cell growth at the shoot tips by elongating the cells and help in the growth process.

130. A is the longest cell of the body. B is a part of A which are the points of receiving information. C is a part which receives impulses from B and conducts towards D which is covered by an insulating sheath E. Can you identify A, B, C, D and E?

Ans. A – Neuron, B – Dendrites, C – Cyton, D – Axon, E – Myelin sheath.

131. On touching a hot plate we suddenly withdraw our hand. Which category of neurons became active first and which one next?

Ans. Sensory neurons get activated first as they carry impulses to spinal cord and the spinal cord interprets the impulses to generate motor impulse which is carried by motor neurons to effector organ for response. So motor neurons get activated next.

132. The brain directs our body's internal functions. It also integrates sensory impulses and information to form perceptions, thoughts and memories. The brain gives us self-awareness and the ability to speak and move in the world.

- (i) The brain is divided into three major subparts. Name these subparts.
- (ii) Name the part of the brain that is responsible for maintaining body posture?



- (iii) Name the part of the brain that has the reflex centers for sneezing and vomiting?
- (iv) The brain is the part of the central nervous system or peripheral nervous system?

Ans. (i) The brain is divided into three main subparts: the forebrain, the midbrain and the hindbrain. The structure present towards the lower back of the skull is the hindbrain. The narrow region that links the hindbrain with the forebrain is the midbrain. The structure in front of the brain is the forebrain.

(ii) The cerebellum controls the body posture and coordinates motor activity for moving limbs.

(iii) The medulla oblongata is the region which regulates the breathing, heart rate, and blood pressure, and consists of reflex centers for sneezing, vomiting, defecating, coughing, hiccupping, and swallowing.

(iv) The nervous system present in vertebrates is divided into the peripheral nervous system and central nervous system. The brain and spinal cord are found in the central nervous system. Thus, the brain is part of the central nervous system.

Application Based Questions

133. Following are the two examples of plant movement. One is dropping of leaves in touch me-not plant and second is

attaching of pea plant to a support with the help of tendrils.

- (i) What is the stimulus which is common for movement in both the cases?
- (ii) What is the difference in movement in both the plants? Explain.
- (iii) Give appropriate scientific terms for the movements described in both cases.

Ans. (i) Touch is the stimulus which is common for movement in both the cases.

(ii) Dropping of leaves in touch me-not plant is an example of growth independent movement which occurs due to change in turgour pressure of the cells. But attaching of pea plant to a support with help of tendrils is a growth dependent movement. The pea plants develop tendrils which are sensitive to touch. When they come in contact with a support they encircle the support and clings to them. Auxin hormone plays an important role. Auxin synthesised at the tip diffuses to parts away from the support, so those parts away from support grow faster than those parts in contact. So, the tendrils encircle the support.

(iii) Dropping of leaves in touch me-not plant is an example of seismonastic movement whereas attaching of pea plant to a support with the help of tendrils is an example of curvature movement.

134. List four precautions which a student should observe while preparing a temporary mount of a leaf peel to show stomata in his school laboratory.

[Board Question]

- Ans.**
1. Freshly plucked leaf should be taken for epidermal peel.
 2. Hold the slide by its edges.
 3. Peel should be cut to a proper size.

4. The peel should be allowed to dry.

135. Rahul went to fruit market to buy fruits. He saw that shopkeeper is spraying some powder like substance on the unripe fruits. He asked the shopkeeper about the powder. The shopkeeper replied that it helps in ripening of fruits quickly.

(i) Can you name the powder the shopkeeper is using to quickly ripen the fruits?

(ii) Give some other functions of the powder named by you in part a.

(iii) Give some examples of growth promoting and growth inhibiting hormones?

Ans. (i) Ethylene which is a phytohormone is used to quickly ripen the fruits.

(ii) Ethylene is used to break dormancy in seeds and buds.

(iii) Growth promoting hormones are auxins, gibberellins, cytokinins, ethylene and growth inhibiting hormone is abscisic acid.

136. Ram has met with an accident after which he lost the capacity to:

(i) Walk in a straight line

(ii) Smell anything

(iii) Does not feel full after eating

Which part of the brain is damaged in each case?

Ans. (i) Cerebellum is hurt because cerebellum controls and coordinates muscular activities as well as maintains posture and balance of the body.

(ii) Olfactory lobe of forebrain is damaged as it is the site for smell.

(iii) Hypothalamus part is damaged as the centre of hunger and thirst is located in it.

137. One day when Geeta was reading newspaper she saw the picture of the shortest and the tallest person in the world. Next day when she went to school she asked her teacher about this condition.

(i) Which gland and hormones might be responsible for this condition?

(ii) What is the cause of the condition given in the above article and give scientific terms associated with the above two conditions?

(iii) Can this disease be cured?

Ans. (i) Pituitary gland and growth hormone secreted from pituitary gland is responsible for this condition.

(ii) Over secretion of growth hormones from pituitary gland in childhood causes gigantism and under secretion of growth hormones from pituitary gland in childhood causes dwarfism.

(iii) No this disease cannot be cured as they are caused due to deficiency or over secretion of hormones.

Creating Based Questions

138. Study the table given below and answer the questions.

Name of the plant hormone	Uses
Absciscic acid	Seed dormancy
Cytokinins	Cell elongation and termination
Auxins	Promotes cell division
Ethylene	Ripening of fruits

(i) What is the plant hormone that regulates phototropism?

- (ii) Which plant hormone stimulates shedding of leaves and fruits?
- (iii) Name the plant hormone that helps stimulate the opening and closing of stomata.
- (iv) Name the plant hormone that participates in the process of thigmotropism.

Ans. (i) The plant hormone that regulates phototropism is auxin.

(ii) The plant hormone that stimulates the shedding of leaves and fruits is ethylene.

(iii) The plant hormone that helps stimulate the opening and closing of stomata is abscisic acid.

(iv) The plant hormone that participates in the process of thigmotropism is ethylene.

139. During a street fight between two individuals, mention the effects on the following organs by the autonomic nervous system, in the table given below:

Organs	Sympathetic nervous system	Parasympathetic system
Lungs		
Heart		
Salivary Gland		
Pupil of eye		

Ans.

Organs	Sympathetic nervous system	Parasympathetic system
Lungs	Dilates bronchi and	Constricts bronchi and

	bronchioles	bronchiole
Heart	Increases heart rate	Decreases heart rate
Salivary Gland	Inhibits saliva secretion	Stimulates saliva secretion
Pupil of eye	Dilation	Constriction

140. ‘An alcoholic person usually walks clumsily’— develop a better explanation for this statement.

Ans. Cerebellum is the part of the brain that maintains balance and posture. After consumption of alcohol the cerebellum gets affected by the alcohol for which it cannot maintain balance and posture properly and hence walk clumsily.

141. Consider the following table given below and answer the questions with reasons:

Parts of brain	Function
Cerebellum	Balance and coordination
Frontal lobe	Thinking, behaviour, and movement
Motor cortex	Movement
Occipital lobe	Sight and vision

- (i) Name the part of the brain where the cerebrum is located.
- (ii) The cerebellum is located in the _____ .
- (iii) What is the main thinking part of the brain?
- (iv) Name the nerves that arise from the spinal cord.

Ans. (i) The forebrain of the brain contains an area known as the cerebrum. This area is composed of the cerebral cortex.

(ii) The cerebellum is located in the hindbrain. The structure present towards the lower back of the skull is the hindbrain.

(iii) The major part of the brain that is involved in thinking is the forebrain.

(iv) The nerves that arise from the spinal cord are called spinal nerves.

142. Using the following words below, construct a reflex arc.

Sensory nerves, receptor, effector, stimulus, brain or spinal cord, response, motor neurons.

Ans. Stimulus → Receptor → Sensory nerves → Brain or spinal cord Motor nerves → Effector → Response.

143. Imagine what would happen if your neurons were disc shaped?

Ans. Transfer of messages with efficiency across a long distance would have been affected if the neurons were disc shaped.

144. Pancreas is both endocrine and exocrine in nature. Suppose the exocrine part becomes damaged then how will it affect your body?

Ans. Digestion of food will be hampered as exocrine part of pancreas produces digestive juices that help in digestion in small intestine.

145. Choose the incorrect word from the following and replace it with the correct word:

(i) Pancreas is called the master gland.

(ii) Iron is needed for production of thyroxine.

Ans. (i) Pancreas is the incorrect word replaced by pituitary gland.

(ii) Iron is the incorrect word replaced by iodine.

146. How do the shoot and roots of a plant respond to the pull of earth's gravity?



The above experimental set up shows the response of different plant parts towards gravity. Give the scientific term used for such response?

148. Assertion: In spite of not having nervous system, plants can sense things.

Reason: Plants can sense things with the help of hormones.

149. Where are pons present in the brain? Which activity do they control?

150. What are releasing hormones? Where are they released from?

151. What is antagonism with reference to hormone functioning? Give an example.

152. Name any three endocrine glands in human body and briefly write the function of each of them.

153. Draw a diagram of a neuromuscular junction.

154. Name the part of brain which controls:

(i) Voluntary actions

(ii) Involuntary actions

What is the significance of peripheral nervous system?

155. 'Synapses act like one-way valves' – Elaborate.

156. State the names and functions of different hormones secreted by pituitary gland.

157. Answer the following:

(i) A hormone which is called birth hormone in humans.

- (ii) Longest cell in the human body.
- (iii) Gland located just below neck.
- (iv) The movement in plant which is non-directional.
- (v) A plant hormone which causes elongation of cells.

158. Draw a diagram of brain showing cranium, medulla oblongata, cerebellum, pons. State function of each.

159. If accidentally we step on something sharp at once we move our foot away. What is this type of response known as? Explain how is it controlled?

160. Name the mechanism by which amount of hormone in the blood is regulated?

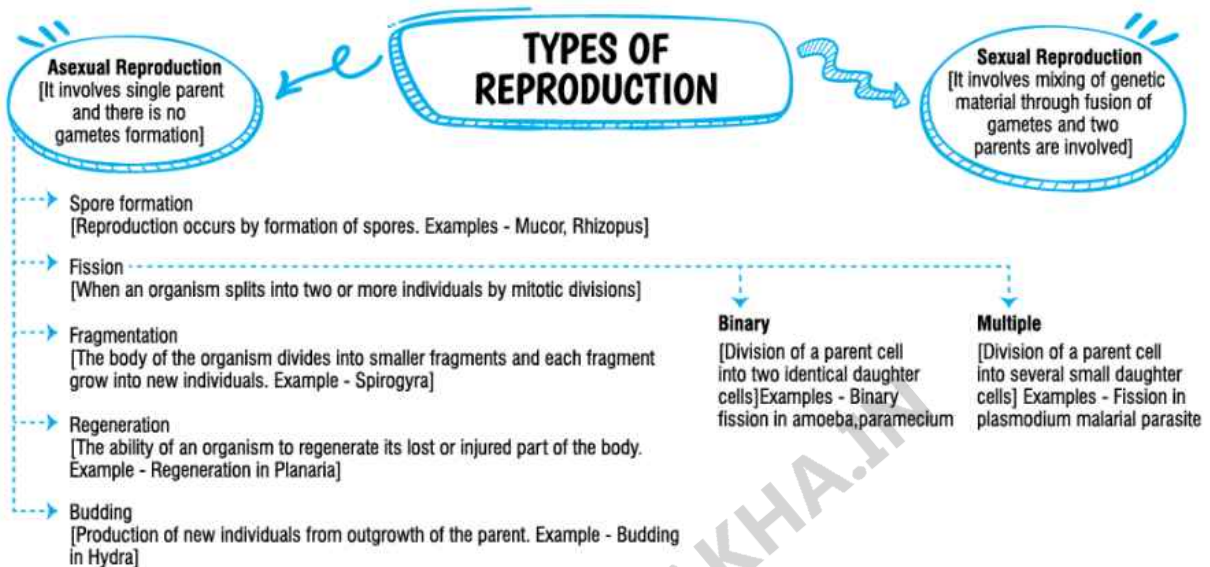
How Do Organisms Reproduce ?

Chapter 8

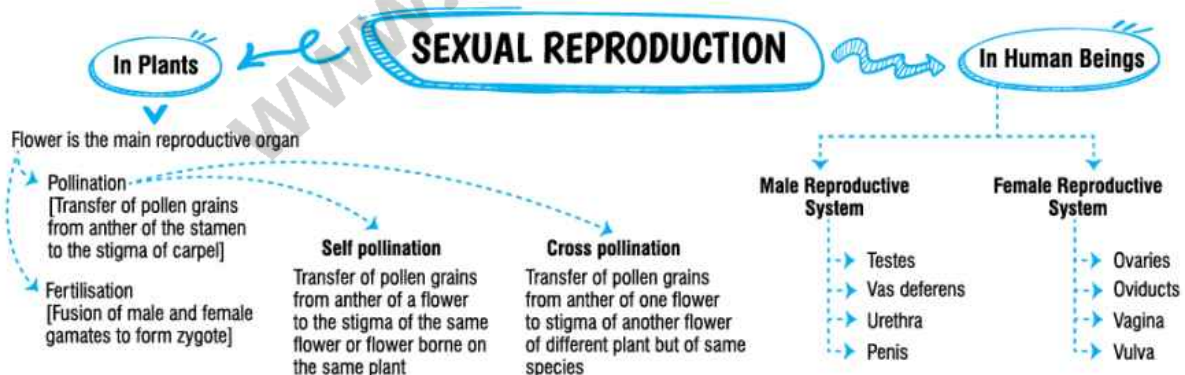
Summary

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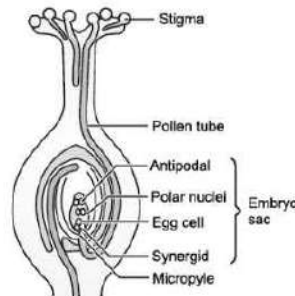
- Reproduction is the biological process by which new individual organisms (offspring) are produced from their parents. Reproduction is a fundamental feature of all known life. Each individual organism exists as the result of reproduction.
- The inheritance of features from parents can be transferred to their offsprings through chromosomes present in the nucleus of the cell.
- Basic event in reproduction is the creation of a DNA copy.
- Some changes in DNA copying produces variations in organisms known as mutations.



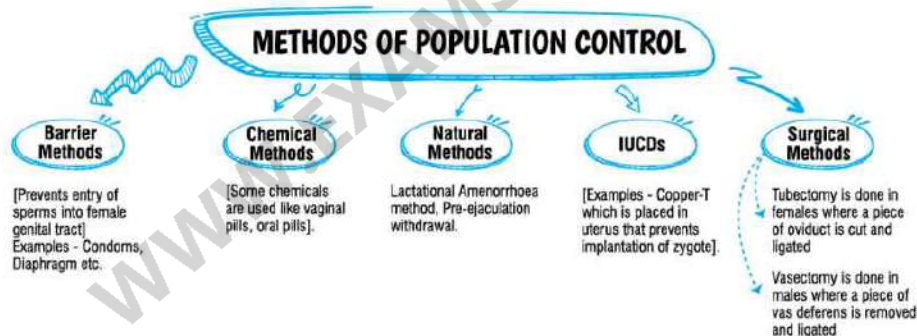
- Vegetative propagation in plants is also an example of asexual reproduction. New plants can be grown from different vegetative parts of the plants like roots, stems, leaves etc.
- Some plants like Bryophyllum develops adventitious buds on their leaves which develops into new plants.
- Modified tuberous roots like sweet potato can be propagated vegetatively when planted in soil.
- Artificial methods of vegetative propagation includes cutting, layering, grafting etc.



- The parts of a flower are calyx, corolla, androecium and gynoecium.
- Calyx is the outermost whorl of a flower which is a collection of sepals mostly green in colour and they are protective in function.
- Corolla is the collection of petals, they are brightly coloured and helps in attraction of insects for pollination.
- Androecium is a collection of stamens which are the male reproductive organs of a flower. A stamen consists of anther and filament. Anther contains pollen sacs in which pollen grains are produced. Pollen grains contain male gametes.
- Gynoecium is a collection of carpels which are the female reproductive organs of a flower.
- A carpel consists of stigma, style and ovary.
- The ovary contains ovules which contain the female gametes.
- Double fertilisation is a complex fertilisation mechanism in flowering plants. This process involves the fusion of a female gametophyte (megagametophyte, also called the embryo sac) with two male gametes (sperm).
- Ovules grow into seeds and ovaries grow into fruits after fertilisation.



- Gonads are primary sex organs in humans. Testes are male gonads which produce sperms whereas ovaries are female gonads which produce eggs.
- Testes are found within sac-like structures called scrotum. Vas deferens or sperm ducts carry sperms from testis.
- Ovaries produce eggs. The fertilisation of egg with sperms occurs at oviduct. After fertilisation zygote is formed which develops into embryo that grows in uterus to a full-term baby in about 280 days which is called gestation period.
- If fertilisation does not occur the egg disintegrates and along with blood and mucus it comes out through the vagina. This cycle occurs every month in females known as menstrual cycle.



- To avoid rapid growth of population some preventive measures are taken which is called birth control.
- The infectious diseases which spread from an infected person to healthy ones through sexual contact are called Sexually Transmitted Diseases or STDs. Examples are AIDS, syphilis, gonorrhoea.

Definitions

1. Asexual reproduction: The process of producing offsprings which involves a single parent without the formation of gametes is called asexual reproduction.

2. Spore: A spore is a single-celled or multi-celled reproductive

structure which gets separated from its parent and under the favourable conditions gives rise to a new individual.

3. Seed: A seed is the reproductive unit of a plant from which a new plant grows.

4. Vegetative propagation: It is mainly seen in plants and is an asexual mode of reproduction where a new plant grows from different parts of plant like roots, stem, leaves etc., rather than from a seed.

5. Tissue culture: The production of new plants from a small piece of plant tissues or cells removed from the growing tips of a plant in a suitable growth medium is called tissue culture.

6. Pollination: The process of transfer of pollen grains from anthers of stamens to the stigma of carpel within the same flower or different flower of same plant or to any other flowers of different plants but of same species is called pollination.

7. Double fertilisation: The process by which a male gamete fuses with an egg to form zygote and the second male gamete unites with two polar nuclei to form endosperm is called double fertilisation.

8. Primary sex organs: They are the gonads *i.e.*, testes and ovaries which produce gametes and secrete sex hormones.

9. Gametes: The special cells involved in sexual reproduction to produce the offsprings are called gametes or sex cells.

10. Puberty: The age at which sex hormones are produced, reproductive organs become matured and have the capacity to give rise to new individuals and there is development of secondary sexual characters in both males and females.

11. Fertilisation: The process of fusion of male and female gametes to produce the zygote is called fertilisation.

12. Gestation period: It is the time from fertilisation till the birth of

the new born.

13. Parturition: The delivery of full term baby from the uterus of mother after the end of gestation period is called parturition.

Multiple Choice Questions

14. What is the disadvantage of parthenogenesis?

- (a) Wastage of germplasm
- (b) Retention of genotype
- (c) Lack of adaptability
- (d) Variety in population

Ans. (c) Lack of adaptability

Explanation :

Since there is no fertilisation of gametes in parthenogenesis, there will be no crossing over of genes. This hence causes no variations in the generations. Which makes it difficult for the offspring to adapt to the changing environmental conditions.

15. Variation patterns are studied in the offspring of sexually and asexually reproducing organisms. State your observation:

- (a) More variations are observed in the offspring of sexually reproducing organisms.
- (b) More variations are observed in the offspring of asexually reproducing organisms.
- (c) No difference in variation is observed in offspring of sexually and asexually reproducing organisms.
- (d) Cannot be determined.

Ans. (a) More variations are observed in the offspring of sexually reproducing organisms.

Explanation :

There is always a possibility of diversity of characters in the offsprings of sexually reproducing organism because the offspring is formed as a result of fusion of two gametes produced by two different individuals: the male and the female parents. So, there is an opportunity for new combinations of characters.

16. Characters transmitted from parents to offspring are present in:[\[NCERT Exemplar\]](#)

- (a) cytoplasm
- (b) ribosome
- (c) golgi bodies
- (d) genes

Ans. (d) genes

Explanation :

Characters are transmitted from parents to offspring through genes. Genes are the heredity units of the body in living organisms. Chromosomes in the nucleus of a cell contain information for the inheritance of features from parents in the form of DNA (Deoxyribonucleic acid). This DNA contains genes.

17. Characters that are transmitted from parents to offspring during reproduction show:

[\[NCERT Exemplar\]](#)

- (a) only similarities with parents.
- (b) only variations with parents.

(c) both similarities and variations with parents.

(d) neither similarities nor variations.

Ans. (c) both similarities and variations with parents.

Explanation :

In sexual reproduction, the offspring are not identical to the parents or to one another. This is because the offspring receive some genes from mother and some from father.

Due to the mixing of genes on re-establishment of number of chromosome in various different combinations, the offspring show both similarities and variations with characters of parents.

18. The number of chromosomes in parents and offspring of a particular species remains constant due to: [\[NCERT Exemplar\]](#)

(a) doubling of chromosomes after zygote formation.

(b) halving of chromosomes during gamete formation.

(c) doubling of chromosomes after gamete formation.

(d) halving of chromosomes after gamete formation.

Ans. (b) halving of chromosomes during gamete formation.

Explanation :

The number of chromosomes in parents and offspring of a particular species remains constant due to halving of chromosomes during gamete formation.

The gametes are special type of cells which contain only half the amount of DNA as compared to normal cells of an organism. So, when a male gamete combines with a female gamete during sexual reproduction, then the new cell 'zygote' will have normal amount of DNA.

19. Reproduction is essential for living organisms to order to

- (a) keep the individual organism alive.
- (b) fulfill their energy requirement.
- (c) maintain growth.
- (d) continue the species generation after generation.

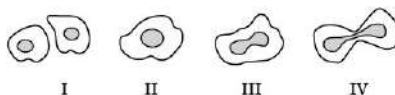
Ans. (d) continue the species generation after generation.

Explanation :

Reproduction is not essential for the survival of an individual, but it is an important function of a living being as it helps an organism to perpetuate its own kind.

Through this process, new individuals are produced, that grow and reproduce again, so as to continue the species generation after generation. Reproduction is a process to maintain the progeny of an organism.

20. In the following figure different stages of binary fission in Amoeba are depicted, which are not in proper sequence. [Board Question]



The correct sequence is :

- (a) II, III, IV, I
- (b) I, II, IV, III
- (c) III, IV, II, I
- (d) I, III, IV, II

Ans. (a) II, III, IV, I

Explanation :

In Amoeba, binary fission is an asexual method of reproduction. (II) represents the parent cell, which replicates the genetic material as shown in (III). The cytoplasm divides after karyokinesis, resulting in two cells (IV). The two cells illustrated in (I) are the daughter cells that result from binary fission.

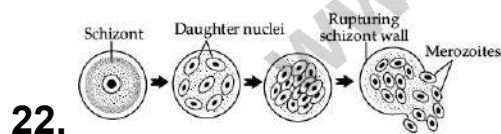
21. The ability of a cell to divide into several cells during reproduction in Plasmodium is called :

- (a) Budding
- (b) Reduction division
- (c) Multiple fission
- (d) Binary fission

Ans. (c) Multiple fission

Explanation :

Plasmodium reproduces asexually after feeding on red blood cells, a process known as schizogony or multiple fission. Plasmodium divides into numerous cells during multiple fission.



Which of the following two combinations are correct?

	Multiple Fission	Binary fission
(a)	2 daughter cells are formed.	Many daughter cells are formed.
(b)	Both the nucleus and cytoplasm divide simultaneously.	First, the nucleus divides and is surrounded by cytoplasm.

(c)	Divides repeatedly.	Divides only once.
(d)	Includes a definite pattern of division.	Has no definite pattern of division.

Ans. (c) Divides repeatedly—Divides only once.

Explanation :

Both binary fission and multiple fission are modes of asexual reproduction and occur with the presence of only one parent. In binary fission, the parent cell divides itself into two equal and identical daughter cells. It is the most common form of reproduction in prokaryotes such as bacteria. In multiple fission, a single parent cell is divided into many daughter cells. It is the most common form of reproduction in protists and in some parasitic species.

23. In which of the following aspects does multiple fission differs from binary fission?

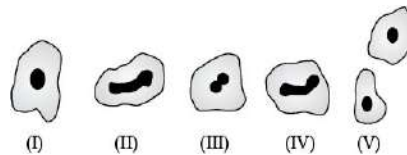
- (i) Number of offsprings produced.
 - (ii) Level of genetic variation in offsprings.
 - (iii) Number of parents involved.
 - (iv) Multiple fission happens in Plasmodium whereas binary fission happens in Leishmania.
- (a) Only (i) is correct
 - (b) Both (i) and (iv) are correct
 - (c) (iii) is correct
 - (d) (ii) is correct

Ans. (b) Both (i) and (iv) are correct

Explanation :

Multiple fission produces many off-springs whereas binary fission produces only two. Off-springs produced through multiple fission as well as binary fission are genetically identical to each other and to their parents. Both multiple fission and binary fission require only one parent. Plasmodium, the protozoan that causes malaria reproduces through multiple fission. Leishmania causes Kala-azar and it reproduces through binary fission.

24. Study the following diagram showing various stages of binary fission in Amoeba: the correct sequence of these diagrams should be:



- (a) I, IV, III, II, V
- (b) III, I, IV, II, V
- (c) I, II, IV, III, V
- (d) I, III, IV, II, V

Ans. (d) I, III, IV, II, V

Explanation :

Asexual reproduction is a process of reproducing the offspring through simple division of cells, this type of reproduction is observed in single cell organisms, it does not undergo fusion of gametes, therefore, the offspring produced by asexual reproduction are genetically identical. The asexual reproduction is further divided into; binary fission, budding, fragmentation, and sporogenesis.

The binary fission is an asexual reproduction observed in amoeba. After the replication process through mitotic division, the amoeba cell divides into two equal halves and these are considered as the

daughter cells. In this process, the daughters cells thus produced through cell division are identical to each other.

The amoebas that are about to divide grow eventually larger, the nucleus gets extended and divides into two. The nuclear division is followed by the cytoplasmic division. Therefore, two amoebas are produced from a single amoeba.

25. Which of the following statements about binary fission is true?

- (a) Some multicellular organisms also reproduce through binary fission.
- (b) Binary fission produces two new organisms.
- (c) Binary fission in amoeba happens only in the vertical plane.
- (d) Binary fission in Leishmania can happen in any plane.

Ans. (b) Binary fission produces two new organisms.

Explanation :

Only unicellular organisms reproduce through binary fission. In binary fission, a unicellular organism (a cell) divides to form two unicellular organisms (two cells). Binary fission in Amoeba can happen in any plane. Binary fission in Leishmania happens in a definite orientation (plane) to the body because Leishmania has somewhat organised structure.

26. A feature of reproduction that is common to Amoeba, Yeast and Bacterium is that :

- (a) they are all multicellular
- (b) they are all unicellular
- (c) they reproduce only sexually

(d) they reproduce asexually

Ans. (d) they reproduce asexually

Explanation :

Amoeba, Yeast and Bacterium are unicellular organisms and reproduce asexually.

27. In the list of organisms given below, those that reproduce by the asexual method are:

[NCERT Exemplar]

(i) banana

(ii) dog

(iii) yeast

(iv) *Amoeba*

(a) (ii) and (iv)

(b) (i), (iii) and (iv)

(c) (i) and (iv)

(d) (ii), (iii) and (iv)

Ans. (b) (i), (iii) and (iv)

Explanation :

Asexual reproduction takes place without the process of gamete formation and only one parent is needed. Examples include *Amoeba* which reproduces by binary fission (division of cell into two similar cells).

Yeast, reproduces by budding (small buds develop from body wall of parent that separate and grow further).

Banana, reproduces by vegetative propagation (Vegetative parts of a plant such as root , stem, etc., can produce new plants).

In dog, sexual reproduction takes place, (i.e., it involves two sexes- male and female whose gametes fuse constituting sexual reproduction).

28. Offspring formed by asexual method of reproduction have greater similarity among themselves because:[\[NCERT Exemplar\]](#)

- (i) Asexual reproduction involves only one parent.
 - (ii) Asexual reproduction does not involve gametes.
 - (iii) Asexual reproduction occurs before sexual reproduction.
 - (iv) Asexual reproduction occurs after sexual reproduction.
- (a) (i) and (ii)
 - (b) (i) and (iii)
 - (c) (ii) and (iv)
 - (d) (iii) and (iv)

Ans. (a) (i) and (ii)

Explanation :

Offspring have greater similarity as only one parent is involved in asexual reproduction thus no gametes are formed. The basis of asexual reproduction is mitosis (division of a nucleus into two identical daughter nuclei). Each daughter nucleus has same genetic make up because of replication of parental DNA. The new offspring produced are called clones.

29. A feature of reproduction that is common to *Amoeba*, *Spirogyra* and yeast is that:

[NCERT Exemplar]

- (a) they reproduce asexually.
- (b) they are all unicellular.
- (c) they reproduce only sexually.
- (d) they are all multicellular.

Ans. (a) they reproduce asexually.

Explanation :

Amoeba and yeast are unicellular while *Spirogyra* is multicellular. But all the three reproduce asexually.

30. In *Spirogyra*, asexual reproduction takes place by:

[NCERT Exemplar]

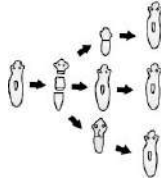
- (a) breaking up of filaments into smaller bits.
- (b) division of a cell into two cells.
- (c) division of a cell into many cells.
- (d) formation of young cells from older cells.

Ans. (a) breaking up of filaments into smaller bits.

Explanation :

In *Spirogyra*, asexual reproduction takes place by fragmentation, *i.e.*, the organism simply breaks up into smaller pieces upon maturation. Each piece grows into new individual without forming any gametes.

31. Name the process shown in the above diagram of getting back a full organism from its body parts.



- (a) Regeneration
- (b) Budding
- (c) Fragmentation
- (d) Fission

Ans. (a) Regeneration

Explanation :

The process of getting back a full organism from its body parts is called regeneration. The simple animals like hydra and planaria show regeneration. If the body of planaria gets cut into a number of pieces, then each body piece can regenerate into a complete planaria by growing all the missing parts. The regeneration of an organism from its cut body part occurs by the process of growth and development. The cells of cut body part divide rapidly to make a ball of cells. The cells then become specialised to form different types of tissues which again form various organs and body parts.

32. What happens when a Planarian (plural-Planaria) is cut into many fragments?

- (a) All fragments regenerate into new organisms.
- (b) Only the head containing fragment regenerates into a new organism.
- (c) Nearly half of the fragments regenerate into new organisms.
- (d) No changes are seen in fragments. Planaria reproduce by budding.

Ans. (a) All fragments regenerate into new organisms.

Explanation :

Cells that cause regeneration are present all over the body of a Planarian. So, when a Planarian is cut into many fragments, all fragments regenerate into new organisms.

33. Asexual reproduction takes place through budding in:
[NCERT]

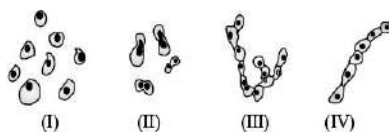
- (a) Amoeba
- (b) Yeast
- (c) Plasmodium
- (d) Leishmania

Ans. (b) Yeast

Explanation :

Both asexual and sexual reproduction are possible for yeast. Budding is the process through which yeast multiply asexually.

34. In which of the given figures, budding is not shown?



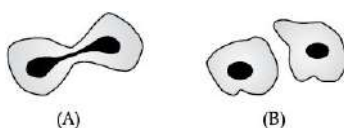
- (a) I
- (b) II
- (c) III
- (d) IV

Ans. (a) I

Explanation :

Budding is a asexual reproduction process that involves the formation of a bud that is an outgrowth in the parent body and later breaks down to form a new organism. Due to repeated cell division the hydra forms an outgrowth in a particular site. This bud develops into a new individual and when it matures it detaches from the parent body and becomes a new independent individual. In the given image, the diagram I does not show any bud formation.

35. Slides A and B were examined and interpreted by four students as a, b, c and d. Identify the correct option:



	Slide A	Slide B
(a)	Binary fission in Amoeba	Daughter cells of Amoeba
(b)	Budding in yeast	Buds of Yeast
(c)	Binary fission in Amoeba	Buds of Yeast
(d)	Budding in yeast	Daughter cells of Amoeba

Ans. (a) Slide A—Binary fission in *Amoeba*.

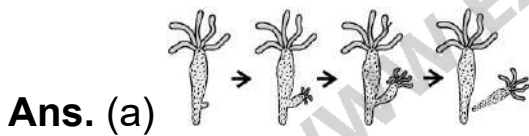
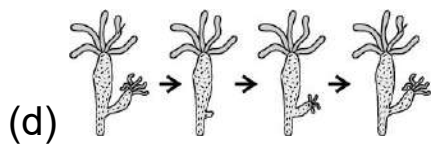
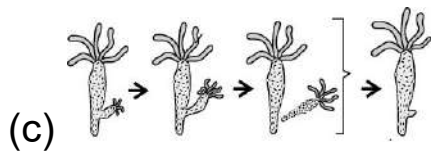
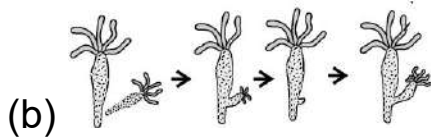
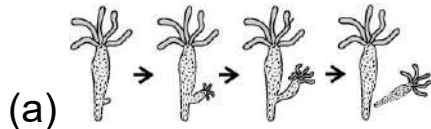
Slide B—Daughter cells of *Amoeba*.

Explanation :

The binary fission is an asexual reproduction observed in amoeba. After the replication process through mitotic division, the amoeba cell divides into two equal halves and these are considered as the daughter cells. In this process, the daughters cells thus produce through cell division are identical to each other as shown in the diagram.

Budding is also a mode of asexual reproduction process that involves the formation of a bud that is an outgrowth in the parent body that later breaks down to form a new organisms and the diagrams do not show the bud formation.

36. Which of the following options shows correct sequence of asexual reproduction in hydra?



Explanation :

In Hydra, a bud develops as an outgrowth due to repeated cell division at one specific site. These buds develop into tiny individuals and when fully mature, detach from the parent body and become new independent individuals.

37. Which of the following statements is NOT true regarding asexual reproduction in plants?

(a) Plants that reproduce asexually reach maturity faster than those who reproduce sexually.

(b) Plants that reproduce asexually have greater genetic diversity than those who reproduce sexually.

(c) Plants that reproduce asexually are more stable than those who reproduce sexually.

(d) Plants that reproduce asexually create offspring that are identical to the parent plant.

Ans. (b) Plants that reproduce asexually have greater genetic diversity than those who reproduce sexually.

Explanation :

Sexual reproduction provides genetic diversity because the sperm and egg that are produced contain different combinations of genes than the parent organisms. Asexual reproduction, on the other hand, does not need sperm and eggs since one organism splits into two organisms that have the same combination of genes.

38. Vegetative propagation refers to formation of new plants from: [\[NCERT Exemplar\]](#)

(a) stem, roots and flowers

(b) stem, roots and leaves

(c) stem, flowers and fruits

(d) stem, leaves and flowers

Ans. (b) stem, roots and leaves

Explanation :

In vegetative propagation, vegetative parts of a plant such as root, stem, leaf, etc., can produce new plants. Vegetative reproduction is seen in plants like orchids, ornamental plants, grasses, banana, rose, jasmine, etc.

39. In Rhizopus, tubular thread like structures bearing sporangia at their tips are called :

[NCERT Exemplar]

- (a) Filaments
- (b) Rhizoids
- (c) Roots
- (d) Hyphae

Ans. (d) Hyphae

Explanation :

In fungi, hyphae are filamentous structures that branch out and spread beneath a substratum's surface. Hyphae may rise upright above the surface during its life cycle, with its contents forming a bulge at the tip. The sporangium is formed by this bulge. Spores are generated in the sporangium.

40. Factors responsible for the rapid spread of bread mould on slices of bread are:**[NCERT Exemplar]**

- (i) large number of spores.
 - (ii) availability of moisture and nutrients in bread.
 - (iii) presence of tubular branched hyphae.
 - (iv) formation of round shaped sporangia.
- (a) (i) and (iii)
 - (b) (ii) and (iv)
 - (c) (i) and (ii)
 - (d) (iii) and (iv)

Ans. (c) (i) and (ii)

Explanation :

The sporangium of the bread mould releases huge number of spores, which germinate on a suitable substratum and form hyphae. Fungi are saprophytes so profuse growth is only possible in the presence of an appropriate substratum, such as bread, that provides a considerable amount of moisture and nutrients.

41. The Ratio of Number of Chromosomes in a Human Zygote and a Human Sperm is:

- (a) 2 : 1
- (b) 3 : 1
- (c) 1 : 2
- (d) 1 : 3

Ans. (a) 2 : 1

Explanation :

The number of chromosomes in a human sperm is half the number of chromosomes in a zygote *i.e.*, their ratio is 2 : 1.

42. A _____ fuses with a _____ in generative fertilisation.

- (a) Secondary nucleus, polar nucleus
- (b) Polar nucleus, female gamete
- (c) Male gamete, female gamete
- (d) All of the above

Ans. (c) Male gamete, female gamete

Explanation :

In double fertilisation, triple fusion (vegetative fertilisation) and syngamy (generative fertilisation) occur. In generative fertilisation, a male gamete fuses with a female gamete and forms diploid zygote.

43. Which of the statements is incorrect?

- (a) The filiform apparatus blocks the entry of pollen and sperm cells.
- (b) The secondary nuclei form a polar nucleus prior to fertilisation.
- (c) Androecium is a part of the carpel.
- (d) All of the above

Ans. (d) All of the above

Explanation :

Filiform apparatus are the finger-like projections that direct the entry of pollen tube and aid in sperm discharge. The definitive nucleus is a secondary nucleus generated by the fusion of two polar nuclei. Stamens are the male parts of a flower; together, they make up the androecium.

44. Which of the following is a product of meiosis?

- (a) Microspore mother cell
- (b) Endosperm nucleus (primary)
- (c) Megaspore mother cell
- (d) Megaspore

Ans. (d) Megaspore

Explanation :

Megaspore is a haploid cell that is formed when the megaspore mother cell undergoes meiosis. It is the initial cell giving rise to

female gametophyte.

45. To perform an experiment to identify the different parts of an embryo of a dicot seed, first of all you require a dicot seed. Select dicot seeds from the following group.[\[Board Question\]](#)

Wheat, Gram, Maize, Pea, Barley, Ground-nut

- (a) Wheat, Gram and Pea
- (b) Gram, Pea and Ground-nut
- (c) Maize, Pea and Barley
- (d) Gram, Maize and Ground-nut

Ans. (b) Gram, Pea and Ground-nut.

Explanation :

Monocot and dicot plants are the two types of angiosperm plants. The seeds of dicot plants have two cotyledons. Ground-nut, gram, and pea are examples of dicot plants.

46. On observing an embryo of a pea seed, a student listed its various parts as given below :

Micropyle, Cotyledon, Plumule, Testa, Radicle, Tegmen

On examining the list the teacher remarked that out of these only three parts belong to embryo. Select these three parts:

[\[Board Question\]](#)

- (a) Testa, Radicle, Cotyledon
- (b) Tegmen, Radicle, Micropyle
- (c) Cotyledon, Plumule, Radicle
- (d) Cotyledon, Plumule, Testa

Ans. (c) Cotyledon, Plumule, Radicle

Explanation :

Pea is a dicot plant with testa, cotyledons, and embryonic axis in its seed. The cotyledon, plumule, and radicle make up the embryo. Cotyledons are fleshy spherical structures on the embryonic axis that carry reserve feeding resources. The radicle is found on the micropylar end of embryonic axis, while the plumule is found on the other end.

47. The correct sequence of reproductive stages seen in flowering plants is :[NCERT Exemplar]

- (a) gametes, zygote, embryo, seedling
- (b) zygote, gametes, embryo, seedling
- (c) seedling, embryo, zygote, gametes
- (d) gametes, embryo, zygote, seedling

Ans. (a) gametes, zygote, embryo, seedling

Explanation :

The male gamete present in the pollen grain and the female gamete egg in the embryo sac are formed by meiosis. The zygote is formed when the male and female gametes unite. The embryo is formed by multiple divisions of the zygote. In the seed, the embryo develops and matures. The seed germinates by absorbing water and grows into a new seedling.

48. Length of pollen tube depends on the distance between : [NCERT Exemplar]

- (a) pollen grain and upper surface of stigma.
- (b) pollen grain on upper surface of stigma and ovule.
- (c) pollen grain in anther and upper surface of stigma.

(d) upper surface of stigma and lower part of style.

Ans. (b) pollen grain on upper surface of stigma and ovule.

Explanation :

The length of pollen tube is determined by the distance between pollen grain on the upper surface of stigma and ovule. This is because pollen germinates and forms pollen tube that reaches up to ovule in ovary and releases male gamete to combine with female gamete.

49. The anther contains :

(a) Sepals

(b) Ovules

(c) Carpel

(d) Pollen grains

Ans. (d) Pollen grains

Explanation :

Pollen grains are microscopic structures produced by an anther. When anther opens, pollen is released, which is subsequently transferred by the wind, insects, or birds to different plants for pollination.

50. What is the event after zygote formation called?

(a) Pre-fertilisation

(b) Post-fertilisation

(c) Fertilisation

(d) Gametogenesis

Ans. (b) Post-fertilisation

Explanation :

Sexual reproduction is divided into 3 events: Pre-fertilisation, fertilisation and post-fertilisation events. Pre-fertilisation events occur before fusion of gametes (gametogenesis), fertilisation is the fusion of gametes to form zygote and post-fertilisation events occur after zygote formation.

51. Anthers and filaments form the _____ .

- (a) gynoecium
- (b) calyx
- (c) androecium
- (d) corolla

Ans. (c) androecium

Explanation :

Androecium consists of the anthers and filaments. They are the male reproductive structures. Male gametes that are in pollen grains are on the anthers. Depending on the species, the stamens (anthers and filaments) may or may not protrude out of the flower.

52. The correct sequence of reproductive stages occurring in flowering plants is:

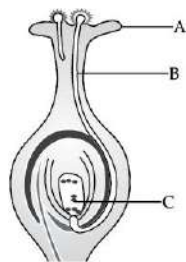
- (a) Gametes, Zygote, Embryo, Seed
- (b) Zygote, Gametes, Embryo, Seed
- (c) Seed, Embryo, Zygote, Gametes
- (d) Gametes, Embryo, Zygote, Seed

Ans. (a) Gametes, Zygote, Embryo, Seed

Explanation :

Gametes of flowers fuse to form a zygote. This zygote develops into an embryo that later forms the seed.

53. Identify A, B and C in the given diagram and match the labelling referred in column I and correlate with the function in column II.



Column I	Column II
A.	(i) Special reproductive female sex cell which combines with male gamete to form zygote.
B.	(ii) A male gamete moves down through it towards the female gamete in the ovary
C.	(iii) Receiving the pollen grains from the anther of stamen during pollination.

(a) A-(iii), B-(ii), C-(i)

(b) A-(ii), B-(i), C-(iii)

(c) A-(i), B-(ii), C-(iii)

(d) A-(iii), B-(i), C-(ii)

Ans. (a) A-(iii), B-(ii), C-(i)

Explanation :

A – Stigma. The top part of carpel is called stigma. Stigma is for

receiving the pollen grains from the anther of stamen during pollination.

B – Pollen tube. When a pollen grain falls on the stigma, it bursts open and grows a pollen tube downward through the style towards the female gamete in the ovary. A male gamete moves down the pollen tube.

C–Female gamete (ovum). It is a special reproductive female sex cell which combines with male gamete to form zygote.

54. In a flower, the parts that produce male and female gametes (germ cells) are:[\[NCERT Exemplar\]](#)

- (a) stamen and anther
- (b) filament and stigma
- (c) anther and ovary
- (d) stamen and style

Ans. (c) anther and ovary

Explanation :

In a flower, the parts that produce male and female gametes are anther and ovary respectively. Stamen is the male reproductive unit of the flower. It contains a bilobed anther at the top which produces male gametes. Filament is the stalk of the stamen that supports anther.

Pistil (carpel) is the female reproductive part of the flower. It consists of ovary (forms ovules-female gametes), stigma (receives pollen) and style (elongated tube).

55. Which of the following is the correct sequence of events of sexual reproduction in a flower?

[\[NCERT Exemplar\]](#)

- (a) Pollination, fertilisation, seedling, embryo
- (b) Seedling, embryo, fertilisation, pollination
- (c) Pollination, fertilisation, embryo, seedling
- (d) Embryo, seedling, pollination, fertilisation

Ans. (c) Pollination, fertilisation, embryo, seedling

Explanation :

The correct sequence of events are:

Pollination (transfer of pollen from stamen to stigma)



Fertilisation (fusion of germ cells to form zygote)



Embryo formation (zygote divides several times to form an embryo within the ovule)



Seedling (ovule develops a tough coat and converts into a seed)

56. Which of the following statements are true for flowers?

[NCERT Exemplar]

- (i) Flowers are always bisexual.
- (ii) They are the sexual reproductive organs.
- (iii) They are produced in all groups of plants.
- (iv) After fertilisation they give rise to fruits.

(a) (i) and (iv)

(b) (ii) and (iii)

(c) (i) and (iii)

(d) (ii) and (iv)

Ans. (d) (ii) and (iv)

Explanation :

Flowers are the sexual reproductive organs of a plant. They are produced in angiosperms. Majority of flowers are bisexual. After fertilisation, they give rise to fruits.

57. Which among the following statements are true for unisexual flowers? [\[NCERT Exemplar\]](#)

(i) They possess both stamen and pistil.

(ii) They possess either stamen or pistil.

(iii) They exhibit cross pollination.

(iv) Unisexual flowers possessing only stamens cannot produce fruits.

(a) (i) and (iv)

(b) (ii), (iii) and (iv)

(c) (iii) and (iv)

(d) (i), (iii) and (iv)

Ans. (b) (ii), (iii) and (iv)

Explanation :

The flowers which are unisexual (papaya, watermelon) contain either stamens or carpels. Since only one reproductive organ is present in them, they depend on cross pollination to form zygote after fertilisation. Both stamen and carpels are required for fertilisation, so only one of them cannot produce fruits.

58. Which among the following statements are true for sexual reproduction in flowering plants?

[NCERT Exemplar]

- (i) It requires two types of gametes.
- (ii) Fertilisation is a compulsory event.
- (iii) It always results in formation event.
- (iv) Offspring formed are clones.

- (a) (i) and (iv)
- (b) (i), (ii) and (iv)
- (c) (i), (ii) and (iii)
- (d) (i), (ii) and (iv)

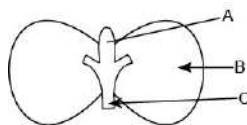
Ans. (c) (i), (ii) and (iii)

Explanation :

Sexual reproduction creates variation in organisms. So, clones cannot be produced through it. Clones are identical copies of parent organism. Sexual reproduction needs two type of gametes, i.e., male and female to form zygote after fertilisation.

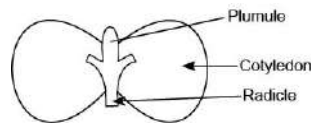
59. In figure, the parts A, B and C are sequentially:

[NCERT Exemplar]



- (a) cotyledon, plumule and radicle
- (b) plumule, radicle and cotyledon
- (c) plumule, cotyledon and radicle

(d) radicle, cotyledon and plumule



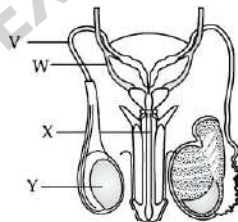
Ans. (c) plumule, cotyledon and radicle

Explanation :

Plumule 'A' grows into shoots, cotyledon 'B' stores food and radicle 'C' grows into roots.

60. The figure is given alongside shows the human male reproductive organs. Which structures make sperms and seminal fluid?

- (a) V makes sperms and X makes seminal fluid
- (b) W makes sperms and Y makes seminal fluid
- (c) X makes sperms and W makes seminal fluid
- (d) Y makes sperms and W makes seminal fluid



Ans. (d) Y makes sperms and W makes seminal fluid

Explanation :

Y represents the testes that produce sperms and W represents the Seminal vesicle that produces seminal fluid.

61. The male human reproductive system consists of the testes and the male accessory glands.

Which of the following statements about male accessory glands is false?

- (a) The prostate gland also synthesises sperm.
- (b) The prostate gland and seminal vesicles are found outside the testes.
- (c) The secretions of prostate gland and seminal vesicles make semen fluid and provide nutrition.
- (d) Male accessory glands contribute to semen.

Ans. (a) The prostate gland also synthesises sperm.

Explanation :

Sperm is synthesized only by the testes. The prostate gland and seminal vesicles are found outside the testes along the path of vas deferens. Secretions from the prostate gland and seminal vesicle glands contribute to the composition of semen. The seminal vesicles secretions include fructose and nourishment for sperm cells. Secretions from the prostate gland contribute to the fluid in semen.

62. In human males, the testes lie in the scrotum, because it helps in the:[\[NCERT Exemplar\]](#)

- (a) process of mating
- (b) formation of sperm
- (c) easy transfer of gametes
- (d) all of the above

Ans. (b) formation of sperm

Explanation :

Formation of germ cells or sperms takes place in the testes and it lies in the scrotum. In the scrotum (outside the abdominal cavity), the temperature is about 3°C lower than the temperature of the body.

Testes lie in scrotum because the sperm formation requires a lower temperature than the normal body temperature.

63. Which among the following is not function of testes at puberty? [\[NCERT Exemplar\]](#)

- (i) Formation of germ cells
- (ii) Secretion of testosterone
- (iii) Development of placenta
- (iv) Secretion of estrogen

- (a) (i) and (ii)
- (b) (ii) and (iii)
- (c) (iii) and (iv)
- (d) (i) and (iv)

Ans. (c) (iii) and (iv)

Explanation :

Development of placenta and secretion of estrogen are related to female reproductive system, hence are not the function of testes at puberty.

64. The correct sequence of organs in the male reproductive system for transport of sperms is

[\[NCERT Exemplar\]](#)

- (a) testis → vas deferens → urethra
- (b) testis → ureter → urethra
- (c) testis → urethra → ureter
- (d) testis → vas deferens → ureter

Ans. (a) testis → vas deferens → urethra

Explanation :

Sperms formed in testis are delivered through the vas deferens which joins with another tube called urethra coming from the urinary bladder.

65. During adolescence several changes occur in the human body. Mark one change associated with sexual maturity in boys.

[NCERT & NCERT Exemplar]

- (a) Loss of milk teeth
- (b) Increase in height
- (c) Weight gain
- (d) Cracking of voice

Ans. (d) Cracking of voice

Explanation :

Cracking of voice is associated with sexual maturity in boys which occurs during adolescence. Loss of milk teeth, height gain, and weight gain are all part of the natural growing process for both boys and girls as they become older.

66. Which of the following is not a part of the female reproductive system in human beings? [NCERT]

- (a) Ovary
- (b) Uterus
- (c) Vas deferens
- (d) Fallopian tube

Ans. (c) Vas deferens

Explanation :

The ovaries, fallopian tubes, uterus, vagina, and external genitals make up the female reproductive system. Vas deferens is a male reproductive organ that connects the epididymis to the urethra and transports sperm from the testis to the urethra.

67. Which of the following sterilisation methods is permanent?

- (a) Vasectomy
- (b) Tubal Sterilisation
- (c) IUD
- (d) Both (a) and (b)

Ans. (d) Both (a) and (b)

Explanation :

Female sterilisation via tubal ligation, commonly known as “tied tubes,” transcervical sterilisation, and male sterilisation or vasectomy are the three types of permanent birth control.

68. Which of the following sexually transmitted diseases is caused by a virus?

- (a) Syphilis
- (b) Chlamydia
- (c) Hepatitis B
- (d) Cholera

Ans. (c) Hepatitis B

Explanation :

Infected blood, semen, and vaginal secretions contain the hepatitis B virus. It is a Sexually Transmitted Infection (STI) that spreads

through unprotected sexual contact and also by contaminated needles and syringes.

69. Which among the following diseases is not sexually transmitted ? [NCERT Exemplar]

- (a) HIV-AIDS
- (b) Hepatitis
- (c) Syphilis
- (d) Gonorrhoea

Ans. (b) Hepatitis

Explanation :

Hepatitis is a virus-induced inflammation of the liver that spreads through the person's body fluids, blood, and other bodily fluids. Syphilis and Gonorrhea are sexually transmitted bacterial diseases. AIDS is a sexually transmitted viral disease caused by HIV.

70. Offspring formed as a result of sexual reproduction exhibit more variations because:

[NCERT Exemplar]

- (a) sexual reproduction is a lengthy process.
- (b) genetic material comes from two parents of the same species.
- (c) genetic material comes from two parents of different species.
- (d) genetic material comes from many parents.

Ans. (b) genetic material comes from two parents of the same species.

Explanation :

Sexual reproduction is a process in which two individuals of the

same species collaborate to produce two distinct gametes, one male and one female. The fusion of gametes results in the mixing of genetic material, resulting in the formation of a diploid cell with new combinations.

Assertion and Reasoning Based Questions

Directions : In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as :

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.
- (c) Assertion is true but Reason is false.
- (d) Assertion is false but Reason is true.

71. Assertion: XX chromosome give rise to female child whereas XY give rise to male child.

Reason: The Y chromosome in males is smaller than X chromosome.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

Smaller Y chromosome, does not decide the gender of the child. Its presence is important not the size. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

72. Assertion: Male is responsible for the sex determination in humans.

Reason: It has similar kind of chromosomes XX.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Male is responsible for the sex determination in humans because it has different kinds of chromosomes namely XY. A child which inherits X chromosome from his father will be a girl and the one who inherits Y chromosome will be a boy. Thus, assertion is true but reason is false.

73. Assertion: Plants raised by vegetative propagation can bear flower and seed earlier than those produced from seeds.

Reason: Plants which have lost the capacity to bear viable seeds, can propagate through vegetative propagation.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

The plant which are unable to produce seed reproduce by the means of vegetative propagation. This process is a type of asexual reproduction which is much faster than sexual reproduction. Thus, both assertion and reason are correct but reason is not the correct explanation of assertion.

74. Assertion: Meiosis takes place only in gametes.

Reason: To restore the total number of chromosomes in offspring.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Both the sperm and ovum have 23 pairs of chromosomes, so when the zygote is formed after their fusion it forms 46 chromosomes in the zygote, and hence the number of chromosome is restored in the offspring. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

75. Assertion: Non flowering plants cannot reproduce sexually.

Reason: Flower is only reproductive part of the plant that can produce gametes.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Gametes are mandatory for sexual reproduction. Though plants can reproduce through other parts like stem and roots (vegetative reproduction), but they cannot reproduce sexually in absence of flowers. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

76. Assertion: The flower of papaya is called unisexual flower.

Reason: The flower contains stamens only as a sex organ.

Ans. (c) Assertion is true but reason is false.

Explanation :

Unisexual flowers are those which can have either stamen or carpels as sex organ. It is not true that it has only stamen in it. It can have only carpel also, so either of these will describe a unisexual flower. Thus, assertion is true but reason is false.

77. Assertion: Pollen grains reach directly to the egg, which is seated deep in the ovarian cavity.

Reason: To effect fertilisation, the pollen grains germinate on the stigma.

Ans. (d) Assertion is false but reason is true.

Explanation :

In angiosperms the female gametophyte is seated deep in the ovarian cavity, quite away from the stigma. In seed plants, the male

gametes are brought to the egg containing female gametophyte by a pollen tube. A pollen grain does not pass down the stigma. Only its pollen tube does so. Thus, assertion is false but reason is true.

78. Assertion: High chances of fertilisation is during the mid of the menstrual cycle.

Reason: Sperms are very active during that time.

Ans. (c) Assertion is true but reason is false.

Explanation :

Ovulation takes place on the 14th day of the menstrual cycle, so if the sperm happens to meet the ovum during that phase fertilisation will take place. Thus, assertion is true but reason is false.

79. Assertion: In male reproductive system, transport of sperm takes place in a fluid which also provide nutrition.

Reason: Prostate glands and seminal vesicles secrete their secretions

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Semen (seminal fluid) contains the sperm cells as well as the seminal plasma. The seminal plasma is the secretion from the tubules of the seminal tract (seminal vesicles, etc) and from the seminiferous tubules in the testicles. It nourishes the sperm cells from ejaculation up to fertilisation. The vas deferens joins the ends of the seminal vesicles to form the ejaculatory ducts. Thus, both assertion and reason are true and reason is the correct explanation of assertion.

80. Assertion: The testes descend into the scrotum just before birth.

Reason: Human males have 2 testes in the body.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

Human males have 2 testes and the testes descend into the scrotum just before the birth for the movement of the foetus in the canal. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

81. Assertion: Lumen of fallopian tube is lined by ciliated epithelium.

Reason: Ciliated epithelium helps in moving the zygote towards the uterus for implantation.

Ans. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

Explanation :

Lumen of Fallopian tube is lined by ciliated epithelium as Cilia have a rhythmic waving and beating motion that helps substances to travel from one place to another. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

82. Assertion: Placenta is connected to the embryo through an umbilical cord which helps in the transport of substances to and from the embryo.

Reason: Placenta acts as an endocrine tissue.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

Placenta performs both the given functions. But they are not related to each other. Being an endocrine tissue it releases hormones like progesterone, estrogen and others, but does not help in transport of

materials to and from the embryo. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

83. Assertion: Ovary releases one egg every month.

Reason: The lining of uterus is always thick and spongy.

Ans. (c) Assertion is true but reason is false.

Explanation :

The thick and spongy lining of the uterus, the endometrium, is developed during each menstrual cycle after ovulation. The endometrium serves as an anchorage for the developing foetus. Thus, assertion is true but reason is false.

84. Assertion: Copper-T can be used as a contraceptive method.

Reason: It prevents from sexually transmitted disease.

Ans. (c) Assertion is true but reason is false.

Explanation :

Copper-T is a contraceptive method, which is inserted inside the uterus, it prevents implantation. It does not prevent sexually transmitted disease. Thus, assertion is true but reason is false.

85. Assertion: HIV/AIDS is a viral disease.

Reason: HIV infection is spread by sexual contact with an infected person.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

HIV infection is caused by the human immunodeficiency virus. One can get HIV from contact with infected blood, semen, or vaginal fluids. Most people get the virus by having unprotected sex with someone who has HIV. Another common way of getting it is by

sharing drug needles with someone who is infected with HIV. Thus both assertion and reason are correct but reason is not the correct explanation of assertion.

Case Based Questions

86. Read the passage given below and answer the following questions from (i) to (v).

Reproduction is a biological process by which new individual organisms are produced. Reproduction is a fundamental feature of all life forms; each individual exists due to the process of reproduction. Reproduction is the mechanism of species continuation. Mechanism and process of reproduction varies for different species in this world.

(i) Which of the following statement is not true about reproduction?

(a) Organisms create exact copies of themselves.

(b) Creation of a DNA copy is a basic event in reproduction.

(c) Simply breaking up into smaller pieces upon maturation is also a method of reproduction.

(d) Cell division in unicellular organisms is the method of reproduction.

Ans. (a) Organisms create exact copies of themselves.

(ii) The ability of cell to divide into several cells during reproduction in plasmodium is called _____ .

(a) budding

(b) reproductive division

(c) multiple fission

(d) binary fission

Ans. (c) multiple fission

(iii) Vegetative propagation is a type of:

(a) farming

(b) reproduction

(c) cooking

(d) movement control

Ans. (b) reproduction

(iv) Organisms in which reproduction is a function of a specific cell type are:

(a) multicellular organisms

(b) amoeba

(c) unicellular organisms

(d) bacteria

Ans. (a) multicellular organisms

(v) Which one of the following is not a method of reproduction?

(a) Regeneration

(b) Budding

(c) Spore formation

(d) Vegetation

Ans. (d) Vegetation

87. Read the passage given below and answer the following questions from (i) to (v).

Asexual reproduction, in which offspring arise from a single organism, occurs in a variety of prokaryotes and eukaryotes including plants, fungi, and animals. It may have some advantages over the sexual reproduction, in which individuals of two genders, females and males, must be involved but only females can give birth to new individuals. There are several different methods of asexual reproduction. Asexual reproduction can be very rapid. This is an advantage for many organisms. It allows them to crowd out other organisms that reproduce more slowly.

(i) Budding is a mode of asexual reproduction in:

- (a) amoeba
- (b) plasmodium
- (c) yeast
- (d) leishmania

Ans. (c) yeast

(ii) The specific reproductive part in Rhizopus responsible for reproduction is:

- (a) sporadic
- (b) stick
- (c) hyphae
- (d) sporangia

Ans. (d) sporangia

(iii) Buds produced in the notches along the leaf margin of

Bryophyllum fall on the soil and develop into new plants. This is an example of:

- (a) vegetation
- (b) vegetative propagation
- (c) sexual reproduction
- (d) clone formation

Ans. (b) vegetative propagation

(iv) *Hydra* and *Planaria* can be cut into any number of pieces and each piece grows into a complete organism. This is known as:

- (a) regeneration
- (b) budding
- (c) fragmentation
- (d) speciation

Ans. (a) regeneration

(v) In amoeba the splitting of the two cells during division can take place in _____ plane.

- (a) single
- (b) perpendicular
- (c) directional
- (d) any

Ans. (d) any

88. Read the passage given below and answer the following

questions from (i) to (v).

Sexual reproduction is the most common method of reproduction in animals and plants. One male and one female parent are involved in the process of sexual reproduction. Sexual reproduction involves fusion of two types of reproductive cells known as gametes to form a single cell called zygote. The zygote multiplies repeatedly and undergoes specific changes to form a new individual.

(i) What is the source of variations in populations of organisms?

- (a) DNA copying is error free
- (b) DNA copying is not error free
- (c) Protein formation
- (d) Involvement of only one parent

Ans. (b) DNA copying is not error free.

(ii) The reproductive parts of angiosperms are located in the:

- (a) fruit
- (b) flower
- (c) pistil
- (d) stigma

Ans. (b) flower

(iii) _____ is the male reproductive part in a plant and it produces pollen grains that are yellowish in colour.

- (a) Stamen
- (b) Pistil

(c) Carpel

(d) Petal

Ans. (a) Stamen

(iv) In plants, after fertilisation, the zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is converted gradually into a:

(a) bud

(b) seed

(c) fruit

(d) plant

Ans. (b) seed

(v) As the rate of general body growth begins to slow down, reproductive tissues begin to mature. This period during adolescence is known as:

(a) puberty

(b) adulthood

(c) germination

(d) reproduction

Ans. (a) puberty

89. Read the passage given below and answer the following questions from (i) to (v).

Sexual reproduction is a method to give rise to one's progeny. In higher animals, male and female gametes are produced by different

individuals to carry out sexual reproduction. Such individuals are said to be unisexual. However, in some animals like flatworm, earthworm, leech, and hydra both male and female gametes are produced by the same individual. Such organisms are said to be hermaphrodites or bisexual. Male and female gametes fertilise to form a zygote that has traits of characters from both the parents.

(i) Where does fertilisation occur in human females?

- (a) Cervix
- (b) Vagina
- (c) Uterus
- (d) Oviduct

Ans. (d) Oviduct

(ii) The offspring formed by sexual reproduction exhibit more variations because _____.

- (a) sexual reproduction is a lengthy process
- (b) genetic material comes from two parents of same species
- (c) genetic material comes from two parents of different species
- (d) genetic material comes only from one parent

Ans. (b) genetic material comes from two parents of same species.

(iii) Why are pollens spiny?

- (a) Help in Fertilisation
- (b) For easy pollination
- (c) To attach to bodies of insects

(d) Appearance

Ans. (c) To attach to bodies of insects

(iv) What is the principle of natural contraceptive methods?

(a) Avoiding sperm and ovum to meet

(b) Avoiding release of egg

(c) Avoiding release of sperm

(d) Abortion when pregnant

Ans. (a) Avoiding sperm and ovum to meet

(v) The number of chromosomes present in parents and offspring of a particular species remains constant due to _____.

(a) doubling of chromosomes during zygote formation

(b) halving of chromosomes during gamete formation

(c) doubling of chromosomes after gamete formation

(d) halving of chromosomes after gamete formation

Ans. (b) halving of chromosomes during gamete formation

90. The below given picture shows a few methods of contraception and avoiding sexually transmitted diseases in humans. See the picture carefully and answer the following questions from (i) to (v).



(i) Which one out of the below given terms is STD?

- (a) Kala azar
- (b) Jaundice
- (c) Pyorrhea
- (d) Syphilis

Ans. (d) syphilis

(ii) IUCD is used for:

- (a) Vegetative propagation
- (b) Preventing miscarriage
- (c) Contraception
- (d) In vitro fertilisation

Ans. (c) contraception

(iii) Use of condom for contraception is a:

- (a) mechanical method
- (b) surgical method
- (c) hormonal method
- (d) chemical method

Ans. (a) mechanical method

(iv) The best way to avoid Sexually Transmitted Diseases is by use of:

- (a) a condom

- (b) medicine
- (c) chemical
- (d) IV injection

Ans. (a) a condom

(v) Which one of the following statements is not true?

- (a) Prenatal sex determination has been prohibited by law in India.
- (b) Illegal sex-selective abortion of female foetus in India is the prime reason for unbalanced male to female sex ratio.
- (c) Contraceptive pills change hormonal balance in a female body.
- (d) Mechanical barriers for contraception is available only for males.

Ans. (d) Mechanical barriers for contraception is available only for males.

Reasoning Based Questions

91. Why is vegetative propagation practiced for growing some types of plants? [NCERT]

Ans. Vegetative propagation is practiced for growing some types of plants because:

1. The plants which cannot produce seeds or produce non-viable seeds also can be easily propagated by this method.
2. It is a very easy, quick and cheapest method of propagation.
3. Seedless plants can be produced by vegetative propagation.
4. Flowers and fruits are produced in very short time.
5. Parental features are preserved.

92. Explain why fertilisation is possible if mating takes place during the middle of menstrual cycle?

Ans. Mostly in an healthy woman ovulation occurs on 14th day of 28 days menstrual cycle which is the middle day of the cycle hence if mating occurs in the middle of cycle there is maximum chance of fertilisation.

93. Why does menstruation occur in human females?

[NCERT]

Ans. Menstruation occurs in human females when egg is not fertilised. Every month the ovary releases an egg and uterus prepares itself to receive the embryo. The wall of uterus gets thickened and they are richly supplied with blood which provides nutrition to the growing embryo from mother. If egg is not fertilised then there is no need of rich supply of blood and thick lining of uterine wall and egg also disintegrates thus egg along with blood and mucus comes out through vagina in the form of menstrual flow.

Very Short Answer Type Questions

94. Name the life process of an organism that helps in the growth of its population. [Board Question]

Ans. Reproduction.

95. Where is DNA found in cell?

Ans. DNA is found inside the nucleus in a cell.

96. What is termed as the blue print of life and why?

Ans. DNA is termed as the blue print of life because it carries all the information for the organisms to grow, survive and reproduce. Proteins which are the structural and functional unit of cells are synthesised according to the information stored in DNA.

97. Can you consider cell division as a type of reproduction in unicellular organisms? Justify.

Ans. Yes, cell division can be considered as a type of reproduction in unicellular organisms because through cell division two or more daughter cells are produced from a parent cell.

98. Is the chromosome number of zygote, embryonal cells and adult of a particular organism always constant? How is the constancy maintained in these three stages?

Ans. Yes, the chromosome number of zygote, embryonal cells and adult of a particular organism is always constant. This is because zygote is diploid and it undergoes mitotic divisions to form embryonal cells and finally adult and during the process of mitosis the chromosome number remains constant.

99. What is a clone? Why do offsprings formed by asexual reproduction exhibit remarkable similarity?

Ans. Clone is an exact replica of an organism produced as a result of asexual reproduction. Since all the offsprings formed by asexual reproduction have exact copies of DNA of their parent so they exhibit remarkable similarity.

100. What is the effect of DNA copying which is not perfectly accurate in the reproduction process?

Ans. If DNA copying is not perfectly accurate in the reproduction process it would lead to variations in the populations which may prove a better survival option to the species.

101. Name the types of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost. Write the first step from where such a type of reproduction begins.

Ans. Binary fission is a type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost. The reproduction starts from Karyokinesis i.e., division of nucleus.

102. Name the causative agent of the disease kala-azar and its mode of asexual reproduction.

Ans. Leishmania causes kala-azar and its mode of asexual reproduction is binary fission.

103. Name the method by which spirogyra reproduces under favourable conditions. Is this method sexual or asexual?

Ans. Spirogyra reproduces under favourable conditions by fragmentation which is an asexual mode of reproduction.

104. An organism which is a worm has very simple eyes, that are really eye spots which detect light. Name the organism.

Ans. Planaria.

105. Name the method by which Hydra reproduces? Is this method sexual or asexual?

Ans. Hydra can reproduce by budding and regeneration. Both are asexual methods of reproduction.

106. How does Planaria reproduce? Is this method sexual or asexual? [\[Board Question\]](#)

Ans. Planaria reproduces by regeneration process. This method is an asexual mode of reproduction. In this process, if Planaria is cut into many pieces each piece grows into a new Planaria.

107. Name a tiny fresh water animal which reproduces by the same method as that of yeast ? What is this method known as ?

Ans. Hydra is a tiny fresh water animal which reproduces by the same method as that of yeast and this method is known as budding.

108. Name the method by which Hydra reproduces ? Is this method sexual or asexual ?

Ans. Hydra can reproduce by budding and regeneration. Both are asexual methods.

109. Name the plant that reproduces vegetatively by leaf?

Ans. Bryophyllum reproduces vegetatively by leaf.

110. State the method of growing rose plant and jasmine plant ?

Ans. Vegetative propagation like cutting is used to grow rose plant and layering method is used to grow jasmine plant.

111. Explain the vegetative reproduction in Bryophyllum.

Ans. Bryophyllum has a special case of vegetative propagation. The buds are generated from the margins of the leaves. These buds grow up to be new saplings on the leaf itself and fall off to the ground to be rooted and matured. These buds are formed from mitosis of meristematic type tissues in the phylloclade of the plant. They are called epiphyllous buds since they are present on top of the leaves. Buds in Bryophyllum are known as epiphyllous buds.

112. What is the end product of double fertilisation?

Ans. In double fertilisation one of the male gametes fuse with egg cell to form a zygote whereas the other male gamete fuses with two polar nuclei to form primary endosperm that provides nourishment to the growing embryo.

113. What are those organisms called which bear both the sex organs in the same individual? Give one example of such organism.

Ans. Organisms having both the sex organs in the same individual are called Hermaphrodite. E.g., Earthworm.

114. Name the agents which bring about cross pollination.

Ans. Insects, wind, water, animals etc., are the agents which bring about cross pollination.

115. How many gametes are produced after germination of angiospermous pollen grains over the stigma of carpel ?

Ans. Two male gametes are produced after germination of angiospermous pollen grains over the stigma of carpel.

116. Explain the roles of gamete and zygote in sexual reproduction?

Ans. Gametes play an important role in sexual reproduction because fusion of male and female gametes lead to formation of a zygote. Zygote formed as a result of fertilisation develops into embryo and finally into a new individual.

117. What would be the ratio of chromosome number between an egg and its zygote? How is the sperm genetically different from the egg?

Ans. The ratio of chromosome number between an egg and its zygote is 1 : 2. Sperms are of two types 50% of sperms have X chromosome and rest 50% Y chromosomes. But eggs have only one type of chromosome i.e., X chromosome.

118. In a bisexual flower inspite of the young stamens being removed artificially the flower produces fruit. Provide a suitable explanation for the above situation.

Ans. Though the stamens are removed but pistils are present so cross pollination might have taken place which leads to fertilisation and finally to the formation of fruits.

119. Where is the zygote located in the flower after fertilisation?

Ans. Zygote is located inside the ovule which is present in the ovary part of the pistil.

120. Name a unisexual and a bisexual flower.

Ans. Watermelon is an unisexual flower whereas Hibiscus is a bisexual flower.

121. List two functions of ovary of human female reproductive system ?

Ans. Ovaries produce the ova or eggs and they produce hormones like oestrogen and progesterone. Oestrogen helps in development of secondary sexual characters in females at the time of puberty whereas progesterone prepares the uterus for receiving the fertilised egg.

122. List two functions performed by testes in human beings.

Ans. In human testes, sperms are produced by the process of spermatogenesis and interstitial cells present in testes produce the male hormone testosterone.

123. What is the significance of testes being located in scrotal sacs outside abdomen?

Ans. The formation of sperms requires a temperature of 2°C – 3°C lower than the body temperature. So testes are located in a sac like structures called scrotum outside the abdomen.

124. Name the largest cell present in the human body.

Ans. Ovum is the largest cell present in the, human body.

125. If a woman is using copper-T, will it help her in protecting from Sexually Transmitted Diseases?

Ans. No, copper-T will not help her in protecting from Sexually Transmitted Diseases. It only prevents the implantation of embryo inside uterus.

126. How does the chemical method help in preventing pregnancy?

Ans. Chemical methods prevent the ovaries from releasing the egg hence no fertilisation can occur thus preventing pregnancy.

127. Expand: (i) IUCD (ii) STDs.

Ans. (i) IUCD: Intra Uterine Contraceptive Devices.

(ii) STDs: Sexually Transmitted Diseases.

128. What are the benefits of using mechanical barriers during sexual act?

Ans. Mechanical barriers like condoms prevent unwanted pregnancies and transmission of Sexually Transmitted Diseases like AIDS, syphilis etc.

Short Answer Type Questions

129. Why is variation beneficial to the species but not necessary for the individual? [NCERT]

Ans. Due to recombination and crossing over in meiosis process during formation of gametes as well as during sexual reproduction the mixing up of male with female gametes produce some variations in the offsprings. These variations are necessary for survival of a particular species to the changing environment. If there would be no variations then there will be less chance of a particular species to get adapted to the changed environment and with course of time that particular species may extinct. Variations also lead to evolution of the species. Thus it is said that variation is beneficial to the species but not necessary for the individual.

130. How are the methods of reproduction different in unicellular and multicellular organisms?

[NCERT]

Ans. An unicellular organism has a single cell so there is no specific organ system for reproduction. They divide by the process of cell division. The different modes of reproduction in unicellular organism are binary fission, multiple fission, budding etc. But in multicellular organism there are specific tissues and organ system to carry out this process. There is formation of male and female gametes. It is a very complex process and normally takes more time as compared to unicellular organisms.

131. What is the importance of DNA copying in reproduction?

[NCERT]

Ans. DNA copying is necessary as parents transmit their characters to offsprings through DNA. Due to this, the offsprings resemble in some of the features with their parents. But DNA copying also produces some variations in the offsprings that helps them to adapt to the changing environment.

132. How does reproduction helps in providing stability to population of species? [NCERT]

Ans. There is a natural cycle of born and death, through reproduction the lost species can be replenished. Stability of a particular species is maintained by equalising birth and death ratios which is possible through reproduction. It ensures the survival of a particular species which might extinct if there is no reproduction process.

133. When a cell reproduces what happens to its DNA?[Board Question]

Ans. During the process of reproduction DNA is transmitted from parents to offspring. But DNA is replicated before reproduction *i.e.*, two copies of DNA are produced. During the time of cell division the two copies of DNA are equally distributed between the two daughter cells. Each daughter cell receives same type and amount of DNA from parent cell. Thus, the consistency in type and amount of DNA is maintained in the particular species of a living organism.

134. Newly formed DNA copies may not be identical at times. Give one reason.[Board Question]

Ans. During the time of DNA replication most of the base sequence in daughter cells is identical to the parent DNA but sometimes due to mutations or some errors during replication some changes in the newly formed DNA copies may occur. So, it is said that newly formed DNA copies may not be identical at times.

135. List the two types of reproduction. Which one of the two is responsible for bringing in more variations in its progeny and how?

[Board Question]

Ans. There are two types of reproduction- sexual and asexual. Sexual reproduction is responsible for bringing in more variations in its progeny as it involves fusion of male and female gametes from two different organisms which leads to more diversity of characters in offsprings. Gametes are formed by meiosis process which brings new combinations of genes due to crossing over and homologous recombination. Due to all these factors sexual reproduction is responsible for bringing in more variations in its progeny.

136. Write one main difference between asexual and sexual mode of reproduction. Which species is likely to have comparatively better chances of survival—the one reproducing asexually or the one reproducing sexually? Give reasons to justify your answer.

Ans. Asexual reproduction involves only one parent and the offsprings produced are clone and similar copies of their parents where as sexual reproduction involves two parents and the offsprings produced are different from their parents. Offsprings produced by sexual reproduction have better chances of survival.

Sexual reproduction leads to variation because it leads to the formation of offspring by the combination of DNA from both the parents, so the species will have better adaptability and better survival rate.

137. What are the advantages of sexual reproduction over asexual reproduction ?

Ans. The advantages of sexual reproduction over asexual reproduction are :

(i) Variations are produced due to sexual reproduction which helps in better survival of offsprings to the changing environment.

(ii) More diversity is seen in case of sexual reproduction as compared to asexual reproduction.

(iii) Due to recombination and crossing over in meiosis process during formation of gametes and as there is mixing of male and female gametes, genetic variations are seen which is the main cause of evolution.

138. How is the process of binary fission different in Amoeba and Leishmania?

Ans. In amoeba, the process of binary fission occurs in any plane but in Leishmania binary fission occurs in a definite orientation. Leishmania has a whip like structure at one end of the cell. The division occurs longitudinally in relation to this whip like structure.

139. Answer the following questions:

(i) Budding, fragmentation and regeneration, all are considered as asexual mode of reproduction. Why?

(ii) With the help of neat diagrams, explain the process of regeneration in Planaria.

Ans. (i) Budding, fragmentation and regeneration are considered as asexual mode of reproduction because only one parent is involved and no sex cells are involved.

(ii) Regeneration in planaria.

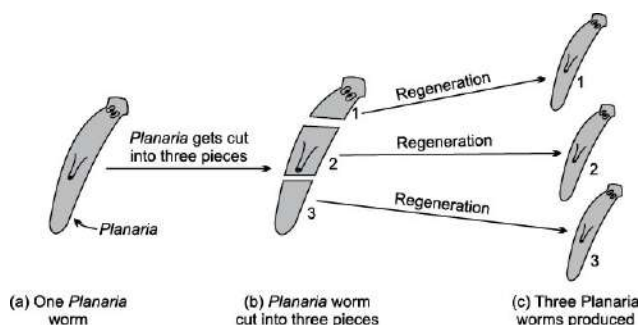


Fig. Regeneration in Planaria

The process of getting back a full organism from its body parts is called regeneration. Planaria reproduces by this method in which if the body of Planaria somehow gets cut into a number of pieces, then each body piece can regenerate into a complete Planaria by growing all the missing parts.

140. How are spores produced in sporangia of Rhizopus?

Ans. Spores are thread-like structures that developed above the hyphae of the bread mould (Rhizopus). The tiny blob-on-a-stick structures known as sporangia contain cells, or spores, that can eventually develop into new Rhizopus individuals. In each sporangium, a nucleus divides a number of times generating a large number of nuclei.

Nuclei surrounded by a little cytoplasm are covered by thick walls that protect them until they come into contact with another moist surface and can begin to grow. The wall of sporangium breaks to release the spores in air.

141. Why are budding, fragmentation and regeneration all considered as asexual types of reproduction?

Ans. A single parent is involved and gamete formation does not take place in reproduction through budding, fragmentation, and regeneration. Hence, all of these are considered as asexual types of reproduction.

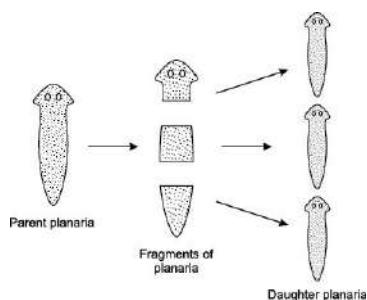
142. Can you think of reasons why more complex organisms

cannot give rise to new individuals through regeneration?
[NCERT]

Ans. Complex organisms have highly and well developed tissue and organ system to perform a particular function. There is division of labour in the body of complex organisms. Their body is highly complicated and the tissue and organ system are highly differentiated and are made up of different kinds of cells. So, it is very difficult for complex organisms to give rise to new individuals through regeneration, which is seen in simple organisms like Hydra, Planaria etc.

143. Answer the following:

(i) With the help of a diagram demonstrate the process of regeneration as seen in Planaria?



(ii) Which type of cells are used by such multicellular organisms to regenerate?

Ans. (i) Regeneration is the process by which an organism has an ability to regenerate its lost parts of the body which might have been removed by injury or by some other methods. When Planaria is cut into many pieces, each piece grows into a complete organism. Regeneration is carried out by specialised cells which have the capacity to develop, proliferate and differentiate into various cell types and tissues.

(ii) A single pluripotent adult stem cell type (neoblasts) is used by such multicellular organisms to regenerate.

144. What happens when:

- (i) Planaria gets cut into two pieces.
- (ii) A mature Spirogyra filament attains considerable length.
- (iii) On maturation sporangia burst.

Ans. (i) When planaria gets cut into two pieces each piece regenerates into a new Planaria.

(ii) When a mature Spirogyra filament attains considerable length it breaks into two or more fragments and each fragment grows into a new individual.

(iii) On maturation when sporangia burst, spores are liberated and they are dispersed.

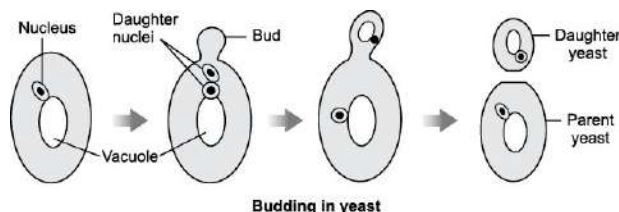
On getting a suitable substratum and under favourable conditions each spore germinates into new mycelium.

145. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope. [Board Question]

- (i) Which adjustment screw were you asked to move to focus the slides?
- (ii) Draw diagrams in correct sequence to show budding in yeast.

Ans. (i) Fine adjustment screws were moved to focus the slides.

(ii)



146. Fallen leaves of Bryophyllum on the ground produce new plants whereas the leaves of rose do not. Explain this difference between the two plants?

Ans. In Bryophyllum new plants develop from the adventitious buds on their leaves through vegetative propagation but buds do not develop from the leaves of rose plants hence new plants cannot grow from the fallen leaves of rose plant.

147. What are the advantages of vegetative propagation?

Ans. Some advantages of vegetative propagation are:

1. It is cheaper, easier and rapid method.
2. The plants which cannot produce seeds also can be easily propagated by this method.
3. The plants produced by this method bear fruits and flowers earlier.
4. It produces new individuals with exactly identical qualities as the parent, which preserves the parental characteristics.

148. Mohan was watching his mother cutting some potatoes into small pieces, each with one or two buds. These buds have started sprouting. She planted them in kitchen garden and started watering them daily. Mohan asked his mother why she planted them as they have no seeds.

- (i) What is this method of propagation called?
- (ii) Which part of plant is used in this case?
- (iii) Is it sexual or asexual mode of reproduction?

Ans. (i) It is called vegetative propagation.

(ii) The stem tuber is used.

(iii) It is asexual mode of reproduction as there is no involvement of gametes and it involves only single parent.

149. How will an organism be benefited if it reproduces through spores? [NCERT]

Ans. An organism can be benefited if it reproduces through spores

by following ways:

1. Spores are covered with thick walls which protect them from adverse environmental conditions like drought, high temperature etc. So, they can survive even in these adverse conditions.
2. They are very light, small and can be easily dispersed through wind, water, animals and on getting favourable conditions they germinate and give rise to new individuals.
3. This mode of reproduction is simple and faster.
4. Large number of spores are produced at one time within a sporangium.

150. Answer the following:

- (i) Name the structures where spores are formed? Give the terms used for non-flagellated, non-motile spores and flagellated, motile spores?
- (ii) Give one example of plant where modified tuberous roots can be propagated vegetatively when planted in soil?

Ans. (i) Spores are formed in sporangia. Non-flagellated, non-motile spores are called aplanospores and flagellated, motile spores are called zoospores.

(ii) Sweet potato is an example of plant where modified tuberous roots can be propagated vegetatively when planted in soil.

151. State the basic requirements for sexual reproduction? Write the importance of such reproduction in nature? [Board Question]

Ans. The basic requirements for sexual reproduction are involvement of a father and mother, parents which will contribute the male and female gametes respectively. The gametes are haploid which are produced through meiosis which on fusion produce a zygote and normal diploid number of chromosome is restored in

offsprings.

Importance of sexual reproduction:

1. It involves variations in species.
2. Two individuals are required one male and another female.
3. Specialised cells called sex cells are involved in this type of reproduction.
4. It promotes diversity of characters in offsprings.
5. It results in recombination of genes thus increases the chances of genetic variations.
6. It plays an important role in the origin of new species.

152. List six specific characteristics of sexual reproduction.

Ans. Characteristics of sexual reproduction are:

1. In sexual reproduction, two parents are involved (male and female).
2. The new organism produced is genetically different from both parents.
3. During gamete formation meiosis occurs. After fertilisation all divisions are mitotic.
4. Sexual reproduction helps in evolution.
5. Fertilisation of gametes leads to zygote formation. This zygote grows and develops to form a new organism.
6. Humans, fish, dogs, hens, cats, cows, horses, deer, rabbit; lions and tigers all reproduce by the method of sexual reproduction. Most of the flowering plants also reproduce by sexual reproduction.

153. Distinguish between pollination and fertilisation. Mention the site and the product of fertilisation in a flower.

Ans. 1. The transfer of pollen grains from anther of a stamen to the stigma of a carpel is called pollination whereas fertilisation is the process when the male gamete present in pollen grain joins the female gamete present in ovule.

2. Pollination is an external mechanism whereas fertilisation is an internal mechanism which takes place inside the flower.

3. Site of fertilisation in flower is ovary. Product of fertilisation in flower is Zygote.

154. What is carpel? Write the function of its various parts.
[Board Question]

Ans. The flask-shaped organ in the centre of a flower is called carpel. It is also called as female reproductive organ of the plant.

It is made up of three parts:

1. Stigma
2. Style
3. Ovary

1. Stigma is the top part of carpel and is sticky. So, it receives the pollen from the anther of stamen.

2. Style connects stigma to ovary.

3. Ovary contains female gametes of the plant and helps in reproduction.

155. What are stamen and carpel in a flower ? What is the name of yellow powdery substance present in the anther of a flower ?

Ans. Stamen is the male reproductive part of a flower whereas carpel is a female reproductive part of a flower. The yellow powdery substance present in the anther of a flower is known as pollen grains.

156. Name the two reproductive parts of a bisexual flower which

contain the germ cells. State the location and function of its female reproductive part.

Ans. Stamen and carpel are the two reproductive parts of a bisexual flower which contain the germ cells. Carpel- the female reproductive part is located at the centre of a flower. Carpel has three parts, the tip part is stigma which is sticky and receives the pollen grains, style is long and middle part through which pollen tube from pollen grains travel to reach ovary. Ovary is the swollen, bottom part of carpel which contains the female gametes where fertilisation takes place.

157. Name the following parts:

- (i) The organ where foetus develop during gestation period.
- (ii) A funnel like structure near the posterior end of ovary.
- (iii) Technical term given to the stalk of the flower.
- (iv) Three parts of carpel.

Ans. (i) Uterus

(ii) Fallopian tube

(iii) Pedicel

(iv) Stigma, style, ovary

158. Answer the following questions:

- (i) What happens to the ovule and ovary after fertilisation?
- (ii) Which group of plants show double fertilisation?

Ans. (i) After fertilisation ovule develops into seeds and ovary into fruit.

(ii) Mostly angiosperms show double fertilisation.

159. Answer the following questions:

- (i) Write the names of those parts of a flower which serve the same

functions as the following do in the animals.

(a) Testis, (b) Sperm, (c) Ovary, (d) Egg

(ii) State the function of flowers in the flowering plants?

Ans. (i) (a) Testis – Anther; (b) Sperm – Pollen grains; (c) Ovary – Ovary; (d) Egg – Ovum

(ii) Flowers are the main organs of sexual reproduction. They contain the reproductive organs.

160. What is the role of seminal vesicles and prostate glands?
[NCERT]

Ans. Seminal vesicles and prostate glands are accessory reproductive organs. The secretion from seminal vesicles provides nourishment and motility to the sperms. Prostate glands secretion neutralises the acidic pH of vagina so that sperms can easily pass through vagina.

161. Answer the following questions:

(i) Trace the path of the sperms from where they are produced in the human body to the exterior?

(ii) Write the functions of seminal vesicles and prostate glands in human male reproductive system?

Ans. (i) Seminiferous tubules → Epididymis → Sperm duct → Urethra

(ii) Seminal vesicles secretion serves as a medium for transportation of sperms and also they activate and nourish the sperms. The secretion of prostate gland makes the medium alkaline and neutralises the acidic medium of female vagina.

162. Answer the following questions:

(i) Name the organ that produces sperms as well as secretes a hormone in human males. Name the hormone it secretes and write

its functions.

(ii) Name the parts of the human female reproductive system where fertilisation occurs.

(iii) Explain how the developing embryo gets nourishment inside the mother's body?

[Board Question]

Ans. (i) Testes produce sperms as well as secrete a hormone in human males. The hormone secreted by testes is testosterone and its functions are:

1. It stimulates sperm production.
2. It stimulates development of secondary sexual characters in males.
3. It involves the development, maturation and functioning of male accessory sex organs.

(ii) Fallopian tubes are the site of fertilisation in the human female reproductive system.

(iii) A specialised tissue called placenta connects developing foetus with uterine wall of mother that provides nutrients from mother to child. Placenta is formed by interlocking of finger like projections called villi which provide a large surface area for diffusion of nutrients like glucose and respiratory gases like oxygen from mother. Carbon dioxide gas and metabolic wastes released by foetus are removed by placenta.

163. Name the hormones responsible for puberty.

Ans. Puberty is the stage in life when a child's body develops into an adult's body. The changes take place gradually, usually between the ages of 10 and 16.

Changes occur at puberty because of hormones are:

1. Testosterone is produced by the testes and it controls the development of male secondary sexual characteristics.
2. Oestrogen is produced by the ovaries and it controls the development of female secondary sexual characteristics.

164. How does the embryo get nourishment inside the mother's body? [NCERT]

Ans. The embryo gets nourishment inside the mother's body through a disc shaped structure called placenta. It connects embryo with mother's blood. It supplies nutrients, oxygen to the growing embryo and removes carbon dioxide, wastes from embryo. Through this structure the blood of embryo comes in close contact with mother's blood and by diffusion process exchange of nutrients occurs. The placenta is formed by interlocking of two sets of villi, which provide maximum surface area for absorption of nutrients and oxygen gas.

165. What are the changes seen in girls at the time of puberty? [NCERT]

Ans. Changes seen in girls during puberty are:

1. Appearance of thick hair in genital parts and under arm pits.
2. Enlargement of breasts.
3. Darkening of skin surrounding the nipples.
4. Start of menstrual cycle.
5. Oily skin and pimples.

166. Why does menstruation occur?

Ans. When the egg is not fertilised and the uterus has not received a fertilised egg, the lining becomes thick. The thick and soft inner lining of the uterus along with the blood vessels and the dead egg comes out of the vagina in the form of blood. This cycle is known as menstruation.

167. Write the functions of each of the following parts in a human female reproductive system.

- (i) Ovary
- (ii) Uterus
- (iii) Fallopian tube

Write the structure and functions of placenta in a human female.

Ans. (i) Ovary: It produces female gametes and female sex hormones like estrogen, progesterone.

(ii) **Uterus:** It supports and nourishes the developing foetus. It expands according to the growth of the baby.

(iii) **Fallopian tube:** They are the site of fertilisation and carry eggs from ovary to uterus.

Placenta connects baby with mother's body. It is a disc like structure embedded in uterine wall. It is a special tissue formed by the interlocking of two sets of villi, one set given by wall of uterus and other set from embryo. It is the site of exchange of materials between the blood of mother and baby. It provides nutrients, oxygen from mother to foetus and removes excretory substances, carbon dioxide from foetus.

168. The embryo gets its nutrition from the mother's blood with the help of special tissue.

- (i) What is this special tissue called?
- (ii) Give any other function of this tissue apart from one mentioned above.
- (iii) Explain the structure of this special tissue.

Ans. (i) This special tissue is called placenta.

(ii) Besides providing nutrition to the embryo, placenta helps in removing waste products from embryo, it also helps in providing

oxygen to the embryo and eliminating carbon dioxide from embryo.

(iii) Placenta is a disc like structure which is attached to the wall of the uterus. It is formed by two sets of minute finger like projections called villi. One set from uterine wall and other set from the embryo. The blood flows through fine capillaries of the placenta.

169. List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country.

Ans. Significance of reproductive health in a society are:

1. It helps in controlling population growth.
2. It helps in preventing the transmission of Sexually Transmitted Diseases like syphilis, AIDS etc.
3. It helps in family planning.
4. It helps in knowing the suitable age for marriage and giving birth to child so that the mortality rates of mother and new born child can be reduced.

The two areas related to reproductive health which have improved over the past 50 years in our country are less mortality rate in new borns and mother.

170. What are different methods of contraception?

[NCERT]

Ans. The methods or devices used to prevent fertilisation and implantation are referred to as contraceptive methods. Some of the methods are:

- 1. Barrier methods:** Use of condoms in male and diaphragms in female prevents the entry of sperms into uterus.
- 2. Chemical methods:** Use of various hormonal pills prevents the release of egg from ovary. They cause a change in menstrual cycle

thus delaying ovulation.

3. IUCDs: Use of IUCDs devices like copper-T which is fitted inside uterus that prevents implantation of embryo into the wall of uterus.

4. Surgical methods: Tubectomy is done in female where a small portion of oviducts are removed and ligated to prevent the entry of egg from ovaries. Vasectomy is done in males where a small portion of vas deferens is cut and ligated preventing passage of sperms.

5. Natural methods: To avoid copulation around the time of ovulation.

171. What could be the reasons for adopting contraceptive method? [NCERT]

Ans. The reasons for adopting contraceptive method are:

1. Preventing unwanted pregnancies to control population growth.
2. It protects from Sexually Transmitted Diseases like AIDS, Syphilis etc.
3. Proper health of mother and child can be maintained by preventing frequent pregnancies.
4. Sufficient gap between the offsprings, which ensures the proper health of the mother and child.

172. Answer the following questions:

(i) List two sexually transmitted diseases in each of the following cases:

(a) Bacterial infections (b) Viral infections

(ii) How may the spread of such diseases be prevented?

Ans. (i) (a) Gonorrhoea and syphilis are bacterial infections.

(b) AIDS, warts are viral infections.

(ii) They can be prevented by avoiding sexual contact with the infected persons, using barriers like condoms, maintaining personal hygiene.

173. Rajeev, a sales executive in a MNC was not keeping well for a long time. He underwent a complete medical check-up and was diagnosed as HIV+. He was terminated on account of this condition.

(i) To which category of disease does AIDS belong to? Give its causative organism.

(ii) Do you think it was a right decision by the head of the company? Justify?

(iii) What concern should the society show towards HIV+ individuals?

Ans. (i) AIDS is a sexually transmitted disease. Its causative organism is HIV.

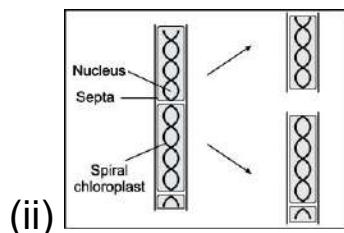
(ii) No, it was not a right decision by the head of the company because HIV is not spread by shaking hands, mixing with HIV infected individuals. Instead he should be given equal rights, justice and freedom so that he should feel happy and should not get depressed.

(iii) The society should show positive attitude towards HIV positive persons. They should be given proper care and treatment. Everybody should support them so that they can lead a healthy life without getting mental depression. We should not isolate them but we should provide proper education and create awareness among people about HIV and AIDS.

Long Answer Type Questions

174. Answer the following questions:

(i) Name the different types of asexual reproduction seen in living organisms. Give examples for each.



Identify the process occurring in the above figure. Briefly describe the process.

Ans. (i) The different types of asexual reproduction seen in living organisms are:

1. Fission: It is the process in which a unicellular organism splits into two or more daughter cells. They are mainly of two types- Binary fission which is seen in Amoeba, Leshmania, Paramecium and Multiple fission seen in Plasmodium.

2. Fragmentation: It is seen in Spirogyra.

3. Regeneration: It is seen in Hydra, Planaria.

4. Budding: It is seen in Yeast, Hydra.

5. Spore formation: Here reproduction occurs through formation of spores. Spores under favourable conditions give rise to new individuals. It is seen in Rhizopus, Mucor etc.

6. Vegetative propagation: It is mainly seen in plants.

(ii) The figure depicts fragmentation process in Spirogyra. In the process of fragmentation organism after maturation breaks into smaller fragments and each fragment grows into a new individual. This process is called fragmentation.

175. With the help of suitable diagrams explain the various steps of budding in Hydra.

Ans. Budding is a form of asexual reproduction and is the process of production of new individual from an outgrowth called bud formed on the parent body. Regenerative cells present in Hydra are used for

budding. Due to repeated mitotic divisions an outgrowth called bud develops from the parent body which enlarges in size and finally develops into a small hydra. After attaining suitable maturity the offspring gets detached from the parent body and becomes an independent individual.

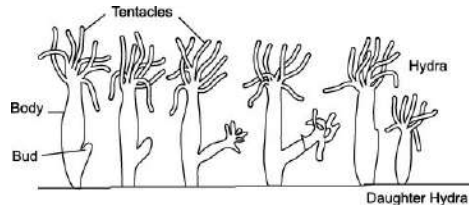


Fig. Budding in Hydra

176. Define pollination. Explain the different types of pollination. List two agents of pollination. How does suitable pollination lead to fertilisation?

[Board Question]

Ans. Pollination is the transfer of pollen from the anther of the stamen to the stigma of the pistil with the help of air, water and insects.

Types of pollination:

- 1. Self pollination:** Transfer of pollen grain from the anther to the stigma of the same flower.
- 2. Cross pollination:** Transfer of pollen grain from the anther of one flower to the stigma of other flower of the same species.

Two agents of pollination are air, water, insects, etc. When correct species of pollen grain lands on the stigma it results in some chemical response from the ovary that causes the growth of pollen tube from pollen grain. The pollen grain slides down the pollen tube and enters the ovary where it meets the egg. This process is called as fertilisation and leads to the formation of zygote.

177. What is vegetative propagation? Describe various methods

of vegetative propagation?

Ans. The growth of new plants from vegetative parts of the plant like roots, stem, leaves other than the seeds is called vegetative propagation. Various methods of vegetative propagation are:

1. Cutting: Small piece of plant part like roots, stem or leaves is cut and is used for propagation. Examples: Rose, china-rose, sugarcane etc.

2. Layering: It is the process where roots are induced when a stem comes in contact with the ground. Examples: Grapevine, jasmine, litchi, mango etc.

3. Grafting: It is a process of joining a part of a living plant like stem or bud to another plant and they grow as one plant. Examples: Lime, lemon etc.

4. Propagation by plant tissue culture: In this method plant cells are cultured in an artificial culture media, where a cell divides into undifferentiated mass of cells called callus which is transferred to different nutrient medium to grow into plantlets.

All the above methods are artificial method of vegetative propagation.

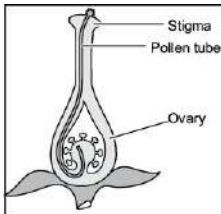
In natural methods of vegetative propagation underground roots [Root tubers of Dahlia] or underground stems [bulbs of onions, rhizomes of ginger] or adventitious buds on leaves [Bryophyllum] grow into new plants.

178. Answer the following questions:

- (i) Draw the female reproductive part of a flower and label:
 - (a) The part which is sticky and receptors of pollen grains.
 - (b) The part that transfers male gametes.
 - (c) The part that contains the female gametes.

(ii) How do the pollen grains reach to the female reproductive part in a flower?

(iii) Describe how male and female gametes unite in a flowering plant with suitable diagrams.



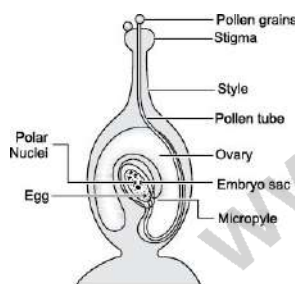
Ans.

(i) (a) Stigma is sticky in nature and receptor of pollen grains.

(b) Pollen tube which arises from pollen grains transfers male gametes by passing through style into ovary.

(c) Ovary contains ovules that carry an embryo sac which contains the female gametes.

(ii) Pollen grains reach the stigma of carpel through pollination process by various pollinating agents like wind, insects, water etc.



(iii)

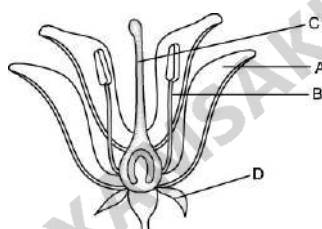
Fertilisation in a Flowering Plant

The process of mixing of male and female gametes to form a zygote is called fertilisation. By pollination process pollen grains get deposited on stigma of carpel. Under suitable conditions they germinate. A long pollen tube containing two male gametes arises and it passes through style to reach the ovary. The ovary contains ovule which has an embryo sac. Female gamete is present inside embryo sac. The pollen tube enters the ovule through micropyle and penetrates through the embryo sac. One male gamete fuses with

female gamete to produce zygote whereas the second male gamete fuses with polar nuclei to form endosperm. This process is called double fertilisation.

179. Study the following diagram and answer the following questions:

- (i) Label the parts A, B, C and D.
- (ii) Which parts represent the male and female reproductive part respectively.
- (iii) What is the function of the parts labeled A and D ?
- (iv) What do you mean by pollination and explain the different types of pollination?



Ans. (i) A – Petals; B – Stamens; C – Pistil; D – Sepals

(ii) Part B [Stamens] represent male reproductive part and part C [Pistil] represent female reproductive part of a flower.

(iii) The main function of petal is to attract insects for pollination so they are large, showy and brightly coloured. The main function of sepal is to protect the stamens and pistils.

(iv) Pollination is the process of transfer of pollen grains from anther to the stigma of the carpel by various pollinating agents like wind, insects etc. There are two types of pollination :

1. Self-pollination : The transfer of pollen grains from anther of a flower to stigma of the same flower or different flower but in same plant is called self-pollination.

2. Cross-pollination : The transfer of pollen grains from anther of flower of one plant to stigma of another flower of different plant but of same species is called cross-pollination.

180. Describe the role of the following in a male reproductive system and label them in a figure:

- (i) Testis
- (ii) Vas deferens
- (iii) Epididymis
- (iv) Scrotum
- (v) Seminal vesicle

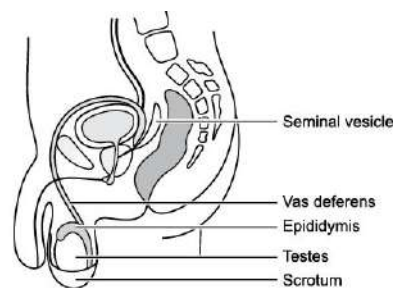
Ans. (i) Testes are the primary sex organs in a human male which produce sperms by the process of spermatogenesis. They also produce male sex hormone testosterone which helps in the development of secondary male characteristics at the time of puberty.

(ii) Vas deferens also called sperm ducts carries the sperms from testes to urethra.

(iii) Epididymis stores the sperms for some days where they get mature and become motile in nature.

(iv) Scrotum or scrotal sacs are pouch like structures located outside the abdomen in which testes are placed. It provides an optimum temperature for sperm formation.

(v) The secretion of seminal vesicles helps in transportation of sperms and provides nourishment to the sperms.



181. Answer the following questions:

(i) Write the function of following parts in human female reproductive system:

- (a) Ovary
- (b) Oviduct
- (c) Uterus

(ii) Describe in brief the structure and function of placenta.

Ans. (i) (a) Ovary: It produces egg for fertilisation. It secretes estrogen and progesterone. Estrogen regulates secondary sexual characters and progesterone controls the thickness of the lining of uterus.

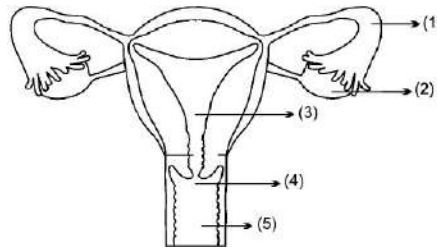
(b) Oviduct: It is the site of fertilisation and carries egg or fertilised ovum (zygote) to the uterus.

(c) Uterus: It helps to nourish the fertilised ovum that will develop into foetus. It holds the baby till it is ready for birth.

(ii) Placenta is a disc shaped structure on uterine wall before implantation of embryo. It provides oxygen and nutrients to the foetus. It helps to remove waste also. The placenta is composed of both maternal tissues and tissue derived from the embryo. The chorion is the embryonic derived portion of the placenta. It is composed of foetal blood vessels and trophoblasts which are organised into finger-like structures called chorionic villi.

182. Answer the following questions:

(i) Identify the given diagram. Name the parts 1 to 5.



(ii) What is contraception? List three advantages of adopting contraceptive measures.

Ans. (i) The parts of the female reproductive system are as follows:

(1) Fallopian tube or Oviduct

(2) Ovary

(3) Uterus

(4) Cervix

(5) Vagina

(ii) Contraception is the method by which a female inhibits fertilisation and hence prevents pregnancy.

The three advantages of contraception are:

(1) It makes the people more aware about the concept of family planning.

(2) It educates the people about sexually transmitted diseases and ways to avoid it.

(3) It helps the female to space children.

(4) It reduces the risk of unwanted pregnancies.

183. Answer the following related to AIDS.

(i) Expand AIDS, HIV.

(ii) Is AIDS an infectious disease?

- (iii) State few methods of transmission of this disease.
- (iv) Give some preventive measures for control of AIDS.
- (v) When is World AIDS day celebrated?

Ans. (i) AIDS – Acquired Immuno Deficiency Syndrome
HIV – Human Immuno deficiency Virus

- (ii) Yes, AIDS is an infectious disease.
- (iii) Few methods of transmission of this disease are:
 - (1) Sexual contact with an infected person.
 - (2) Transfusion of blood from an infected person.
 - (3) From mother to child through placenta during pregnancy.
 - (4) Sharing of infected needles for injection of drugs or vaccines.
- (iv) Some preventive measures for control of AIDS are:
 - (1) Using disposable syringes.
 - (2) Using condoms for sex.
 - (3) Before blood transfusion, blood should be tested for AIDS.
 - (4) Educating people about transmission and prevention of AIDS.
- (v) World AIDS day is celebrated on December 1 every year.

184. Given below are few questions based on analogy. Fill in the blanks with appropriate answer in each.

- (i) Diaphragm: Barrier methods: : Copper-T : _____.
- (ii) Removal of vas deferens surgically: Vasectomy
: : _____ : Tubectomy
- (iii) HIV : AIDS : : _____ : Gonorrhoea
- (iv) Ovary: Oestrogen: : Testis : _____

(v) Propagation by tissue culture: _____ : : Development of new plants from adventitious buds in Bryophyllum : Natural Methods of vegetative propagation.

Ans. (i) Intra Uterine Contraceptive Device (IUCD)

(ii) Removal of oviduct surgically

(iii) Nisseria gonorrhoeae

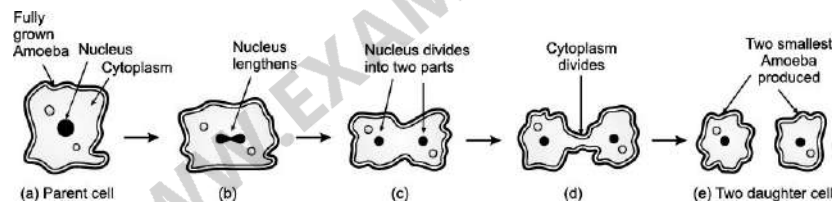
(iv) Testosterone

(v) Artificial Methods of vegetative propagation

Diagram Based Questions

185. Draw in sequence (showing the four stages), the process of binary fission in amoeba.

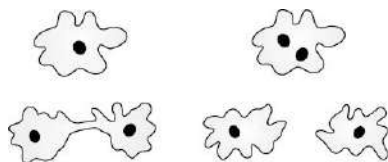
Ans. Binary fission is an asexual mode of reproduction in amoeba where a single parent cell divides into two daughter cells and each daughter cell receives a copy of genetic material.



Binary Fission in Amoeba

186. Study the diagram and answer the following:

(i) What does the figure represents?



(ii) Give an example of organism which shows this process.

(iii) Describe the process shown in the picture.

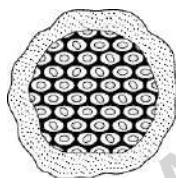
Ans. (i) The figure represents binary fission which is an asexual

mode of reproduction.

(ii) Amoeba and Paramecium show this mode of reproduction.

(iii) The genetic material first duplicates through mitosis leading to duplication of nucleus through karyokinesis and a constriction appears in the cell membrane which deepens and finally a single parent cell divides into two daughter cells. The division of cytoplasm is called cytokinesis. This mode of asexual reproduction is called binary fission.

187. The picture given below depicts the process of reproduction in a single cell organism. Answer the following questions based on it:



(i) Name the process depicted above and define it?

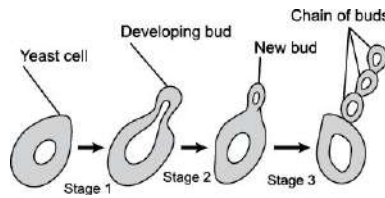
(ii) What is meant by asexual reproduction?

Ans. (i) The diagram given above represents multiple fission. The process by which there is division of a parent cell into several daughter cells is called multiple fission. During this process the nucleus of parent cell divides into many daughter nuclei along with the division of cytoplasm.

(ii) The reproduction which involves only one parent and occurs without the formation and fusion of gametes and there is no mixing of genetic material is called asexual reproduction.

188. A student is observing a permanent slide showing sequentially the different stages of asexual reproduction taking place in yeast. Name this process and draw diagrams of what he observes in a proper sequence.

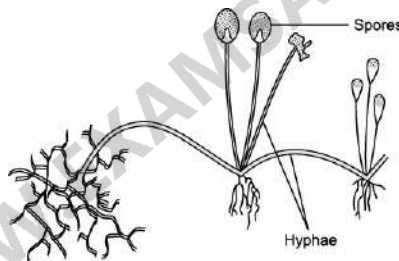
Ans. This process is called budding.



189. Draw a diagram of Rhizopus labelling the reproductive and non-reproductive parts. Explain the process of reproduction in Rhizopus.

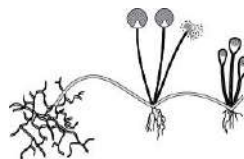
Ans. Spores are reproductive parts and Hyphae are non-reproductive parts of Rhizopus.

Rhizopus reproduces through asexual method by spore formation. During spore formation a structure called sporangium develops from the fungal hypha. The nucleus divides several times within the sporangium and each nucleus with small amount of cytoplasm develops into a spore. The spores are liberated and develop into new hypha on the substratum when conditions become favourable.



190. Answer the following questions:

- (i) Identify the process depicted in the diagram given below:
- (ii) The spores have a covering of thick walls around it. What is its advantage?
- (iii) What are hyphae?



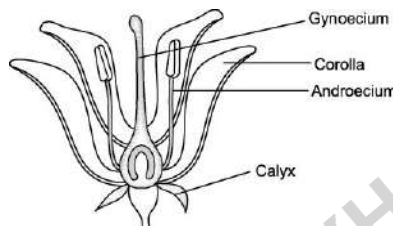
Ans. (i) The process is known as spore formation in rhizopus.

(ii) Spores are covered by a thick structure to withstand unfavourable conditions like drought, high temperature etc., so that they can survive for a long time.

(iii) Hyphae are long, thread, branched filaments of fungus which release enzymes to absorb nutrients from food sources.

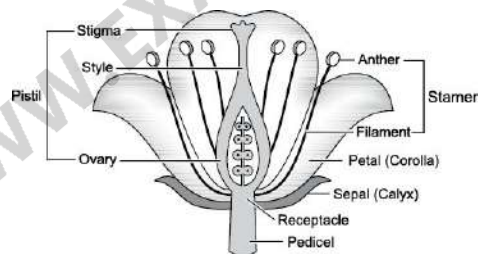
191. Draw the diagram of a flower and label the four whorls. Write the names of gametes producing organs in the flower.

Ans. Anther of stamen produce male gametes and ovary pistil produce female gametes.



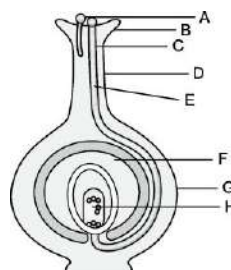
192. Draw a labelled diagram of the longitudinal section of a flower. [NCERT]

Ans.



L.S. of a Flower

193. Study the diagram and answer the following questions.



(i) What does the figure indicate?

(ii) Label the parts A, B, C, D, E, F, G, H.

(iii) Mention the role of parts B, E?

Ans. (i) The figure indicates fertilisation process in flowering plant.

(ii) A – Pollen grains, B – Stigma, C – Male gametes, D – Style, E – Pollen tube, F – Ovule, G – Ovary, H – Embryo sac

(iii) Stigma is the part of carpel which receives pollen grains during pollination.

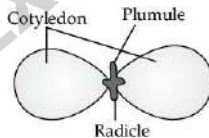
Pollen tube contains the male gamete which passes through the style and finally reaches the ovary. It carries the male gametes towards female gametes for fertilisation.

194. Draw and label the diagram of embryo of a gram seed. Give the functions of each parts labelled by you ?

Ans. Cotyledons store food for the growth of embryo.

Radicle becomes root in future plant.

Plumule becomes shoot in future plant.

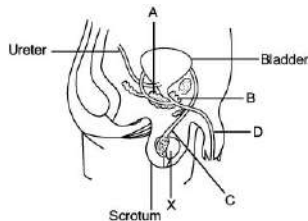


195. Study the diagram and answer the following:

(i) What does the figure represent and label the parts A and B.

(ii) Name a hormone produced by X and what is its function?

(iii) Mention the substances carried by ducts C and D.



Ans. (i) The figure represents human male reproductive system. Part

A is seminal vesicle and B is prostate gland.

(ii) The organ represented by X is testes and Hormone produced by it is testosterone which helps in developing secondary sexual characters in males at the time of puberty.

(iii) Duct C is vas deferens which carries sperms and Duct D is urethra which carries both sperms and urine.

196. Answer the following by carefully studying the figure:

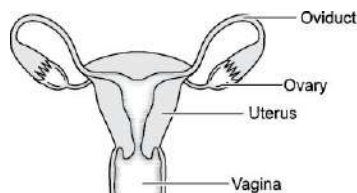
(i) Identify the image shown below.

(ii) Label in the figure the ovary, oviduct, uterus, vagina.



Ans. (i) The figure represents female reproductive system.

(ii) The labelled figure is given below:



Differentiate Between

197. What is the difference between albuminous seed and ex-albuminous seed?

Ans.

Albuminous seeds	Ex-albuminous seeds
Endosperm is present and cotyledons are thin and surrounded by membrane. Examples: Cereals,	They lack endosperm and cotyledons are thick and fleshy because they store food. Examples : Gram, peas.

custard apple.

198. How does binary fission differ from multiple fission?
[NCERT]

Ans.

Binary fission	Multiple fission
A single parent cell divides into two daughter cells.	It results in production of many daughter cells.
Nucleus divides once and then each nucleus gets surrounded by cytoplasm to form two individuals.	Nucleus divides repeatedly to form many nuclei and each gets surrounded by cytoplasm to form many daughter cells.
It occurs under favourable conditions. Example: Binary fission in Amoeba, Paramecium.	It occurs under unfavourable conditions. Example: Plasmodium.

199. Distinguish between a gamete and zygote?

Ans.

Gamete	Zygote
The germ cells that are mixed during sexual reproduction are called gametes, e.g. sperm (male) and ova (female).	It is the product of the fusion of male gametes and female gametes during sexual reproduction.
Gametes are unfertilised reproductive cells.	Zygote is a fertilised egg or a fertilised egg.
As a product of meiosis, gametes	Since zygote is the product of

are always haploid cells.	the fusion of the male and female gamete haploid, it is a diploid structure.
Haploid	Diploid
Meiosis and cytokinesis occur.	Compaction and formation of blastula occur.
Found in gonads.	Found in fallopian tube.
No new individuals are formed.	New individuals are formed.
Has one copy of all autosomes and one sex chromosome, either X or Y.	Have two copies of all of the autosomes. Sex chromosomes may be either XX or XY.
They give rise to the zygote.	They give rise to the foetus.
Sperm: very motile. Oocyte: non-motile	Non-motile

Analysis and Evaluation Based Questions

200. A potato is cut into a number of small pieces, these potato pieces are placed on wet cotton kept in a tray. After a few days, green shoots and roots appear only from some potato pieces and not from all potato pieces, why?

Ans. In those potato pieces which possess the buds on getting moisture, light, oxygen new plants develop from them which is an example of natural methods of vegetative propagation and those potato pieces which do not have buds, from them new plants do not grow.

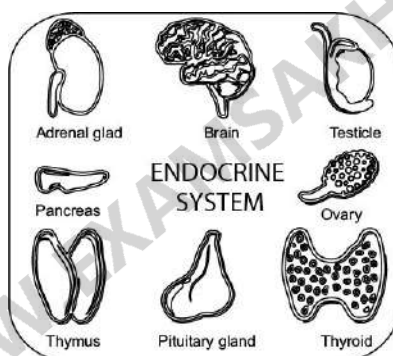
201. Colonies of yeast fail to multiply in water but multiply in sugar solution. Give one reason for this.

Ans. Sugar solution provides energy which cannot be provided by water for the growth of yeast colonies.

202. What is the advantage of reproduction through spores in the case of Rhizopus?

Ans. Spores are highly resistant to adverse environmental conditions like drought, heat etc. They have a thick wall which protects them and on exposure to suitable conditions they germinate and give rise to new individuals.

203. Hormones are powerful. It takes only a tiny amount to cause big changes in cells or even your whole body. That is why too much or too little of a certain hormone can be serious. Laboratory tests can measure the hormone levels in your blood, urine, or saliva.



(i) Name the part of the brain that regulates the release of hormones.

(ii) Name any two endocrine glands that are common in both males and females.

(iii) Name the endocrine gland which is present only in the males. Also, name the hormone that is produced by this gland.

(iv) Name the endocrine gland which is present only in the females and the hormone that is produced by this gland.

Ans. (i) The part of the brain that controls and regulates the release of hormones is the hypothalamus.

(ii) Pituitary gland and thyroid gland.

(iii) Testis which produces a hormone named testosterone is present only in males.

(iv) Ovary which produces the hormones progesterone and estrogen is the endocrine gland which is present only in the females.

204. Answer the following:

(i) Complete the sentence by filling in X and Y. The ovary contains the X and the X contains the Y.

(ii) If a farmer wishes to develop a mango with characters of two related species, what method of vegetative propagation should he use?

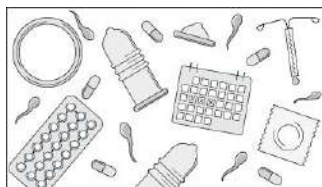
Ans. (i) X is Ovule, Y is embryo sac which contains egg cell and two polar nuclei.

(ii) Grafting method is used.

205. Why is the number of sperms produced always more than the number of eggs produced?

Ans. A single ejaculation produces about 400 million sperms. Sperms are motile in nature and they have to travel long distance to reach the egg for fertilisation. They also compete with each other to reach the egg, very few are able to climb through uterus to reach oviduct whereas rest die and are absorbed on the way. Only one sperm in the end fuses with egg so to fertilise a single egg million number of sperms are produced.

206. The sexual act always has the potential to lead to pregnancy. Pregnancy will make major demands on the body and the mind of the woman, and if she is not ready for it, her health will be adversely affected. Therefore, many ways have been devised to avoid pregnancy.



- (i) Name any two bacterial diseases that are caused due to unprotected sex.
- (ii) How a pill helps in preventing pregnancy?
- (iii) What is vasectomy?
- (iv) What are the common side-effects of using contraceptive pills?

Ans. (i) The two bacterial diseases that are caused due to unprotected sex are gonorrhea and syphilis.

(ii) The pill helps in preventing pregnancy as it prevents the release of the ovum, by changing the hormonal balance.

(iii) Vasectomy is the surgical process by which the vas deferens is cut. This prevents the sperms from reaching the ejaculatory duct.

(iv) The common side-effects of using contraceptive pills are irritation, nausea, and mood swings.

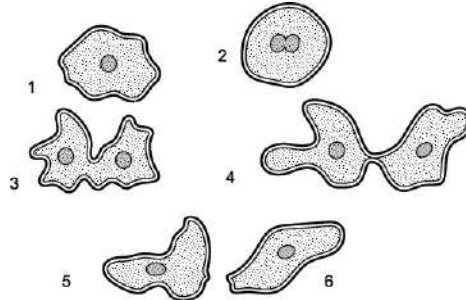
Practical Based Questions

207. Are binary fission and budding faster processes of reproduction when compared to sexual reproduction? Justify.

Ans. Yes, binary fission and budding are faster processes of reproduction when compared to sexual reproduction because in sexual reproduction there are lot of events like formation of gametes, fusion of gametes, development of a zygote to a young one etc.

208. Name the type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost. Draw the initial and the final stages of this type of reproduction. State the event with which this reproduction starts.

Ans. Binary fission is the type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost.



This reproduction starts with elongation of Nucleus.

209. Answer the following questions:

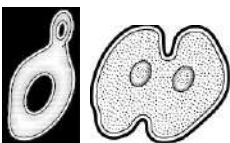
(i) A slide showing several amoeba was given to a student and was asked to focus the Amoeba undergoing binary fission. What will the student look for to correctly focus on a dividing Amoeba?

(ii) How can you identify the daughter cells which are formed due to binary fission in amoeba?

Ans. (i) Student should observe the Amoeba which will have a elongated nucleus along with a constriction in the middle of cytoplasm.

(ii) The daughter cells would be smaller in size than their respective parent cells.

210. A student is made to observe two permanent slides. He was asked to identify the mode of reproduction in the respective organism. The student observed the following slides:



Slide I Slide II

Ans. Slide I is showing budding in yeast and slide II is showing the process of binary fission in Amoeba.

211. A Planaria worm is cut horizontally in the middle into two halves P and Q such that the part P contains the whole head of the worm. Another Planaria worm is cut vertically into two halves R and S in such a way that both the cut pieces R and S contain half head each. Which of the cut pieces of the two Planaria worms could regenerate to form the complete respective worms?

- (a) only P
- (b) only R and S
- (c) P, R and S
- (d) P, Q, R and S

Ans. (d) P, Q, R and S

Explanation: When a Planaria gets cut into two pieces, each piece will regenerate into a new individual.

212. Write any two precautions while studying different parts of an embryo of a dicot seed?

Ans. Two precautions are:

1. The slide should first be observed under low power magnification compound microscope and then under high power magnification compound microscope.
2. The slides should be focused properly.

213. Name three dicot seeds. Seeds on germination give rise to _____ and _____.

Ans. The three dicot seeds are gram, peas and beans. Seeds on germination give rise to plumule and radicle.

214. Answer the following questions:

(i) Name the remaining structure after removing the testa from water soaked gram seed.

(ii) How many cotyledons are present in the embryo of gram?

Ans. (i) Full mature embryo

(ii) Two cotyledons

215. Which among the following organisms is capable of reproducing through spores?

(i) Amoeba

(ii) Plasmodium

(iii) Hydra

(iv) Rhizopus

Ans. (iv) Rhizopus

Explanation: Asexual reproduction by spore formation is the common method of reproduction in fungi and bacteria. Example: Rhizopus During spore formation a structure called sporangium develops from the fungal hypha. The nucleus divides several times within the sporangium and each nucleus with small amount of cytoplasm develops into a spore. The spores are liberated and develop into new hypha on the substratum when conditions become favourable.

Application Based Questions

216. (i) Observe a permanent slide of Amoeba under a microscope.

(ii) Similarly observe another permanent slide of Amoeba showing binary fission.

Now, compare the observations of both the slides.

Ans. One slide shows an amoeba containing a nucleus and cytoplasm whereas the second slide shows amoeba undergoing

binary fission i.e., nucleus to be dividing, constriction appearing on the cytoplasm, a single amoeba divides to produce two daughter amoeba.

217. (i) Collect water from a lake or pond that appears dark green and contains filamentous structures.

(ii) Put one or two filaments on a slide.

(iii) Put a drop of glycerine on these filaments and cover it with a coverslip.

(iv) Observe the slide under a microscope.

Can you identify different tissues in the Spirogyra filaments ?

Ans. Spirogyra is a multicellular, filamentous, green algae where cells are alike and there is no differentiation of tissues.

218. A student noticed that an organism by mistake was cut in two parts. After sometime both the parts developed into new individuals.

(i) Name the mode of reproduction used by the organism.

(ii) State the type of cells which carry this process.

(iii) Write examples of two organisms which multiply by this process.

Ans. (i) Regeneration method of asexual mode of reproduction.

(ii) Specialised regenerative cells.

(iii) Planaria and Hydra multiply by this process.

219. (i) Dissolve about 10 g of sugar in 100 mL of water.

(ii) Take 20 mL of this solution in a test tube and add a pinch of yeast granules to it.

(iii) Put a cotton plug on the mouth of the test tube and keep it in a warm place.

(iv) After 1 or 2 hours, put a small drop of yeast culture from the test tube on a slide and cover it with a cover slip.

Observe the slide under a microscope.

Ans. Formation of yeast cells by budding process could be seen. Some may show a chain of yeast cells attached to each other.

220. (i) Take a potato and observe its surface. Can notches be seen ?

(ii) Cut the potato into small pieces such that some pieces contain a notch or bud and some do not.

(iii) Spread some cotton on a tray and wet it. Place the potato pieces on this cotton. Note where the pieces with the buds are placed.

(iv) Observe changes taking place in these potato pieces over the next few days. Make sure that the cotton is kept moistened.

Which are the potato pieces that give rise to fresh green shoots and roots ?

Ans. Potatoes having buds show the growth of fresh green shoots and roots and those who do not have buds does not show any growth of new plants.

221. (i) Select a money-plant.

(ii) Cut some pieces such that they contain at least one leaf.

(iii) Cut out some other portions between two leaves.

(iv) Dip one end of all the pieces in water and observe over the next few days.

Which ones grow and give rise to fresh leaves ?

Ans. The portion of money plant having at least one leaf develops fresh leaves and branch as they have axillary bud present in axil of leaf. Other parts did not show any growth.

222. (i) Soak a few seeds of Bengal gram (chana) and keep them overnight.

(ii) Drain the excess water and cover the seeds with a wet cloth and leave them for a day. Make sure that the seeds do not become dry.

(iii) Cut open the seeds carefully and observe the different parts.

Ans. The seed contains two cotyledons which store food, when seed germinates plumule and radicle are seen which grows into shoot and root respectively.

223. (i) Wet a slice of bread, and keep it in a cool, moist and dark place.

(ii) Observe the surface of the slice with a magnifying glass. Record your observations for a week.

Ans. A white cottony mass appears on the moist bread which later becomes black to produce sporangiospores which contain spores in them. This is called Rhizopus or bread mould.

224. Ravi took three bread slices and kept the three pieces of the slices in the following conditions.

(i) Slice 1 in a dried and dark place.

(ii) Slice 2 in a moist and dark place.

(iii) Slice 3 in moist and in refrigerator.

What would he observe in each of the above conditions? Give reasons for your answer.

Ans. In slice 1, no spores will develop as there is lack of moisture. In slice 2, white spongy mass like structures with black spots will be seen as both moisture and darkness favours the growth of bread moulds. In slice 3, there will be no formation of spores even though moisture is present because the low temperature in refrigerator does not favour the growth of spores.

225. We hear and read about female foeticide, which is really a wrong practice. In some families, be it rural or urban, females are tortured for giving birth to a girl child. They do not seem to understand the scientific reason behind the birth of a boy or a girl.

In your opinion, the approach of the society towards mother in this regard is correct or not? Explain the scientific reason.

Ans. No, it is not correct. Mother should not be blamed for this. There is no difference between a male and female child, both are equal. A female is born if it receives the X bearing sperms from father as father carries both X and Y chromosomes and mother carries only X chromosomes.

226. Ram and Shyam went for a trip to Botanical garden. They saw some plants with beautifully coloured and scented flowers. They wondered why some flowers were beautifully coloured and scented. Then they saw in a flower bed, rose plants with same coloured flowers and of same size. Next day when they went to school they asked teacher about that.

(i) Why flowers are beautifully coloured and scented?

(ii) Why all the flowers in the flower bed were of same size and colour?

Ans. (i) Flowers are beautifully coloured and scented to attract insects for pollination. Pollination would lead to fertilisation and finally formation of fruits and seeds will take place.

(ii) Rose plants might have propagated by vegetative propagation so they resemble their parents i.e., all the rose plants are of same size and of same colour.

227. It is a well known fact that pregnant woman's health is a backbone of every family, society and thus nation.

(i) Which tissue is responsible for providing nutrition from mother to

growing embryo?

(ii) According to you, what can likely be the measures to maintain woman health during pregnancy.

Ans. (i) Placenta is responsible for providing nutrition from mother to growing embryo.

(ii) Following measures should be maintain for the proper health of woman during pregnancy:

1. Well balanced and proper nutritious diet.
2. She should not take alcohol, smoke cigarette.
3. She must be kept stress free away from family problems.
4. Regular check-ups and visits to doctor.
5. Avoid use of excess medicines and do light exercises.

228. Study the table given below and answer the questions.

Contraceptive method	Duration of efficiency	Hormonal exposure
Copper IUD	10 years	No
Pills	Use days	Yes
Diaphragm	Reusable	No

(i) What are STDs?

(ii) Which of the bacteria is responsible for causing syphilis?

(iii) Name the contraceptive device that is commonly used by the males?

(iv) What is the part of the male reproductive organ that is cut in the

process of vasectomy?

Ans. (i) There are a number of diseases that are caused by sexual intercourses. These diseases are called STDs “Sexually transmitted disease”.

(ii) *Treponema pallidum* is the bacterium that causes a disease called syphilis in humans.

(iii) The contraceptive device that is commonly used by the males is the condom.

(iv) The vas deferens is cut in the process of vasectomy. This prevents the sperms from reaching the ejaculatory duct.



229. Elaborate the statement ‘DNA contains the blueprint of the next generation’.

Ans. DNA is the hereditary material. It stores the blueprint in the genes which are the sequence of nucleotides. Genes control synthesis of proteins. These proteins act as enzymes which control biochemical reactions of the body. Genes are responsible for transmitting characters from parents to offspring. Before transmitting characters from parents to offspring prior to cell division DNA makes its copies by replication. Hence, DNA contains the blueprint of the next generation.

230. Due to his recent travel and the location of sores, Dr. Gonzala suspects that Mike may have contracted Leishmaniasis.

(i) Name the parasite that causes Leishmaniasis.

(ii) The parasite that causes Leishmaniasis reproduced through which mode?

(iii) How it is transmitted?

Ans. (i) Leishmaniasis infection is caused by the parasite Leishmania.

(ii) Leishmania reproduces through binary fission.

(iii) Leishmania is transmitted through the bite of an infected sand-fly. Leishmania (which cause kala-azar), have a whip-like structure at one end of the cell.

231. Study the table given below and answer the questions.

Disease	Causative agent
Syphilis	<i>Treponema pallidum</i>
Genital herpes	HSV-2
AIDS	HIV
Trichomoniasis	<i>Trichomoniasis vaginalis</i>

(i) What are STDs?

(ii) What is the full form of HIV and AIDS?

(iii) Is syphilis a bacterial infection or a viral infection?

(iv) Is trichomoniasis a bacterial infection?

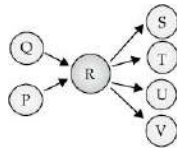
Ans. (i) There are a number of diseases that are caused by sexual intercourses. These diseases are called STDs “Sexually Transmitted Disease”.

(ii) The full form of HIV is the Human Immunodeficiency Virus, and the full form of AIDS is Acquired Immunodeficiency Syndrome.

(iii) The syphilis is a bacterial infection as it is caused by a bacteria named *Treponema pallidum*.

(iv) No, trichomoniasis is not a bacterial infection as it is caused by a protozoan named *Trichomoniasis vaginalis*.

232. The diagram represents gametes P and Q fusing to give cell R. This cell then produces gametes S.T.U. and V.



(i) State whether P, Q and R are haploid or diploid.

(ii) What is the Ratio of Number of Chromosomes in a Human Zygote and a Human Sperm?

(iii) The parental cell divides and gives rise to two daughter cells. Each division doubles the number of cells. How many numbers of cells will be there in third generation? If starting cells is considered as 0 generation.

Ans. (i) P and Q are haploid gametes while R is zygote and diploid.

(ii) The number of chromosomes in a human sperm is half the number of chromosomes in a zygote i.e their ratio is 2:1

(iii) The number of cells increases exponentially and can be expressed as 2^n , where n is the number of generations. If we apply the formula 2^n , where n is equal to 3, the single cell would give rise to 23 i.e 8 cells.

233. Mrs. Alka, 37 years old, was diagnosed with secondary infertility. The experts diagnosed her for tubal factor infertility that was obstructing her second pregnancy. Later, she was suggested to go for In-Vitro Fertilisation (IVF). She conceived in the first attempt of the treatment and delivered a healthy baby. Why it is difficult to conceive if fallopian tube is blocked?

Ans. In case the fallopian tube is blocked, the passage for sperm to get to the eggs, as well as the path back to the uterus for the

fertilised egg, is blocked. To prevent pregnancy in females quite often the fallopian tube is blocked by surgery due to which the egg released by the ovary is not able to reach the uterus and hence fertilisation does not occur. If the fallopian tube is blocked then the female cannot conceive. The process of fertilisation starts in the fallopian tube hence if it is blocked then it is difficult for the female to get pregnant.

234. A 25-year-old young man with his partner of 3 years decides not to have babies and undergoes a surgical procedure to prevent pregnancy. This led to permanent sterilisation of young man.

- (i) Name the surgery performed.
- (ii) Which part is cut during this process?
- (iii) How does this process prevent pregnancy?

Ans. (i) Vasectomy is a surgical procedure for male sterilisation or permanent contraception.

(ii) During the procedure, the male vasa deferentia are cut and tied or sealed.

(iii) Cutting and sealing of vasa deferentia prevents sperm from entering into the urethra and thereby prevents the fertilisation of a female through sexual intercourse.

Self-Assessment

235. Discuss what will be the effect of DNA copying which is not perfectly accurate in the reproduction process?

236. What are the different methods of asexual reproduction? Explain budding and regeneration with diagrams?

237. Give one difference between binary fission and budding.

238. Explain budding in yeast with proper diagram?

239. List distinguishing features between sexual and asexual types of reproduction in tabular form.

240. Answer the following related to diagrams given below:

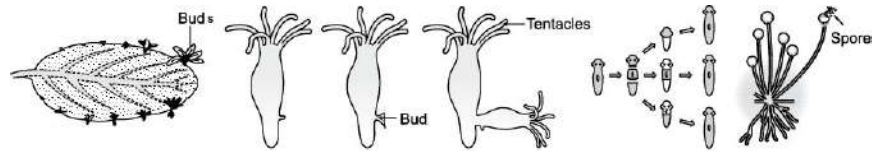


Figure (A) Figure (B) Figure (C) Figure (D)

(i) Identify the organisms in figure A, B, C and D.

(ii) Identify the life process shown in all the figures.

(iii) How is the life process advantageous to the organisms?

241. What is syngamy?

242. Which parts of plants can grow vegetatively?

243. What are the various parts of an embryo of a dicot seed?

244. Which hormone stimulates the release of egg from ovary almost every month after puberty in woman?

245. Mention secondary sexual characters in human male and female.

246. Answer the following:

(i) List two advantages of sexual reproduction over asexual reproduction?

(ii) How will an organism be benefitted if it reproduces through spores.

(iii) Name a sexually transmitted disease and a method to avoid it.

(iv) Illustrate the following with the help of suitable diagrams:

(a) Spore formation in Rhizopus

(b) Multiple fission in Plasmodium

247. Assertion: XX chromosome give rise to female child whereas XY give rise to male child.

Reason: The Y chromosome in males is smaller than X chromosome.

248. (i) Draw a longitudinal section of flower exhibiting germination of pollen on stigma and label ovary, male-germ cell, female-germ cell, ovule on it.

(ii) After fertilisation in a flower, mention the structures that develop into the embryo and seed.

249. What is the role of Seminal Fluid ?

250. Give reason for the statement— “Since the ovary releases one egg every month, the uterus also prepares itself every month by making its lining thick and spongy.”

251. List two differences between self-pollination and cross-pollination?

252. From the internet, gather information about the chromosome numbers of five animals and five plants. Correlate the number with the size of the organism and answer the following questions:

(i) Do larger organisms have more number of chromosomes or cells?

(ii) Can organism with fewer chromosomes reproduce more easily than organisms with more number of chromosomes?

(iii) More the number of chromosomes or cells greater is the DNA content. Justify.

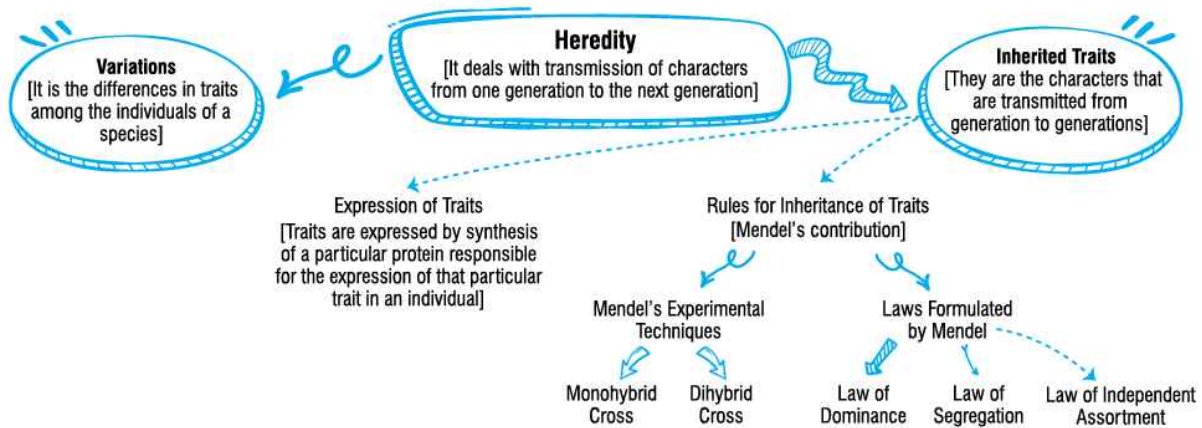
Heredity and Evolution

Chapter 9

Summary

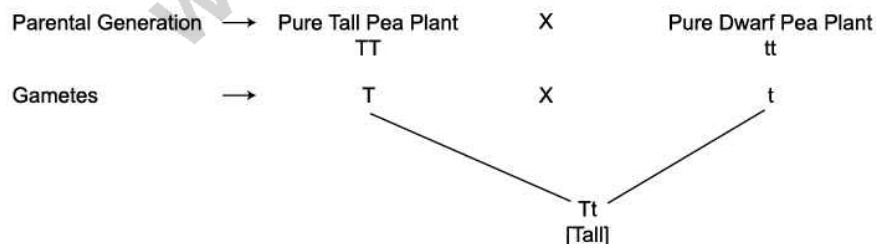
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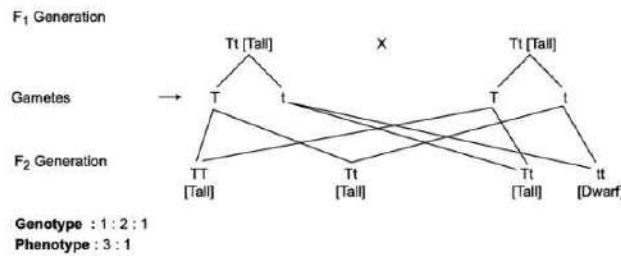
- Genetics is the process of transmission of body features from parents to offsprings and the laws related to transmission. In other words we can say Genetics deals with study of both heredity and variations.
- The word " Genetics " was coined by **William Bateson in 1906**.



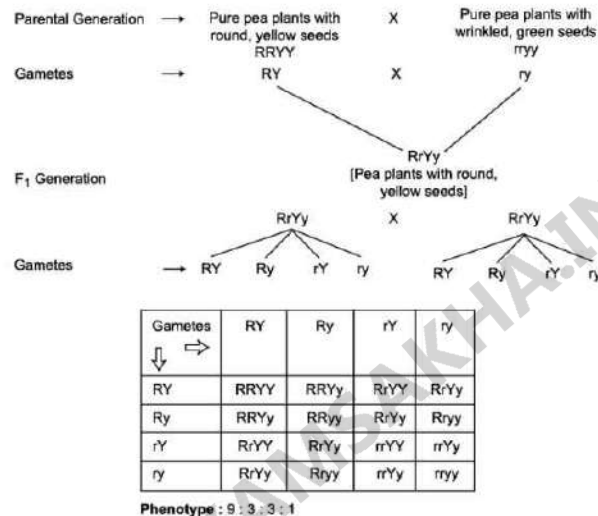
- Variations are mainly seen during sexual reproduction due to the following reasons :
 - Crossing over during meiosis process.
 - Alterations in genetic material due to mutations.
 - Mixing of female and male gametes that come from two different individuals i.e., father and mother.
- Gregor Johann Mendel** is considered as "**Father of Genetics.**" He had formulated the Laws of Inheritance by performing hybridisation experiments on *Pisum sativum* – Garden pea plant.
- He had studied seven contrasting pairs of characters in pea plants.

(i) Height of the plant – Tall or short	(ii) Colour of flower – Purple or white
(iii) Shape of seed – Round or wrinkled	(iv) Colour of seed – Yellow or green
(v) Colour of pod – Green or yellow	(vi) Shape of pod – Inflated or constricted
(vii) Position of flower – Axial or terminal	
- The cross between the two pure breeding varieties of an organism taking into account only a single character at a time is called monohybrid cross.
- Example of monohybrid cross : A pure tall pea plant is crossed with pure dwarf pea plant. In F_1 generation tall pea plants are produced with heterozygous condition i.e., they carry both dominant and recessive alleles. When these plants are crossed they give tall and dwarf plants in the ratio 3 : 1 which is also called phenotypic ratio and their genotypic ratio is 1 : 2 : 1.





- The cross between the two pure breeding varieties of an organism taking into account two characters at a time is called dihybrid cross.
- When a pure pea plant with round yellow seeds is crossed with pure pea plant having green wrinkled seeds, in F₁ generation hybrid plants with round yellow seeds are produced. But again when these plants are crossed they produce round-yellow, round-green, wrinkled-yellow, wrinkled-green in the ratio 9 : 3 : 3 : 1, which is the phenotypic ratio.



- Based on Mendel's breeding experiments three Laws were deduced.
- **Law of Dominance** : The phenomenon of appearance of only one of the two contrasting traits in F₁ generation is called dominance. The other character remains suppressed which is known as recessive character.
- **Law of Segregation** : At the time of reproduction when gametes are formed the factors segregate so that each gamete receives only factor of each character. This is called Law of purity of gametes.
- **Law of independent assortment** : At the time of reproduction, two pairs of factors of each of the two traits in a dihybrid cross segregated independently during gamete formation and randomly formed combinations in F₂ generation. Inheritance of factors controlling a particular trait in an organism is independent of the other.
- The mechanism by which sex of an individual is determined when it begins its life is called **sex determination**.
- In human beings, sex is determined by XX-XY mechanism. Males have XY sex chromosomes whereas females have XX sex chromosomes.
- In some reptiles sex is determined by **environmental factors**.
- **Gene** is a fragment of DNA molecule that has a particular nucleotide sequence which encodes for a particular protein.
- **Evolution** is the constant process of gradual change occurring in an organism since the origin of life which gives rise to variety of complex organisms on the surface of earth.

Definitions

1. **Heredity**: Transmission of genetical characters from one generation to the next generation is called heredity.
2. **Gene**: It is a specific segment of DNA on a chromosome occupying specific position and determines the hereditary

characters.

3. Traits: The alternative forms of a character are called traits.

4. Genetics: It is the branch of biology that deals with the study of heredity and variations.

5. Monohybrid cross: A breeding experiment which involves the alternative traits of one single character is called monohybrid cross.

6. Dihybrid cross: A cross between two pure breeding individuals taking into consideration alternative traits of two different characters is called a dihybrid cross.

7. Variation: It is the differences in the traits shown by the individuals of a species and also by the offsprings of the same parents are called variations.

8. Sex determination: The mechanism by which sex of an individual is determined when it begins its life.

Multiple Choice Questions

9. What determines the differences between the progeny and parents?

- (a) Inheritance
- (b) Heritage
- (c) Genetics
- (d) Variation

Ans. (d) Variation

Explanation :

Variation is the difference between individuals within a population. These arise between the progeny and parents/ancestors and form a backbone for natural selection to act on.

10. What branch of biology focuses on the study of patterns of

inheritance?

- (a) Genetics
- (b) Immunology
- (c) Evolution
- (d) Ecology

Ans. (a) Genetics

Explanation :

Genetics is the branch of biology that deals with questions of inheritance. It uses techniques from various disciplines like Molecular biology, Cell biology, and many more to understand the basis of inheritance.

11. The phenomenon where individuals of a species exhibit differences in characteristics are called:

- (a) Adaptation
- (b) Evolution
- (c) Variation
- (d) All of these

Ans. (c) Variation

Explanation :

Any difference between cells, individuals, or groups of organisms of any species produced by genetic differences (genotypic variation) or the effect of environmental conditions on the manifestation of genetic potentials is referred to as variation (phenotypic variation).

12. Which of the following statements is incorrect?

- (a) Gene is a sequence of nucleotides.
- (b) During the process of gene expression, DNA is first copied into

RNA.

(c) Genes can acquire mutations in their sequence.

(d) Genes cannot acquire mutations in their sequence.

Ans. (d) Genes cannot acquire mutations in their sequence.

Explanation :

Genes can acquire mutations. A gene mutation is a change in the DNA sequence that makes up a gene that is permanent and differs from the sequence found in most people.

13. When a new plant is formed as a result of cross-pollination from different varieties of a plant, the newly formed plant is called:

(a) Dominant plant

(b) Mutant plant

(c) Hybrid plant

(d) All of these

Ans. (c) Hybrid plant

Explanation :

The process of crossing pollen from one flower to the pistils of another flower is known as cross-pollination. When a new plant is formed as a result of cross-pollination from different varieties of a plant, the newly formed plant is called hybrid plant.

14. Which of the following is an example of genetic variation?

(a) One person has a scar but his friend does not.

(b) One person is older than the other.

(c) Reeta eats meat but her sister Geeta is a vegetarian.

(d) Two children have different eye colour.

Ans. (d) Two children have different eye colour.

Explanation :

Variation in gene frequencies is referred to as genetic variation. Eye colour is determined by variations in genes of a person. Two children having different eye colour is an example of genetic variation.

15. Which of the following statements is true?

(a) The characteristics or traits of parents are transmitted to their progeny (offspring) through genes present on their chromosomes during the process of sexual reproduction.

(b) The genes which dominate other genes are called dominant genes and the genes which get dominated are called recessive genes.

(c) The progeny inherits two genes for each trait from its parent but the traits shown by the progeny depends on which inherited gene is dominant of the two.

(d) All of the above

Ans. (d) All of the above

Explanation :

Here, all the statements are correct. Hence, the answer will be option [D].

16. What, according to Mendel, was responsible for the inheritance of specific traits?

(a) Genes

(b) Factors

(c) Chromosomes

(d) DNA

Ans. (b) Factors

Explanation :

Mendel discovered the laws of inheritance. He attributed these traits being encoded by factors. Later studies showed that these factors are genes.

17. The process where characteristics are transmitted from parent to offsprings is called:

- (a) Variation
- (b) Heredity
- (c) Gene
- (d) Allele

Ans. (b) Heredity

Explanation :

Characteristics from parents are passed down to offspring during sexual reproduction. These are the combinations of female and male parent. This is known as heredity.

18. _____ is the observable set of characteristics of an organism.

- (a) Phenotype
- (b) Genes
- (c) DNA
- (d) All of these

Ans. (a) Phenotype

Explanation :

The term “phenotype” refers to an organism’s observable physical properties, such as its appearance, development, and behaviour.

19. Which of the following is not controlled by genes?

- (a) Eye colour
- (b) Height
- (c) Hair colour
- (d) None of the above

Ans. (d) None of the above

Explanation :

Characters or traits are the characteristics that a person expresses and can be seen in their phenotype. Height, eye colour, and body colour are all controlled by genes and can be inherited.

20. Two pink coloured flowers on crossing resulted in 1 red, 2 pink and 1 white flower progeny. The nature of the cross will be:

[NCERT Exemplar]

- (a) Double fertilisation
- (b) Self pollination
- (c) Cross fertilisation
- (d) No fertilisation

Ans. (c) Cross fertilisation

Explanation :

Cross fertilisation will be the nature of the cross. Cross-fertilisation is when a plant is fertilised with pollen from another plant of the same species. Flowering plants use a sophisticated fertilisation method called double fertilisation. Fusion of a male and female gamete is required.

21. Dominant alleles are expressed exclusively in a heterozygote, while recessive traits are expressed only if the organism is _____ for the recessive allele.

- (a) Homozygous

- (b) Heterozygous
- (c) Normal
- (d) None of the above

Ans. (a) Homozygous

Explanation :

Mendel's law of dominance states that in a heterozygote, one trait will conceal the presence of another trait for the same characteristic. Rather than both alleles contributing to a phenotype, the dominant allele will be expressed exclusively. The recessive allele will remain "latent," but will be transmitted to offspring by the same manner in which the dominant allele is transmitted. The recessive trait will only be expressed by offspring that have two copies of this allele.

22. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers but almost half of them were short. This suggests that the genetic make-up of the tall parent can be depicted as:

- (a) TTWW
- (b) TTww
- (c) TtWW
- (d) TtWw

Ans. (c) TtWW

Explanation :

The genetic makeup of tall parent could be TtWW. Since half of the progenies are short, the parent plant will have a set of recessive genes as well; all progenies produced violet flowers, indicating that violet is the dominant colour over white.

23. A cross between a tall plant (TT) and short pea plant (tt) resulted in progeny that were all tall plants because: [NCERT Exemplar]

- (a) Tallness is the dominant trait
- (b) Shortness is the dominant trait
- (c) Tallness is the recessive trait
- (d) Height of pea plant is not governed by gene 'T' or 't'

Ans. (a) Tallness is the dominant trait

Explanation :

When two traits of a character are crossed, the F_1 plants only show one of the two traits, which is known as the dominant trait. The recessive trait (dwarfness) is a trait that does not manifest itself in the F_1 generation.

24. Which of the following is a recessive trait in pea plants?

- (a) Dwarf stem height
- (b) Violet flowers
- (c) Axial flowers
- (d) Inflated pods

Ans. (a) Dwarf stem height

Explanation :

Recessive traits are the ones that require both alleles to be present to result in the expression of the gene product. Of the mentioned traits, only dwarf stem height is a recessive trait.

25. If you were to sample garden pea plants in Mendel's garden, which of the following statements would hold?

- (a) Round seeds were more abundant than wrinkled seeds.

- (b) Wrinkled seeds were more abundant than round seeds.
- (c) Both round and wrinkled seeds were equally abundant.
- (d) Answer depends on the time of day when sampling is done.

Ans. (a) Round seeds were more abundant than wrinkled seeds.

Explanation :

Dominant allele can express even in the presence of a recessive allele. Hence dominant phenotype is more common. Round seeds are dominant over wrinkled seeds; hence would be more abundant.

26. In peas, a pure tall (TT) is crossed with a pure short plant(tt). The ratio of pure tall plants to pure short plants in F₂ generation is:

- (a) 1:3
- (b) 3:1
- (c) 1:1
- (d) 2:1

Ans. (c) 1:1

Explanation :

In the F₂ generation, the ratio of pure tall plants to pure short plants will be 1:1. The other two plants that are produced will be tall as well, but will not be pure.

27. Two pea plants one with round green seeds (RR yy) and another with wrinkled yellow (rrYY) seeds produce F₁ progeny that have round yellow (RrYy) seeds. When F₁ plants are self pollinated, the F₂ progeny will have a new combination of characters. Choose the new combinations from the following:

[NCERT Exemplar]

- (i) Round, yellow
- (ii) Round, green
- (iii) Wrinkled, yellow
- (iv) Wrinkled, green
- (a) (i) and (ii)
- (b) (i) and (iv)
- (c) (ii) and (iii)
- (d) (i) and (iii)

Ans. (b) (i) and (iv)

Explanation :

The new combination in F₂ progeny will be round yellow and wrinkled green. The phenotypic ratio obtained in a dihybrid cross is 9 : 3 : 3 : 1.

The phenotypic ratio will be - Round Yellow: Round green: Wrinkled yellow: Wrinkled green = 9 : 3 : 3 : 1.

28. In humans, the sex Chromosomes comprises one pair of the total of 23 pairs of chromosomes. The other 22 pairs of chromosome are called:

- (a) Autosomes
- (b) Chromosomes
- (c) Meiosis
- (d) All of these

Ans. (a) Autosomes

Explanation :

In humans, each cell normally contains 23 pairs of chromosomes, for a total of 46. Twenty-two of these pairs, called autosomes, look the

same in both males and females. The 23rd pair, the sex chromosomes, differ between males and females. Females have two copies of the X chromosome, while males have one X and one Y chromosome.

29. The number of pairs of sex chromosomes in the zygote of humans is:

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Ans. (a) 1

Explanation :

In the human zygote, the number of pairs of autosomes and sex chromosomes is the same as in an adult human. A human adult possesses 23 pairs of chromosomes, 22 of which are autosomes and 1 of which is a sex chromosome.

30. In human males all the chromosomes are paired perfectly except one. These unpaired chromosomes are:

- (i) Large chromosome
 - (ii) Small chromosome
 - (iii) Y-chromosome
 - (iv) X-chromosome
- (a) (i), (ii)
 - (b) (iii) only
 - (c) (iii), (iv)
 - (d) (ii), (iv)

Ans. (c) (iii), (iv)

Explanation :

In human males, one pair called as the sex chromosomes are unpaired. Here, one is a normal sized X chromosome while other is a short Y chromosome. Women have a perfect pair of sex chromosomes, both called as X. Whereas the X and Y chromosomes are paired well.

31. Which chromosomes do not play any role in the determination of the sex of an individual?

- (a) Autosomes
- (b) Metacentric chromosomes
- (c) Acrocentric chromosomes
- (d) None of the above

Ans. (a) Autosomes

Explanation :

Autosomes do not play any role in the determination of the sex of an individual since they are alike in both the males and the females and are 22 in pairs.

32. The two versions of a trait which are brought in by the male and female gametes are situated on:[\[NCERT Exemplar\]](#)

- (a) Copies of the same chromosome
- (b) Two different chromosomes
- (c) Sex chromosomes
- (d) Any chromosomes

Ans. (a) Copies of the same chromosome

Explanation :

On different copies of the same chromosome, different alleles are present. One chromosome is inherited from the father via the male gamete, while the other chromosome is inherited from the mother via the female gamete. After fertilisation, a zygote with 23 pairs of chromosomes is created, with alleles for a trait present on the homologous pair.

33. Humans have two different sex chromosomes, X and Y. Based on Mendel's laws, a male offspring will inherit which combination of chromosomes?

- (a) Both the X chromosomes from one of its parents
- (b) Both the Y chromosomes from one of its parents
- (c) Combination of X chromosomes from either of its parents
- (d) Combination of X and Y chromosome from either of its parents

Ans. (d) Combination of X and Y chromosome from either of its parents

Explanation :

The X and Y chromosomes are found in humans and most other mammals. Males have both X and Y chromosomes in their cells, whereas females have two X chromosomes. X chromosomes are found in all egg cells, while X or Y chromosomes are found in sperm cells.

34. Which of the following can be inherited from parents to offspring?

- (a) Swimming technique
- (b) Big nose
- (c) Sculpted body
- (d) All of the above

Ans. (b) Big nose

Explanation :

Big nose is an inherited trait which can be passed from parents to offspring.

35. From the list given below select the character which can be acquired but not inherited:

[NCERT Exemplar]

- (a) Colour of eye
- (b) Colour of skin
- (c) Size of body
- (d) Nature of hair

Ans. (c) Size of body

Explanation :

Environmental factors influence the development of acquired traits. It is because the availability of less or more food can modify the size of the body, it is an acquired feature. The other three- eye and skin colour, and nature of hair, are inherited characteristics from the parents.

Assertion and Reasoning Based Questions

Mark the option which is most suitable:

- (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
- (b) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
- (c) Assertion is true but Reason is false.
- (d) Assertion is false but Reason is true.

36. Assertion: The genetic complement of an organism is called genotype.

Reason: Genotype is the type of hereditary properties of an organism.

Ans. (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

Explanation :

Genotype of the organism includes all dominant and recessive characters. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

37. Assertion: Variations are seen in offspring produced by asexual reproduction.

Reason: DNA molecule generated by replication is not exactly identical to original DNA.

Ans. (d) Assertion is false but Reason is true.

Explanation :

Variations are not seen in the offspring produced by the asexual reproduction since only a single parent is involved the variations are not there and thus assertion is false but reason is true.

38. Assertion: Dominant allele is an allele whose phenotype expresses even in the presence of another allele of that gene.

Reason: It is represented by capital letter, e.g., T.

Ans. (b) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

Explanation :

Dominant allele is an allele whose phenotype will be expressed even in the presence of another allele of that gene. It is represented by a capital Letter, e.g., T. Both assertion and reason are correct but

reason is not the correct explanation of assertion.

39. Assertion: Mendel was successful in his hybridization experiments.

Reason: Garden pea proved as an ideal experimental material.

Ans. (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

Explanation :

The pea plant which Mendel chose for conducting experiments, is most ideal for controlled breeding, since it can easily be subjected to cross pollination. He identified very clear contrasting characters in the pea plants. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

40. Assertion: Mendel self-crossed F_1 yellow with round seeds to obtain F_2 generation.

Reason: F_1 progeny of a yellow with round seeds and a green with wrinkled seeds are all green and wrinkled seeds.

Ans. (c) Assertion is true but Reason is false.

Explanation :

Mendel took two contradicting traits together for crossing i.e. colour and shape of seeds. He chose a round yellow seed and a wrinkled green seed and crossed them. He obtained only round yellow seeds in the F_1 generation. Then, F_1 progeny was self-pollinated, which gave four different combinations of seeds i.e. round-yellow, wrinkled-yellow, round green and wrinkled green seeds in the F_2 generation. So, assertion is true but reason is false.

41. Assertion: Mendel selected the pea plant for his experiments.

Reason: Pea plant is cross-pollinating and has unisexual flowers.

Ans. (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

Explanation :

The flowers of pea plant are bisexual and they are self-pollinating, and thus, self and cross-pollination can easily be performed. They have a shorter life span and are the plants that are easier to maintain. Thus, Mendel chose the pea plant. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

42. Assertion: The sex of the children will be determined by chromosome received from the father.

Reason: A human male has one-X and one Y-chromosome.

Ans. (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

Explanation :

If a child inherits X-chromosome from the father it will be a girl and one who inherits a Y-chromosome will be a boy. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

Case Based Questions

43. Read the passage given below and answer the following questions from (i) to (v):

Gregor Johann Mendel is known as a “Father of modern genetics” for his work in the field of genetics. He gave three laws of inheritance followed as Law of dominance, Law of segregation and Law of independent assortment. He conducted his experiment on garden pea plants having contrasting characteristics. He performed self-pollination and cross-pollination to understand the inheritance patterns of traits.

(i) After cross-fertilisation of true-breeding tall and dwarf plants, the F₁ generation was self-fertilised. The resultant plants have genotype in the ratio:

- (a) 1:2:1 (homozygous tall: heterozygous tall: dwarf)
- (b) 1:2:1 (heterozygous tall: homozygous tall: dwarf)
- (c) 3:1 (tall: dwarf)
- (d) 3:1 (dwarf: tall)

Ans. (a) 1:2:1 (homozygous tall: heterozygous tall: dwarf)

(ii) Which of the following characteristics of pea plants was not used by Mendel in his experiments?

- (a) Seed colour
- (b) Seed shape
- (c) Pod length
- (d) Flower position

Ans. (c) Pod length

(iii) Mendel took _____ contrasting characteristics of pea plants.

- (a) eight
- (b) seven
- (c) six
- (d) five

Ans. (b) Seven

(iv) The maleness of a child is determined by:

- (a) the X-chromosome in the zygote
- (b) the Y-chromosome in zygote
- (c) the cytoplasm of germ cell which determines the sex

(d) sex is determined by chance

Ans. (b) the Y-chromosome in zygote

(v) Test cross determines:

(a) whether two traits are linked or not

(b) the genotype of F₂ plant

(c) whether the two species will breed successfully or not

(d) number of alleles in a gene

Ans. (b) The genotype of F₂ plant

44. Read the passage given below and answer the following questions from (i) to (v).

Gregor Mendel, in 1865, paved the way for the analysis of the underlying genetic basis of traits by setting out to understand the principles of heredity.

As per Darwin's observations, in nearly all populations individuals tend to produce far more offspring than are needed to replace the parents. He also observed that it is very rare for any two individuals to be exactly alike. All the natural variations among individuals lead to natural selection. Individuals born with variations that present an advantage in obtaining resources or mates have greater chances of living and reproducing offspring who would inherit and carry forward the favourable variations. At the same time, individuals with different variations might be less likely to reproduce.

(i) VV, Vv and vv are _____, while violet and white are _____.

(a) genotypes, phenotypes

(b) phenotypes, genotypes

(c) genotypes, genotypes

(d) phenotypes, phenotypes

Ans. (a) genotypes, phenotypes

(ii) Which one of the following traits is most likely to pass from one generation to other?

(a) Artificial hair coloured by a mother during pregnancy

(b) Acquired skills by a father

(c) Brown eye colour

(d) Six fingers in right hand of a person

Ans. (c) Brown eye colour

(iii) _____ is simply the generation of diversity and the shaping of the diversity by environmental selection.

(a) Evolution

(b) Speciation

(c) Heredity

(d) Natural selection

Ans. (a) Evolution

(iv) Which one of the following statements is not true?

(a) Excavating, time-dating, studying fossils, and determining DNA sequences are tools to study evolution.

(b) Variations arising during the process of reproduction cannot be inherited.

(c) Variations in the species may confer survival advantages or merely contribute to the genetic drift.

(d) Classification of organisms is based on tracing evolutionary relationships.

Ans. (b) Variations arising during the process of reproduction cannot be inherited.

(v) Frequency of certain _____ in a population changes over generations to bring about evolution.

(a) members

(b) progenies

(c) genes

(d) ideas

Ans. (c) genes

45. Read the passage given below and answer the following questions from (i) to (v).

The study of heredity is called genetics. Traits are characteristics such as hair colour, eye colour, artistic or athletic ability, height, and more. Every living organism, plant, or animal, receives its characteristics or traits from its parents. In plants these traits may include seed colour, flower position, length of stem, and much more. The first person to discover this passing of traits was a scientist named Gregor Mendel. He is considered as the father of genetics. He studied pea plants and discovered that certain traits were passed on, or inherited from parent to offspring.

(i) Pure-bred pea plant A is crossed with pure-bred pea plant B. It is found that the plants which look like A do not appear in F_1 generation but re-emerge in F_2 generation. Which of the plants A and B are tall and dwarf?

(a) A are tall and B are dwarf

(b) A are tall and B are also tall

(c) A are dwarf and B are also dwarf

(d) A are dwarf and B are tall

Ans. (d) A are dwarf and B are tall

(ii) In humans if gene B gives brown eyes and gene b gives blue eyes, what will be the colour of eyes of the persons having combinations.

(i) Bb and (ii) BB?

(a) (i) Blue and (ii) Brown

(b) (i) Brown and (ii) Blue

(c) (i) Brown and (ii) Brown

(d) (i) Blue and (ii) Blue

Ans. (c) (i) Brown and (ii) Brown

(iii) If a round, green seeded pea plant (RRyy) is crossed with a wrinkled yellow seeded pea plant (rrYY), the seeds produced in F₁ generation are:

(a) round and green

(b) round and yellow

(c) wrinkled and green

(d) wrinkled and yellow

Ans. (b) round and yellow

(iv) A cross between two individuals results in a ratio of 9: 3: 3:1 for four possible phenotypes of progeny. This is an example of a:

(a) Monohybrid cross

(b) Dihybrid cross

(c) Test cross

(d) F₁ generation

Ans. (b) Dihybrid cross

(v) A man with blood group A marries a woman having blood group O. What will be the blood group of the child?

(a) O only

(b) A only

(c) AB

(d) Equal chance of acquiring blood group A or blood group O

Ans. (d) Equal chance of acquiring blood group A or blood group O

46. Read the passage given below and answer the following questions from (i) to (v).

Heredity is the passing on of some specific characteristics from one generation to the next, from parent to offspring. The study of heredity is called genetics. The traits are passed on by genes in our DNA. A gene gives instructions about making a certain protein to determine a trait for the person like the colour of eyes or hair. The genes are located inside a DNA molecule which is a material found in chromosomes. Genes may be dominant or recessive.

(i) What was the model organism used by Mendel to give the laws of inheritance?

(a) Garden peas

(b) Wild peas

(c) Basket peas

(d) Bottle gourd

Ans. (a) Garden peas

(ii) A zygote which has an X-chromosome inherited from the father will develop into a:

(a) girl

- (b) boy
- (c) either boy or girl
- (d) X-chromosome does not influence the sex of a child

Ans. (a) girl

(iii) The factor which expresses in homozygous and heterozygous states is called _____.

- (a) dominant
- (b) recessive
- (c) gene
- (d) allele

Ans. (a) dominant

(iv) The study of the pattern of chromosomes from parents to the offspring is called:

- (a) Genetics
- (b) Evolution
- (c) Offspring analysis
- (d) Genetical analysis

Ans. (a) Genetics

(v) In Mendel's experiment, the trait which did not appear in the F₁ generation was:

- (a) dominant
- (b) recessive
- (c) recession
- (d) allele

Ans. (b) recessive

47. How can a person be normal for a trait even when carrying one defective gene for that trait?

Ans. The other member of the pair is dominant and masks the effect of the recessive gene. In this way, a person can be normal for a trait even when carrying one defective gene for that trait.

48. Why do all the gametes formed in human females have an X-chromosome? [NCERT]

Ans. The sex chromosome in human female is homomorphic *i.e.*, they contain same chromosome XX. During meiosis process at the time of gamete formation all egg cell will get one copy of X chromosome, hence all the gametes formed in human females have an X-chromosome.

49. Why Pre-natal Diagnostic Techniques(Regulation and Prevention of Misuse) Act, 1994, was enacted?

Ans. The Pre-natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994, was enacted and brought into operation from 1st January, 1996, in order to check female foeticide. The Act prohibits determination and disclosure of the sex of foetus. It also prohibits any advertisements relating to pre-natal determination of sex and prescribes punishment for its contravention. The person who contravenes the provisions of this Act is punishable with imprisonment and fine.

50. How does the creation of variations in species promote survival?[NCERT]

Ans. Due to errors in DNA copying some variations in a species occur. Species with useful variations get adapt to the changing environment and they have better chances of survival and produce

their offsprings.

51. When a black guinea pig is crossed with a white guinea pig, what coloured guinea pigs are obtained in F_1 generation if black colour is dominant over white?

Ans. Guinea pigs of black colour will be obtained in F_1 generation.

52. In a cross between a tall pea plant (TT) and a short pea plant (tt), what will be the characteristics shown by the F_1 generation?

Ans. As Tall is a dominant trait and short is recessive so in F_1 generation plants will be tall (Tt).

53. In a cross between round yellow seeds (RRYY) and wrinkled green seeds (rryy) of pea plant, what is the ratio of plants obtained in F_2 generation?

Ans. The ratio of plants obtained in F_2 generation is 9: 3: 3: 1.

54. A Mendelian experiment consisted of breeding pea plants bearing violet flowers with pea plant bearing white flowers. What will be the result in F_1 progeny? [\[Board Question\]](#)

Ans. All the progeny of F_1 generation will have violet flowers because violet colour is dominant over the recessive white colour.

55. Discuss the types of egg and sperm in reference to X and Y chromosome.

Ans. Ova or eggs are of one kind only. These contain 22 autosomes and a single X chromosome. Sperms are of two kinds (i) having 22 autosomes and one X chromosome, or (ii) having 22 autosomes and a Y chromosome.

56. How many X chromosomes can be found in the cells of the body of (i) a boy, and (ii) a girl?

Ans. (i) Males have one X chromosome.

(ii) Females have two X chromosomes.

57. In turtle, high incubation temperature leads to the development of female offspring. On the other hand in lizards, high incubation temperature leads to the development of male offspring. What determines the sex of the offspring in these examples?

Ans. Here in these examples, sex of the offspring is determined by environmental factors.

58. What will be the sex of a child who inherits Y chromosome from his or her father?

Ans. The child will be a male because the sex chromosome that the child inherits from his or her father will determine the sex as mother has only X chromosome. Here as the child inherits Y chromosome from his father so he will be a male (XY).

59. Do genetic combinations of mothers play a significant role in determining the sex of a new born?

Ans. No, genetic combinations of mothers do not play a significant role in determining the sex of a new born; because mother has only one type of sex chromosomes *i.e.*, X chromosomes but a father has two types of chromosomes X and Y chromosomes. So, all children will inherit X chromosome from mother and whether X or Y bearing sperm from father fertilises the egg will determine the sex of new born.

60. Bacteria have a simpler body plan when compared with human beings. Does it mean that human beings are more evolved than bacteria? Provide a suitable explanation.

Ans. Bacteria and human beings perform all activities in life to live in their environment. Human beings have more complex organisation and differentiation which are absent in bacteria. Due to evolution

more complexity and differentiation in body designs of organisms has occurred. Thus based on complexity and differentiation human beings are more evolved than bacteria.

Short Answer Type Questions

61. Gene controls traits. Explain this with an example?

Ans. Genes are a specific sequence on nucleotides on chromosome which encodes a particular protein which express in form of a particular trait in the body. Each gene has two alternative forms for a particular character. These alternative forms are called alleles, one is dominant allele and other is recessive allele. For example – Height of a plant, plant height depends on the amount of hormones synthesised. The amount of hormones synthesised depends upon the efficiency of the process for making it. If the protein needed for this process is synthesised and works efficiently plant would be tall. On the other hand if the gene is altered, the protein synthesised will be less efficient and hence hormones produced would be less and plant would be dwarf.

62. Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not? [NCERT]

Ans. Yes, we agree with this statement that only variations that confer an advantage to an individual organism will survive in a population because those variations which occur in an individual that favours the organism to get adapt to the environment will be able to survive otherwise it may not. The chances of survival depend upon the nature of variations. Different individuals would have different kinds of advantages. For example– A bacteria which can withstand heat will be able to survive in hot springs otherwise it will die. Selection of variants by environmental factors forms the basis for evolutionary process.

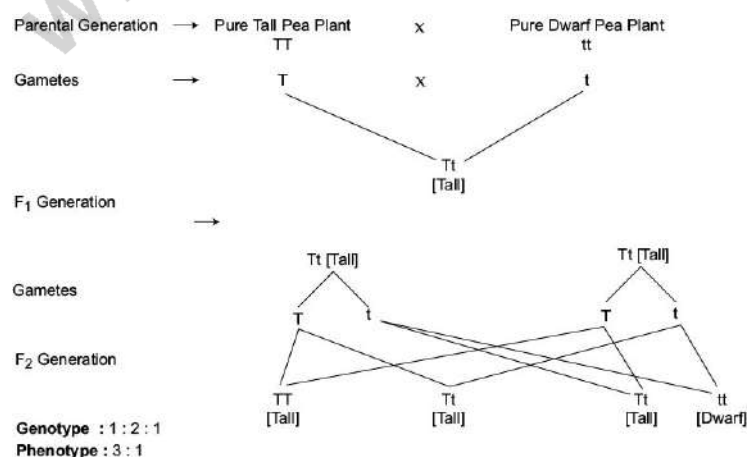
63. If a trait A exists in 10% of a population of an asexually

reproducing species and trait B exists in 60% of the same population, which trait is likely to have arisen earlier? [NCERT]

Ans. Trait B would have arisen earlier than trait A because as species are asexually reproducing, there would be very minor differences generated due to small inaccuracies in DNA copying which results in variations in trait A. But as trait B occurs in more number in the population as compared to trait A so Trait B would have arisen earlier than trait A.

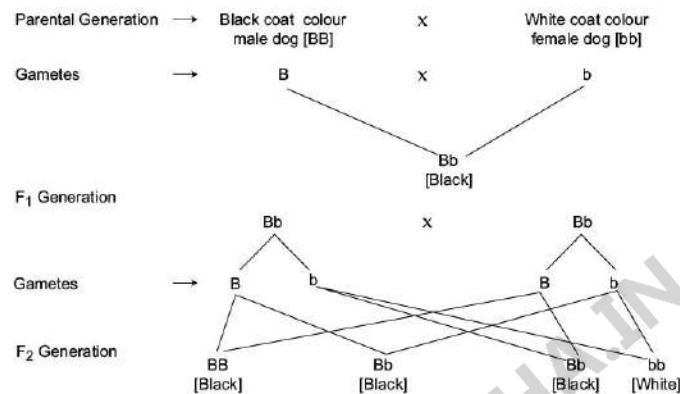
64. How do Mendel's experiments show that traits may be dominant or recessive? [NCERT]

Ans. When Mendel crossed pure tall (TT) pea plants with pure dwarf (tt) pea plants, in F₁ generation he found that all pea plants were tall (Tt). There were no dwarf plants produced in F₁ generation. When he self-pollinated these F₁ plants, in F₂ generation he obtained tall and dwarf plants in the ratio 3: 1. Thus as three-fourths of the plant in F₂ generation are tall and one-fourth is dwarf so tall is a dominant trait whereas dwarf is a recessive trait [which expressed itself only in homozygous condition]. So he concluded that for a particular trait [here in this example height of the plant] it may be dominant or recessive.



65. Outline a project which aims to find the dominant coat colour in dogs. [NCERT]

Ans. Consider a homozygous black coat colour male dog (BB) breed with homozygous white coat colour female dog (bb). In F₁ generation all dogs with black coat colour are produced. When these are again breed we get black and white coat colour dogs in F₂ generation in the ratio 3 : 1. Thus, we can say black colour is dominant over white.



66. A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of the traits blood group A or O is dominant? Why or why not? [NCERT]

Ans. No, this information is not enough to find out which blood group is dominant. Blood group A can be represented as $I^A I^A$ or $I^A I^O$ which is the father's blood group. Blood group O is represented as $I^O I^O$ which is the mother's blood group. The blood group of daughter is also O which might be inherited from her mother or father so it is difficult to assume which blood group is dominant.

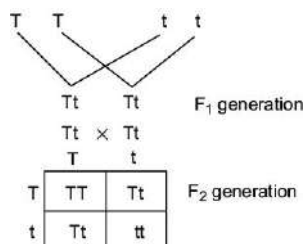
67. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F₁ and F₂ generations when he crossed the tall and short plants? Write the ratio he obtained in F₂ generation plants. [Board Question]

Ans. Mendel used pea plant (*Pisum sativum*) when he crossed tall and short plants the progeny obtained in F₁ generation were tall.

When the F_1 plants were selfed the F_2 generations showed three tall and one dwarf plant. The genotypic ratio of F_2 generation is 1: 2: 1.

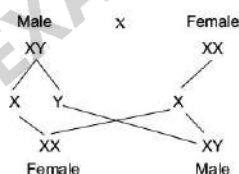
(TT: Tt: Tt: tt)

The phenotypic ratio 3: 1 (Tall: Dwarf)



68. How is the sex of the child determined in human beings?
[NCERT]

Ans. In human beings, there are two types of sex chromosome X and Y; female have XX chromosome whereas male have XY chromosome. Females produce eggs which carry only X chromosomes but males contain half of the sperms with X chromosomes and other half with Y chromosomes.



During fertilisation when X carrying sperms fuse with an egg which contains X chromosome the offsprings will be a female (XX). But when Y bearing sperms fuses with an egg (X) the offspring will be male (XY). Thus the sex of a child is determined by the type of sex chromosome X or Y received by the male gamete.

69. How is the equal genetic contribution of male and female parents ensured in the progeny?[NCERT]

Ans. Human beings contain 23 pairs of chromosomes-22 pairs are autosomes and one pair sex chromosomes. During meiosis process gametes are formed in sex cells where the chromosome number is

halved(n). At the time of fertilisation when male gamete fuses with female gamete the diploid number ($2n$) is restored back in zygote. Thus half of the chromosomes come from father and other half from mother. In this way meiosis process ensured equal genetic contribution of male and female parents in the progeny.

70. How many pairs of chromosomes are present in human beings? Out of this how many are sex chromosomes? How many types of sex chromosomes are found in human beings?

[Board Question]

Ans. There are 23 pairs of chromosomes present in human beings. One pair is sex chromosome. They are XX and XY. So there are two types of sex chromosomes.

Long Answer Type Questions

71. How do Mendel's experiments show that the:

[Board Question]

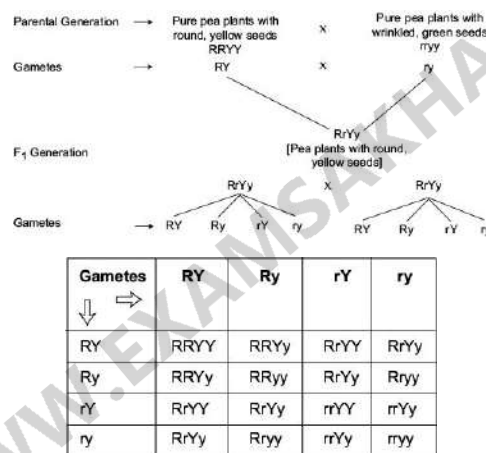
- (i) Traits may be dominant or recessive
- (ii) Traits are inherited independently.

Ans. (i) When Mendel crossed pure tall pea plants with pure dwarf pea plants in F_1 generation only tall plants were produced. When these F_1 plants were self-pollinated in F_2 generation both tall and dwarf plants were produced in the ratio of 3: 1. In F_1 generation only tall plants were found so it showed that tall is a dominant character. In F_2 generation dwarf plants appeared which shows that dwarf is a recessive trait which express only in recessive condition.

Parental Generation	→	Pure Tall Plant TT	x	Pure Dwarf Plant tt
Gametes	→	T		t
F_1 Generation		Tt		Tt
			X	
Gametes	→	Tt	Tt	
F_2 Generation	→	TT [Tall]	Tt [Tall]	Tt [Tall]
				tt [Dwarf]

(ii) When Mendel crossed pure pea plants with round, yellow seeds with pure plants with wrinkled, green seeds in F_1 generation all pea plants with round and yellow seeds were produced. This shows that round and yellow are dominant characters whereas green and wrinkled are recessive characters. Again when these F_1 plants were crossed round, yellow pea plants as well as green, wrinkled seeds pea plants were produced. But in addition to these two new characters were produced i.e., round and green, wrinkled and yellow seeds pea plants were produced.

This shows that two pair of characters combine in F_1 generation but they get separated and behave independently in F_2 generation.



Round-yellow, round-green, wrinkled-yellow, wrinkled-green – 9: 3: 3: 1

72. Answer the following questions:

(i) What are dominant and recessive traits?

[Board Question]

(ii) “Is it possible that a trait is inherited but may not be expressed in the next generation? Give a suitable example to justify this statement.

[Board Question]

Ans. (i) The trait which can express its effect over contrasting trait is called dominant trait whereas the trait which cannot express its effect over contrasting trait or which gets suppressed by the contrasting trait is called recessive trait. The inherited trait which is not expressed will be a recessive trait.

(ii) In Mendel's experiment, when pure tall pea plants were crossed with pure dwarf pea plants, only tall pea plants were obtained in F_1 generation. On selfing the pea plants of F_1 generation both tall and dwarf pea plants were obtained F_2 generation. Reappearance of the dwarf pea plants in F_2 generation proves that the dwarf trait was inherited but not expressed in F_1 generation. The recessive trait does not express itself in the presence of the dominant trait. So, it is possible that one trait may be inherited but may not be expressed in an organism.

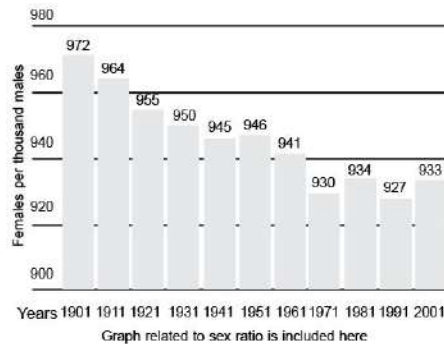
73. The sex of a new born child is a matter of chance and none of the parents may be considered responsible for it. Draw a flowchart showing determination of sex of a newborn to justify this statement.

[Board Question]

Ans. In human beings, there are two types of sex chromosome X and Y; female have XX chromosome whereas male have XY chromosome. Females produce eggs which carry only X chromosomes but males contain half of the sperms with X chromosomes and other half with Y chromosomes. During fertilisation when X carrying sperms fuse with an egg which contains X chromosome the offsprings will be a female (XX). But when Y bearing sperms fuses with an egg (X) the offspring will be male (XY). Thus, the sex of a child is determined by the type of sex chromosome X or Y received by the male gamete.

74. The given box diagram represents the ratio of females to

males or the sex ratio in our country for 10 decades (1901 to 2001). Answer the following questions in the light of your knowledge of sex determination and the data presented in the box diagram.



- (i) What does the bar diagram show?
- (ii) As per scientific knowledge regarding sex determination, what should be the sex ratio or the male to female ratio at a given point of time?
- (iii) Assign one reason to the trend showing deviation from the expected sex ratio.
- (iv) Suggest a way by which such a trend can be stopped.

Ans. (i) Bar diagram shows the proportion of females in the population over a decade.

(ii) 1:1 should be the sex ratio or the male to female ratio at a given point of time.

(iii) Female foeticide is the main reason to this trend showing deviation from the expected sex ratio.

(iv) Banning sex tests of unborn baby; increasing awareness and education will help to stop such trends.

Differentiate Between

75. Differentiate between dominant and recessive trait?

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Ans.	Dominant trait	Recessive trait
	The trait which gets expressed in F_1 generation is called dominant trait.	The trait which remains suppressed in F_1 generation, which cannot express itself in presence of dominant trait is called recessive trait.
	It gets expressed in both homozygous and heterozygous condition.	It gets expressed only when present in homozygous condition.

76. List two differences between acquired traits and inherited traits by giving an example of each.

[Board Question]

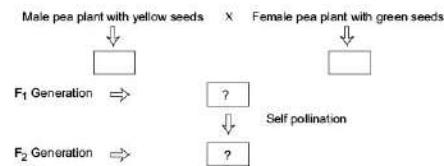
Ans.	Acquired traits	Inherited traits
	These are somatic variations and do not bring any change in DNA.	These are genetic variations and bring about changes in the DNA.
	These traits develop throughout the life time of an individual. Example, learning of dance and music.	These traits are transferred by or (inherited) by the parents to the offspring. Example, Eye colour, hair colour.

Analysis and Evaluation Based Questions

77. Study carefully the given flowchart depicting cross between pea plant with yellow seeds and pea plant with green seeds and answer the following:

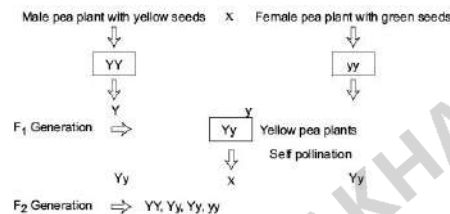
(i) What kind of cross it depicts?

(ii) In which proportions the characters will appear in F_1 and F_2 generation?

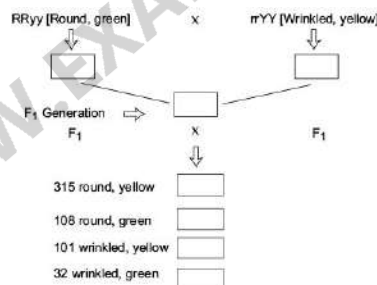


Ans. (i) It depicts monohybrid cross.

(ii) In F_1 generation all pea plants with yellow seeds will be produced whereas in F_2 generation pea plants with yellow and green seeds in the ratio 3:1 will be produced.



78. Following is the experiment carried out by Mendel to study inheritance of two traits in garden pea.

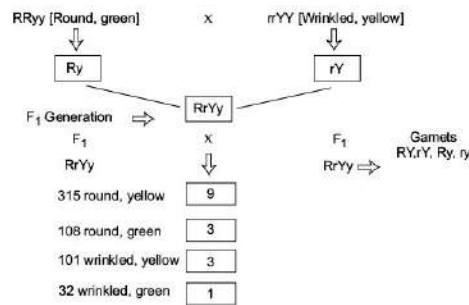


(i) Fill the boxes.

(ii) Why did Mendel carry experiment with two traits?

(iii) What were his findings with respect to inheritance of traits in F_1 and F_2 generations?

Ans. (i)



(ii) Mendel carried out experiment with two traits to study the independent assortment of characters during inheritance.

(iii) In F_1 generation though both the traits were inherited but only dominant traits [*i.e.*, round, yellow characters] are expressed, the recessive traits, [wrinkled, green] were not expressed. But in F_2 generation both dominant and recessive traits were expressed in the ratio 9: 3: 3: 1.

79. The rules for inheritance of such traits in human beings are related to the fact that both the father and the mother contribute practically equal amounts of genetic material to the child. This means that each trait can be influenced by both paternal and maternal DNA.

(i) What is inheritance?

(ii) Who gave the three laws of inheritance?

(iii) What is the meaning of paternal and maternal DNA?

(iv) What is the phenotypic ratio of the dihybrid cross?

Ans. (i) Traits of organisms can pass from the parents to their offspring, and this mechanism is known as an inheritance.

(ii) Gregor Mendel was a monk, and he discovered three laws that describe the inheritance of factors from parents to offsprings.

(iii) The parental DNA is defined as the DNA that is received from the father while the DNA that is received by the mother is called the maternal DNA.

(iv) Gregor Mendel discovered that the dihybrid cross yields a phenotypic ratio of 9: 3: 3: 1.

Practical Based Questions

80. In a monohybrid cross between tall pea plants (TT) and short pea plants (tt) a scientist obtained only tall pea plants (Tt) in the F₁ generation. However on selfing the F₁ generation pea plants he obtained both tall and short plants in F₂ generation. On the basis of above observations with other angiosperms also can the scientist arrive at a law? If yes, explain the law. If not, give justification for your answer.

[Board Question]

Ans. Yes, the scientist arrive at Law of Dominance according to which the trait that gets expressed in F₁ generation is dominant and the trait which gets expressed along with dominant trait in F₂ generation is recessive trait which express itself only in homozygous condition.

Application Based Questions

81. Guinea pig having black colour when crossed with a guinea pig having same colour produced 80 offspring, out of which 60 were black and 20 were white. Now find out:

- (i) What is the possible genotype of the guinea pigs?
- (ii) Which trait is dominant and which trait is recessive?
- (iii) What is this cross called and what is its phenotypic ratio?

Ans. (i) The possible genotype of the guinea pigs is Bb × Bb.

(ii) Black colour is dominant and white colour is recessive.

(iii) This is an example of monohybrid cross and its phenotypic ratio is 3 : 1.

82. A woman with blonde curly hair married a man with black soft hair. All of their children in first generation had black soft hair but in next generation children had different combinations in the ratio of 9 : 3 : 3 : 1. State the law that governs this expression.

Ans. Law of independent assortment governs this expression which states that inheritance of factors controlling a particular trait in an organism are independent of each other i.e., during the time of reproduction two pairs of factors of each of the two traits in a dihybrid cross segregate independently during gamete formation and randomly formed combinations in F_2 generations.

83. Mrs. Joshi, an eight months pregnant lady was suggested by her doctor to get an ultrasound done. She went to a radiologist with her husband and got the ultrasound done. When the ultrasound was done, her husband asked doctor about the sex of the baby in the womb.

- (i) Is it ethical to determine the sex of the foetus? Why?
- (ii) What is the chance of giving birth to a girl child in human beings?
- (iii) What has government done to stop female foeticides?

Ans. (i) No, it is not ethical to determine the sex of the foetus because sex determination may lead to female foeticides which results in death of a girl child and thus the sex ratio becomes unbalanced in the society.

- (ii) The chance of giving birth to a girl child in human beings is 50%.
- (iii) Government has imposed a ban on sex determination techniques to stop female foeticides.



84. Ram met with an accident. John his school mate takes him to the hospital where Ram (AB blood group) needs blood

transfusion. John also has AB blood group and is willing to donate his blood but Ram's mother objects by saying "John belongs to different community so has different type of blood". Give your opinion about Ram's mother views.

Ans. Blood group does not depend on community, same blood group is same for all communities. Blood group AB has two alleles A and B in the people of all communities.

85. Study the table given below and answer the questions.

Characters	Males	Females
Total number of chromosomes	23 pairs	23 pairs
Number of autosome	22 pairs	22 pairs
Number of sex chromosome	1 pair	1 pair

- (i) What is sex determination?
- (ii) What are the sex chromosomes in the males?
- (iii) What are the sex chromosomes in the females?
- (iv) Is the father responsible for the sex of the child?

Ans. (i) The process by which the sex of a newborn organism is detected is called sex determination.

(ii) The males have two sex chromosomes which are X and Y.

(iii) The sex chromosomes in the females are X and X.

(iv) Yes, it is the father that gives either the X or Y chromosome to the child. In case, the child receives the X chromosome from the father, then it has XX chromosome, and it develops into a female child. However, if the father gives Y chromosome, then the child

develops into a male as it gets XY chromosome.

Self-Assessment

86. Riya met with an accident. Aastha his schoolmate takes him to the hospital where Riya (AB blood group) needs blood transfusion. Aastha also has AB blood group and is willing to donate his blood but Riya's mother objects by saying "Aastha belongs to different community so has different type of blood". Give your opinion about Riya's mother views.

87. Which of the following represent the round shaped and green coloured seeds of pea plant? [rrYY, RrYy, RRyy, Rryy]

88. A pea plant with blue colour flower denoted by BB is cross bred with a pea plant with white flower denoted by ww.

(i) What is the expected colour of the flowers in F₁ progeny?

(ii) What will be the % of plants bearing white flower in F₂ generation when the flowers of F₁ plants were selfed?

(iii) State the expected ratio of the genotype BB and Bw in the F₂ progeny.

89. Explain Mendel's experiment with peas on inheritance of characters considering only one visible contrasting characters.

90. Answer the following:

(i) Define dominant and recessive traits.

(ii) Why are two letters like TT, Tt, tt are used to denote the character of height?

(iii) If a purple pea plant (PP) is crossed with a white coloured pea plant (pp), will we have white flowered pea plant in F₁ generation? Why?

91. A husband has 46 chromosomes and his wife also has 46

chromosomes. Then why do not their offsprings have 46 pairs of chromosomes which are obtained by fusion of male and female gametes?

WWW.EXAMSAKHA.IN

Light : Reflection and Refraction

Chapter 10

Summary

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LIGHT

Light is a form of energy that causes the sensation of vision.

Reflection

- The return of light into the same medium after striking a surface is called **reflection**.

Laws of Reflection

- The incident ray, the reflected ray and the normal all lie in the same plane.
- The angle of reflection is always equal to the angle of incidence.

Important Points

- When the reflecting surface is smooth, the parallel rays of light falling on it are reflected in one direction. This is called **regular reflection**.
- When the reflecting surface is rough, the parallel rays of light falling on it are reflected in different directions. This is called **irregular reflection**.

Refraction

- The change in direction of light when it passes from one medium to another obliquely, is called **refraction of light**.
- The refraction of light is due to the change in the speed of light on going from one medium to another.

Laws of Refraction

- The incident ray, the refracted ray and the normal at the point of incidence, all lie in the same plane.
- The ratio of sine of angle of incidence to the sine of angle of refraction is constant for a given pair of media.

Important Points

- A medium in which the speed of light is more is known as optically **rarer medium**.
- A medium in which the speed of light is less, is known as optically **denser medium**.
- When a ray of light goes from a rarer medium to a denser medium, it bends towards the normal and when it goes from denser to rarer medium, it bends away from the normal.
- The refractive index of medium 2 with respect to medium 1 is equal to the ratio of speed of light in medium 1 to the speed of light in medium 2.

TYPES OF MIRRORS

Plane Mirror

- A plane mirror is a thin, flat and smooth sheet of glass having a shining coating of silver metal on one side.
- It is represented by a straight line having a number of short, oblique lines on one side.

Characteristics

- The image formed is virtual and erect.
- The image is of the same size as the object.
- The image is at the same distance behind the mirror as the object is in front of the mirror.
- The image formed is laterally inverted.

Uses

- These are used to see ourselves, in making periscopes etc.

Important Points

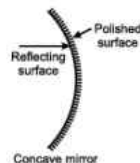
- Anything which gives out light rays is called an **object**.
- Image** is an optical appearance produced when light rays coming from an object are reflected from a mirror.
- The image which can be obtained on a screen is called a **real image**.
- The image which cannot be obtained on a screen is called a **virtual image**.

Spherical Mirror

- A spherical mirror is that mirror whose reflecting surface is the part of a hollow sphere of glass.

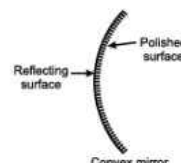
Concave Mirror

- A spherical mirror in which the reflection of light takes place at the concave surface (or bent-in surface).



Convex Mirror

- A spherical mirror in which the reflection of light takes place at the convex surface (or bulging-out surface).



CONCAVE MIRROR

Rules for image formation

- Rays, parallel to the principal axis, get reflected back through focus.
- Rays, passing through the focus, will emerge parallel to the principal axis after reflection.
- Rays from the centre of curvature get reflected back along its own path.
- A ray of light incident obliquely at pole gets reflected at the same angle on the other side of principal axis into the same medium.

Uses

These are used as shaving mirrors, reflectors in torches, doctor's head-mirrors etc.

Image formation by a concave mirror for different positions of the object

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F	Highly diminished, point-sized	Real and inverted
Beyond C	Between F and C	Diminished	Real and inverted
At C	At C	Same size	Real and inverted
Between F and C	Beyond C	Enlarged	Real and inverted
At F	At infinity	Highly enlarged	Real and inverted
Between P and F	Behind the mirror	Enlarged	Virtual and erect

CONVEX MIRROR

Rules for image formation

- Rays parallel to principal axis, get reflected and appear to come from the principal focus.
- Rays going towards the principal focus, will emerge parallel to the principal axis after reflection.
- Rays from the centre of curvature get reflected back along its own path.
- A ray of light incident obliquely at pole gets reflected at the same angle on the other side of principal axis into the same medium.

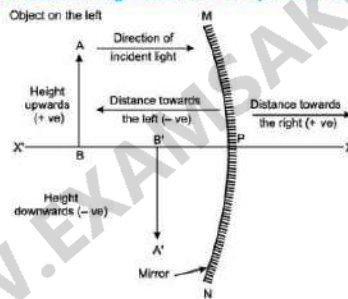
Uses

These are used as rear-view mirrors in vehicles and shop security mirrors etc.

Image formation by a convex mirror for different positions of the object

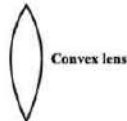
Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F, behind the mirror	Highly diminished, point-sized	Virtual and erect
Between infinity and the pole P of the mirror	Between P and F, behind the mirror	Diminished	Virtual and erect

New Cartesian Sign Convention for Spherical mirrors



Convex Lens

- It is thick at the centre but thinner at the edges.
- It converges light rays.

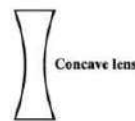


Spherical Lenses

A lens is a piece of transparent glass bound by two spherical surfaces.

Concave Lens

- It is thin in the middle but thicker at the edges.
- It diverges light rays.



CONVEX LENS

Image formation rules

- Rays parallel to principal axis, will pass through second principal focus after refraction.
- Rays passing through the focus will emerge parallel to the principal axis after refraction.
- Rays passing through the optical centre, will emerge without any deviation after refraction through the lens.

Uses
These are used in making microscopes, telescopes, slide projectors, magnifying glass etc.

Image formation by a convex lens for different positions of the object

Position of the object	Position of the image	Relative size of the image	Nature of the image
At infinity	At the focus F_2	Highly diminished, point-sized	Real and inverted
Beyond $2F_1$	Between F_2 and $2F_2$	Diminished	Real and inverted
At $2F_1$	At $2F_2$	Same size	Real and inverted
Between F_1 and $2F_1$	Beyond $2F_2$	Enlarged	Real and inverted
At focus F_1	At infinity	Infinitely large or Highly enlarged	Real and inverted
Between focus F_1 and optical centre O	On the same side of the lens as the object	Enlarged	Virtual and erect

CONCAVE LENS

Image formation rules

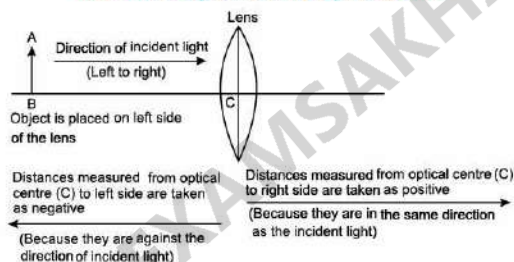
- Rays parallel to principal axis appear to diverge from the principal focus, which is located on the same side of the incident ray.
- Ray going towards the principal focus, will emerge parallel to the principal axis after refraction.
- Rays passing through the optical centre will emerge without any deviation after refraction through the lens.

Uses
These lenses are used in spectacles to correct the defect of vision, wide-angle spy hole in doors etc.

Image formation by a concave lens for different positions of the object

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F_1	Highly diminished, point-sized	Virtual and erect
Between infinity and Optical centre O of lens	Between focus F_1 and optical centre O	Diminished	Virtual and erect

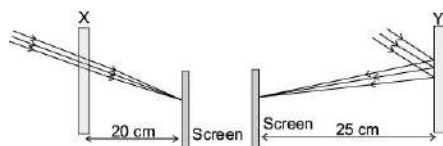
New Cartesian Sign Convention for Spherical Lenses



Multiple Choice Questions

1. Study the given ray diagrams and select the correct statement from the following :

[Board Question]



- (a) Device X is a concave mirror and device Y is a convex lens, whose focal lengths are 20 cm and 25 cm respectively.
- (b) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 10 cm and 25 cm respectively.
- (c) Device X is a concave lens and device Y is a convex mirror, whose focal lengths are 20 cm and 25 cm respectively.
- (d) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 20 cm and 25 cm respectively.

Ans. (d) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 20 cm and 25 cm respectively.

Explanation :

Since, for device X the light rays are coming from a object at infinity passes through the device X and forms a real image on a screen on right side. Since, convex lens forms a real and inverted image at focus when object is at infinity. So, device X is converging lens or convex lens of focal length 20 cm.

For device Y, the beam of parallel rays from infinity is incident on the left side and after reflection a real image is formed on the screen. This device should be a mirror. Also, the light rays are getting converged, so mirror is converging in nature it is a concave mirror of focal length 25 cm.

2. A student obtains a blurred image of a distant object on a screen using a convex lens. To obtain a distinct image on the screen he should move the lens :

- (a) away from the screen
- (b) towards the screen
- (c) to a position very far away from the screen.

(d) either towards or away from the screen depending upon the position of the object.

Ans. (b) towards the screen

Explanation :

As in order to get a sharp image the screen should be near to lens.

3. Suppose you have focussed on a screen the image of candle flame placed at the farthest end of the laboratory table using a convex lens. If your teacher suggests you to focus the parallel rays of the Sun, reaching your laboratory table, on the same screen, what you are expected to do is to move the :

- (a) lens slightly towards the screen
- (b) lens slightly away from the screen
- (c) lens slightly towards the sun
- (d) lens and screen both towards the sun

Ans. (a) lens slightly towards the screen

Explanation :

Since, candle is at the farthest end but not at the infinity. So, image will be formed between focus and centre of curvature of lens, but parallel rays from sun will converge at the focus. So, the distance between lens and screen should be reduced to get the image of the Sun.

4. Rays from sun converge at a point 15 cm in front of a concave mirror. Where should an object be placed so that size of its image is equal to the size of the object? [\[NCERT Exemplar\]](#)

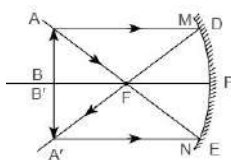
- (a) 15 cm in front of the mirror
- (b) 30 cm in front of the mirror
- (c) Between 15 cm and 30 cm in front of the mirror
- (d) More than 30 cm in front of the mirror

Ans. (b) 30 cm in front of the mirror

Explanation :

In case of a concave mirror, image size becomes equal to the object size when the object distance equals to the radius of curvature *i.e.*, twice the focal length.

So, the object has to be placed at a distance of $(15 \times 2) = 30$ in front of a concave mirror.



5. What is not a characteristic of a rear view mirror in a car ?

- (a) Convex in nature
- (b) Concave in nature
- (c) They have wider field of coverage
- (d) They give a virtual image

Ans. (b) Concave in nature

Explanation :

As rear view mirror is a convex mirror. It has wider field of coverage and gives a virtual, erect and diminished image of an object.

6. Which of the following statement is incorrect ?

- (a) The bending of a ray of light on passing from different media to one is called reflection.
- (b) The phenomenon of splitting of white light into seven constituent colours is known as the dispersion of light.
- (c) Refractive index of medium depends upon its temperature.
- (d) Refractive index is directly proportional to the density of the medium.

Ans. (a) The bending of a ray of light on passing from different

media to one is called refraction.

Explanation :

Bending of a ray of light on passing from one media to another is called refraction.

7. A piece of red cloth when suitably illuminated may look black, but a piece of black cloth will never appear red. This phenomenon occurs because :

- (a) Black cloth reflects only black light
- (b) Black absorbs all the colours
- (c) Black cloth reflects all colours
- (d) Red cloth reflects all colours

Ans. (b) Black absorbs all the colours

Explanation :

Black colour is a good absorber.

8. Consider four mediums P, Q, R and S whose refractive indices are 2.14, 1.99, 2.98, and 2.16 respectively. Assume that if light travels from one medium to another. The rate of change will be utmost in which medium.

- (a) P to Q (b) Q to R
- (c) R to S (d) S to P

Ans. (b) Q to R

Explanation :

As the difference in refractive indices is maximum.

9. The refractive index (n) of a colourless, volatile, non-polar solvent is 1.24 to the refractive index of a solid ice cube. The unmitigated refractive index of the ice cube is 1.31. Enumerate the unmitigated refractive index of the non-polar solvent.

- (a) 1.6522 (b) 1.3241

(c) 1.6244 (d) 1.2401

Ans. (c) 1.6244

Explanation :

$$\mu_p = \frac{\mu_p}{\mu_i}$$

$$\Rightarrow 1.24 = \frac{\mu_p}{1.31}$$

$$\Rightarrow \mu_p = 1.31 \times 1.24$$

$$= 1.6244$$

10. Which of the following mirror is used by a dentist to examine a small cavity?

- (a) Convex mirror
- (b) Plane mirror
- (c) Concave mirror
- (d) Combination of convex and concave mirror

Ans. (c) Concave mirror

Explanation :

As concave mirror gives the dentist a magnified reflection of the mouth while also refracting a bit of light. It forms a image in the mirror as larger, brighten and for the dentist easier to see.

11. When light falls on a smooth polished surface, most of it?

- (a) Is reflected in the same direction
- (b) Is reflected in different direction
- (c) Is scattered in all direction
- (d) Is refracted into the second medium

Ans. (a) Is reflected in the same direction

Explanation :

This type of reflection is known as regular or specular reflection.

12. A student very cautiously traces the path of a ray through a glass slab for different values of the angle of incidence ($\angle i$). He then measures the corresponding values of the angle of refraction ($\angle r$) and the angle of emergence ($\angle e$) for every value of the angle of incidence. On analysing these measurements of angles, his conclusion would be :

(a) $\angle i > \angle r > \angle e$

(b) $\angle i = \angle e > \angle r$

(c) $\angle i < \angle r < \angle e$

(d) $\angle i = \angle e < \angle r$

Ans. (b) $\angle i = \angle e > \angle r$

Explanation :

As angle of incidence is equal to angle of emergence when light ray is passed through the prism, and angle of refraction is smaller than two.

13. Three students A, B and C focussed a distant building on a screen with the help of a concave mirror. To determine focal length of the concave mirror they measured the distances as given below : [Board Question]

Student A : From mirror to the screen

Student B : From building to the screen

Student C : From building to the mirror

Who measured the focal length correctly ?

(a) Only A

(b) Only B

(c) A and B

(d) B and C

Ans. (a) Only A

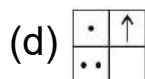
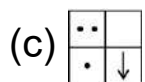
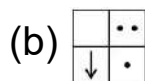
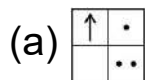
Explanation :

A concave mirror always forms the image of a distant object at its focus.

14. If you focus the image of a distant object, whose shape is given below, on a screen using a convex lens. [\[Board Question\]](#)



The shape of the image of this object on the screen would be :

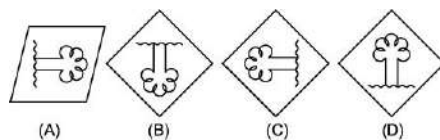


Ans. (c)

Explanation :

Since, the image formed is inverted.

15. A student is performing the experiment of determining the focal length of a given concave mirror by focussing a distant tree on a screen. Which one of the following kinds of images he is likely to obtain on the screen ?



(a) (A)

(b) (B)

(c) (C)

(d) (D)

Ans. (b)



Explanation :

The image formed by concave mirror is real and inverted.

16. A student has focussed on the screen of distant building using a convex lens. If he has selected a blue coloured building as object, select from the following options the one which gives the correct characteristics of the image formed on the screen.

- (a) Virtual, erect, diminished and green shade
- (b) Real, inverted, diminished and in violet shade
- (c) Real, inverted, diminished and in blue shade
- (d) Virtual, inverted, diminished and in blue shade

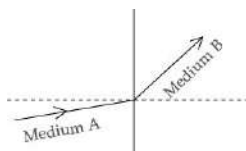
Ans. (c) Real, inverted, diminished and in blue shade

Explanation :

As the image is focussed on screen, the image will be real, inverted and diminished but the colour of the image will remain same.

17. A light ray enters from medium A to medium B as shown in figure. The refractive index of medium B relative to A will be:

[NCERT Exemplar]



- (a) greater than unity
- (b) less than unity
- (c) equal to unity
- (d) zero

Ans. (a) greater than unity

Explanation :

As the light ray when travelled from medium A to medium B, then they bend towards the normal which means that medium B has higher refractive index and less speed of light with respect to medium A, So, refractive index of medium B w.r.t. medium A will be greater than unity.

18. An optical device has been given to a student and he determines its focal length by focusing the image of the sun on a screen placed 24 cm from the device on the same side as the sun. Select the correct statement about the device.

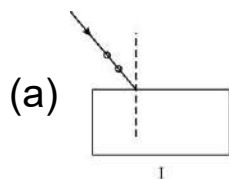
- (a) Convex mirror of focal length 12 cm
- (b) Convex lens of focal length 24 cm
- (c) Concave mirror of focal length 24 cm
- (d) Convex lens of focal length 12 cm

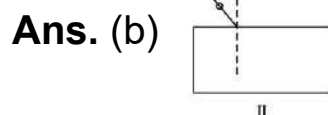
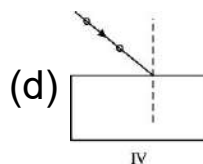
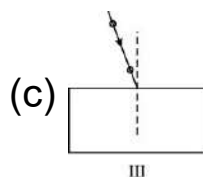
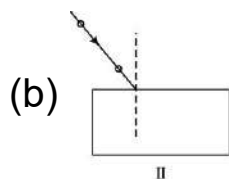
Ans. (c) Concave mirror of focal length 24 cm

Explanation :

The optical device is a concave mirror because when light rays from a distant object (like Sun) fall on this mirror, its image is formed at the focus of the mirror on same side as the object. Thus, the distance between the mirror and the screen is the focal length of the concave mirror. Hence, focal length of given device is 24 cm.

19. Select from the following the best experimental set-up for tracing the path of a ray of light through a glass slab : [Board Question]

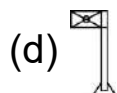
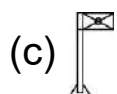
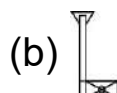
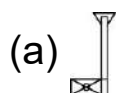





Explanation :

To achieve best experimental set-up for tracing the path of a ray of light through a glass slab, the point of incidence should be in the middle of the glass slab and the incident angle should be close to 45° .

20. When you focus the image of a distant flag, whose shape is given below, on a screen using a convex lens, the shape of the image as it appears on the screen is:



Ans. (a) 

Explanation :

As image is focused on the screen, then the image formed is real. And real images are inverted.

21. A student determines the focal length of a device 'X' by focusing the image of a distant object on a screen placed 20 cm from the device on the same side as the object.

The device 'X' is:

- (a) Concave lens of focal length 10 cm
- (b) Convex lens of focal length 20 cm
- (c) Concave mirror of focal length 10 cm
- (d) Concave mirror of focal length 20 cm

Ans. (d) Concave mirror of focal length 20 cm

Explanation :

In case of the concave mirror, the image will be formed on the same side of the screen at its focus point when object is distant.

22. A teacher sets up the stand carrying a convex lens of focal length 15 cm at 42.7 cm mark on the optical bench. He asks four students A, B, C and D to suggest the position of screen on the optical bench so that a distinct image of a distant tree is obtained immediately on it. The positions suggested by the students were as :

- (A) 12.7 cm
- (B) 29.7 cm
- (C) 57.7 cm
- (D) 72.7 cm

The correct position of the screen was suggested by:

(a) (A)

(b) (B)

(c) (C)

(d) (D)

Ans. (c) 57.7 cm

Explanation :

Focal length of convex lens

$$f = 15 \text{ cm}$$

It is placed at 42.7 cm mark on optical bench.

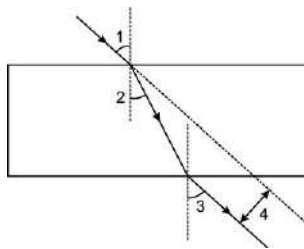
When we want the distant objects to be focused, we get image at focus of convex lens.

Because rays from distant object are parallel rays and they get converged at focus.

... Position of screen = 42.7 + 15

= 57.7 cm

23. A student has traced the path of a ray of light through a glass slab as follows. If you are asked to label 1, 2, 3 and 4, the correct sequencing of labeling $\angle i$, $\angle e$, $\angle r$ and lateral displacement respectively is :



(a) 2, 1, 3, 4

(b) 1, 2, 3, 4

(c) 1, 3, 2, 4

(d) 1, 3, 4, 2

Ans. (c) 1, 3, 2, 4

Explanation :

Here 1 is angle of incidence, 3 is angle of emergence, 2 is the angle of refraction and 4 is the lateral displacement.

24. In an experiment to trace the path of a ray of light through a triangular glass prism, a student would observe that the emergent ray :

- (a) is parallel to the incident ray.
- (b) is along the same direction of incident ray.
- (c) gets deviated and bends towards the thinner part of the prism.
- (d) gets deviated and bends towards the thicker part (base) of the prism.

Ans. (d) gets deviated and bends towards the thicker part (base) of the prism.

Explanation :

Student will observe that the emergent ray gets deviated and bends towards the thick parts (*i.e.*, base) of the prism.

25. Focal length of plane mirror is:

- (a) at infinity
- (b) zero
- (c) negative
- (d) None of these

Ans. (a) at infinity

Explanation :

A plane mirror is a flat, reflecting surface. Thus, in case of plane mirror, when the parallel rays of light strike the mirror they get reflected back parallel to each other. So, they never meet, so we can say that they meet at infinity. So, the focal length of the plane mirror

is infinity.

Assertion and Reasoning Based Questions

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.
- (c) Assertion is true but reason is false.
- (d) Assertion is false but reason is true.

26. Assertion : The nature of the image formed by a concave mirror is real and inverted.

Reason : The image formed by a concave mirror depends on the position of the object at infinity.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

When the object is placed at an infinity position, the image formed by a concave mirror will be placed at the focus. Then the size of the image will be highly diminished and point-size. So, the nature of the image formed by the concave mirror is real and inverted. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

27. Assertion : Convex mirrors are used for rear view on vehicles.

Reason : The size of the image formed by a convex mirror will be same.

Ans. (c) Assertion is true but reason is false.

Explanation :

Convex mirrors are used for rear view on vehicles. We use only convex mirrors for rear view. Convex mirrors will always give erect and diminished image of the object. They provide a wider field for clear view. For this reason, the convex mirrors are fitted on both sides of the vehicles. Thus, the assertion is true but reason is false.

28. Assertion : Light bends from its path when it goes from one medium to another medium.

Reason : Speed of light changes, when it goes from one medium to another medium.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

When the light travels from one medium to another, its speed changes so, it bends from its path. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

29. Assertion : The path of light passing through the colloidal solution becomes not visible.

Reason : The large particle size does not come its way.

Ans. (d) Assertion is false but reason is true.

Explanation :

We know that the path of light passing through a colloidal solution becomes visible because light is scattered by relatively larger particles. But the path of light passing through a clear solution is not visible because of small particle size do not come its way. Thus, assertion is false but reason is true.

30. Assertion : When a ray of light travels from air to water, its speed will increase.

Reason : The speed of light is slower in a denser medium than in a rarer medium.

Ans. (d) Assertion is false but reason is true.

Explanation :

When a ray of light travels from air to water, its speed slows down because we know that the velocity is slower in a denser medium (water) to rarer medium (air). Thus, assertion is false but reason is true.

31. Assertion : A ray of light that travels obliquely from one transparent medium into another will change its direction in the second medium.

Reason : Refraction is due to change in the speed of light as it enters from one transparent medium to another.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

A ray of light that travels obliquely from one transparent medium to another will change its direction in the second medium. It is nothing but the process called refraction. This occurs due to change in the speed of light as it enters from one transparent medium to another. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

32. Assertion : The refractive index of kerosene is 1.44 which is optically denser than water.

Reason : The mass density of kerosene is lesser than water.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

We know that the refractive index of kerosene is 1.44 and the refractive index of water is 1.33. It shows that kerosene is optically denser than water. But the mass density of kerosene is lesser than water. So, there is no relation between mass density and optical density. Therefore, it clearly defines that an optically denser medium may not possess greater mass density. Thus, the given assertion and reason are correct but reason is not the correct explanation of assertion.

33. Assertion: Owls can move freely during night.

Reason: They have large number of rods on their retina.

Ans. (c) Assertion is true but reason is false.

Explanation :

Owls can move freely during night, because they have large number of cones on their retina which help them to see in night. Thus, assertion is true but reason is false.

34. Assertion: The air bubble shines in water.

Reason: Air bubble in water shines due to refraction of light.

Ans. (c) Assertion is true but reason is false.

Explanation :

Shining of air bubble in water is on account of total internal reflection. Thus, assertion is true but reason is false.

35. Assertion: Large concave mirrors are used to concentrate sunlight to produce heat in solar cookers.

Reason: Concave mirror converges the light rays falling on it to a point.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

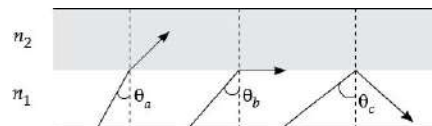
Concave mirror converge the light rays falling on it to a point. So large concave mirrors are used to concentrate sunlight to produce heat in solar cookers. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

Case Based Questions

36. Read the passage carefully and answer the following questions from (i) to (v).

This figure shows a light ray travelling from medium with refractive index n_1 to a different medium with refractive index n_2 . It shows the

bending of light ray due to a change in medium which is called 'Refraction'. It also shows formation of a 'Critical Angle' and the phenomena of 'Total Internal Reflection (TIR)'. The Refractive Index of a medium depends upon the refractive index of the surroundings, optical density, wavelength of the light and temperature. Lower the refractive index, faster the velocity of light.



(i) Which is correct if total internal reflection occurs in medium 1 (with refractive index n_1)?

- (a) $n_2 > n_1$
- (b) $n_1 = n_2$
- (c) $n_1 > n_2$
- (d) TIR does not depend upon refractive index

Ans. (c) $n_1 > n_2$

(ii) The measure of how much light bends in a medium is?

- (a) refraction
- (b) refractive index
- (c) magnification
- (d) scattering

Ans. (b) refractive index

(iii) Refractive index of ethanol is 1.361 and it is known that benzene is optically denser than ethanol. Which could be the refractive index of benzene:

- (a) 1.350
- (b) 1.281
- (c) 1.333
- (d) 1.501

Ans. (d) 1.501

(iv) Refractive index does not depend upon:

- (a) temperature
- (b) frequency of light
- (c) optical density of material
- (d) pressure at constant density

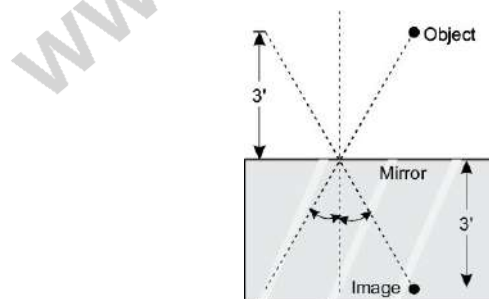
Ans. (d) pressure at constant density

(v) Diamond sparkles more than a similar cut glass piece. Reason being:

- (a) more cuts on the diamond are possible than that of a glass piece
- (b) dispersion of light shown by diamond as compared with glass
- (c) more total internal reflection due to greater refractive index of diamond
- (d) diamond's critical angle with reference to air is too small

Ans. (c) more total internal reflection due to greater refractive index of diamond

37. Read the passage carefully and answer the following questions from (i) to (v).



When you look at yourself in a mirror, you see your own image as if your exact twin are standing in front of you, but reversed right to left. The image appears as far into the mirror as you are in front of the mirror. If you step back, so does your image.

Image appears in mirrors because of how light is reflected by mirrors. As light is reflected from all surfaces, not just mirrors. But

not all surfaces from images. The reason is the two types of reflections.

(i) For a plane mirror image formed is:

(I) erect and virtual

(II) same size as the object

(III) laterally inverted

(a) only I is correct

(b) only II is correct

(c) II and III are correct

(d) All I, II and III are correct

Ans. (d) All I, II and III are correct

(ii) Match the following columns:

Column 'A' Column 'B'

(I) Plane mirror (P) virtual image

(II) Real image (Q) cannot be taken on screen

(III) Virtual image (R) can be taken on screen

(IV) Convex mirror (S) lateral inversion

(a) I–R, II–S, III–P, IV–Q

(b) I–P, II–Q, III–R, IV–S

(c) I–S, II–R, III–Q, IV–P

(d) I–Q, II–R, III–S, IV–P

Ans. (c) I–S, II–R, III–Q, IV–P

(iii) In a plane mirror, the image formed is:

(a) behind the mirror

(b) in front of the mirror

- (c) both (a) and (b)
- (d) none of the above

Ans. (a) behind the mirror

(iv) A plane mirror reflects a pencil of light to form a real image. Then the pencil of light incident on the mirror is:

- (a) parallel
- (b) convergent
- (c) divergent
- (d) none of these

Ans. (b) convergent

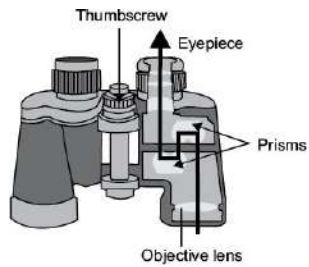
(v) What should be the angle between two plane mirrors so that whatever be the angle of incidence, the incident ray and the reflected ray from the two mirrors be parallel to each other?

- (a) 60°
- (b) 90°
- (c) 120°
- (d) 175°

Ans. (b) 90°

38. Read the passage carefully and answer the following questions from (i) to (v):

Binoculars, like telescopes, produce, magnified images of far away objects. Figure shows a typical binocular design. Each side of the binoculars is like a small telescope: light enters a convex objective lens, which inverts the image. The light then travels through two prisms that which is used to completely reflect the incoming ray to invert the image again, so that the viewer sees an image that is upright compared to the object.



(i) Binocular is basically a:

- (a) microscope
- (b) telescope
- (c) dispersion device
- (d) magnifying glass

Ans. (b) telescope

(ii) Prisms are used in binoculars:

- (a) for reflection
- (b) for refraction
- (c) for dispersion
- (d) for total internal reflection

Ans. (d) for total internal reflection

(iii) Binoculars are used to see:

- (a) near objects
- (b) far objects
- (c) both near and far object
- (d) None of the above

Ans. (b) far object

(iv) Refractive index of air is:

- (a) 1.00
- (b) 0.5
- (c) 1.5

(d) 2.0

Ans. (a) 1.00

(v) The lens facing object in binocular is called:

(a) object lens

(b) objective lens

(c) intermediate lens

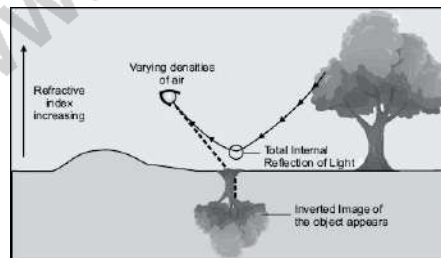
(d) eye lens

Ans. (b) objective lens

39. Read the passage carefully and answer the following questions from (i) to (v).

Light is a form of energy that produces in the sensation of sight. Reflection of light is the phenomenon of bouncing back of light in the same medium on striking the surface of any object.

The two laws of reflection are the incident ray, the reflected ray and the normal (at the point of incidence), all lie in the same plane and the angle of reflection (r) is always equal to the angle of incidence (i). Refraction of light is the phenomenon of change in the path of light in going from one medium to another.



(i) Mirage is caused due to.....

(a) total Internal Reflection of light by the various layers of air

(b) illusion of the presence of water

(c) result of refraction of light from a non uniform medium

(d) during sunny days when driving on a roadway

Ans. (a) Total Internal Reflection of light by the various layers of air

(ii) What is mirage?

- (a) Depends on the position of object
- (b) Mirror is concave and the lens is convex
- (c) Goes straight into the second medium
- (d) Optical illusion caused due to Total Internal Reflection

Ans. (d) Optical illusion caused due to total internal reflection

(iii) What are the two types of mirage?

- (a) Thin mirage and thick mirage
- (b) Inferior mirage and superior mirage
- (c) Intense mirage and diminished mirage
- (d) Light mirage and dark mirage

Ans. (b) Inferior mirage and superior mirage

(iv) How a mirage is formed?

- (a) Between focus and centre of curvature
- (b) Is formed away from the normal
- (c) Illusion of the presence of water and is a result of refraction of light from a non-uniform medium
- (d) Is reflected along the same path

Ans. (c) Illusion of the presence of water and is a result of refraction of light from a non-uniform medium

(v) Mirage is observed mainly during _____ days.

- (a) Sunny
- (b) Winter
- (c) Spring
- (d) Hot

Ans. (a) Sunny

40. Read the passage carefully and answer the following questions from (i) to (v).

Rear view mirror is a device that allows the driver to see rearward. It usually finds its place at the top of windscreen in side of the cabin. This device is one of the most basic but essential safety devices in the vehicle. It provides assistance to the driver during overtaking, parking in reverse gear etc. Generally, vehicles also have a pair of mirrors attached to the body from outside. They are popular as 'side mirrors' or Outer Rear View Mirrors (ORVM) which serve the same purpose.

Almost all modern cars mount their side mirrors on the doors—normally at a pillar rather than the wings (the portion of the body above the wheel well).



(i) For a real object, which of the following can produce a real image?

- (a) Plane mirror
- (b) Concave mirror
- (c) Convex mirror
- (d) None of the above

Ans. (b) Concave mirror

(ii) An object at a distance of +15 cm is slowly moved towards the pole of a convex mirror. The image will get...

- (a) shortened and real
- (b) enlarged and real
- (c) enlarge and virtual
- (d) diminished and virtual



Ans. (d) diminished and virtual


(iii) A convex mirror is used:

- (a) by a dentist
- (b) for shaving
- (c) as a rear view mirror in vehicles
- (d) as a light reflector for obtaining a parallel beam of light

Ans. (c) as a rear view mirror in vehicles

(iv) The word 'AMBULANCE' is written on the vehicle as:

- (a) CNALUBMA
- (b) 
- (c) 
- (d) None of the above

Ans. (b) 

(v) Mark the correct statement:

- (a) Convex mirror conform images of objects spread over a large area.
- (b) Convex mirrors are used by dentist.
- (c) In convex mirror image is formed larger in size, erect and real.
- (d) Convex mirror forms real image.

Ans. (a) Convex mirror conform images of objects spread over a large area.

Formula or S.I. Unit Based Questions

41. How is the focal length of a spherical mirror related to its radius of curvature ?

Ans. The focal length of a spherical of mirror is equal to half of its radius of curvature.

$$f = \frac{1}{2}R$$

42. Write the expression for magnification of a spherical mirror.

Ans. Magnification (m) = $\frac{\text{Length of the image (I)}}{\text{Length of the object (O)}}$

$$= \frac{\text{Image distance (v)}}{\text{Object distance (u)}}$$

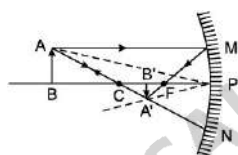
$$m = \frac{I}{O} = -\frac{v}{u}$$

43. Obtain an expression for magnification of an image formed by a concave mirror.

[Board Question]

Ans. Consider the formation of the image $A'B'$ of an object AB by a concave mirror. As shown in the given figure, the right angled triangles ABP and $A'B'P$ are similar triangles, hence

$$\frac{A'B'}{AB} = \frac{PB'}{PB}$$



As per sign convention followed, $PB = -u$, $PB' = -v$, $AB =$ size of the object $= +h$ and $A'B' =$ size of the image $= -h'$. Hence, we have

$$\frac{-h'}{h} = \frac{-v}{-u} \text{ or } \frac{h'}{h} = -\frac{v}{u} \text{ Thus, by definition of magnification of image, we have}$$

$$\text{Magnification, } m = \frac{h'}{h} = -\frac{v}{u}$$

44. What is the relationship between the refractive index of two media?

Ans. The refractive index for the light going from medium '1' to medium '2' is equal to the reciprocal of the refractive index for light going from medium '2' to medium '1'.

$${}_1n_2 = \frac{1}{{}_2n_1}$$

45. How is the refractive index of a medium related to the speed of light?

Ans. The refractive index (n) of a medium is the ratio of the speed of light in vacuum (or air) to the speed of light in that medium.

$$n = \frac{\text{Speed of light in vacuum or air (c)}}{\text{Speed of light in that medium (v)}}$$

46. What is the S.I. unit of refractive index?

Ans. Refractive index is a unitless quantity.

47. Give a formula to find refractive index of a glass slab in terms of angle of incidence and angle of refraction. [Board Question]

Ans. Refractive index, $n = \frac{\sin i}{\sin r}$, where i = angle of incidence in air and r = angle of refraction in glass slab.

48. How is the power of a lens related to its focal length?

Ans. Power of lens (in D) = $\frac{1}{\text{Focal length (in metre)}}$

$$P = \frac{1}{f}$$

49. What is the power of a combination of lenses?

Ans. If n number of lenses are placed in close contact, then the power of the combination of lenses is equal to algebraic sum of the powers of the individual lenses.

$$P = P_1 + P_2 + \dots + P_n$$

50. Write the lens formula explaining the meaning of the symbols used.

Ans. The equation relating the distance of object (u), distance of image (v) and focal length (f) of a lens is called the lens formula.

It is same for both convex and concave lenses and is represented as :

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

Definitions

51. What is Reflection of light?

Ans. The return of light into the same medium after striking a surface is called reflection.

52. What is a spherical mirror?

Ans. It is a mirror whose reflecting surface is a part of a hollow sphere of glass and has a curved surface.

53. What is Centre of curvature?

Ans. The centre of curvature of a spherical mirror is the centre of the sphere of which the mirror is a part.

54. Define Pole.

Ans. The pole of a spherical mirror is the geometric centre of the spherical surface of the mirror.

55. What is Aperture of a mirror?

Ans. The plane surface area of the mirror through which the light rays enter and fall on the mirror is called its aperture.

56. What is angle of incidence?

Ans. The angle between an incident ray and the normal at the point of incidence is called angle of incidence.

57. What is angle of refraction?

Ans. The angle between the refracted ray and the normal at the point of incidence is called angle of refraction.

58. What is Magnification?

Ans. The ratio of length of the image to the length of the object is called linear magnification.

59. What is Refraction of light?

Ans. The change in the path of light, when it passes from one transparent medium to another transparent medium, is called refraction of light.

60. Define Lateral shift.

Ans. The perpendicular distance between the path of emergent ray and the direction of incident ray is called lateral shift.

61. What is Refractive index of a medium?

Ans. It is defined as the ratio of speed of light in vacuum to the speed of light in the medium.

62. Define the Power of a lens.

Ans. One diopetre is defined as the power of a lens of focal length 1 metre.

Very Short Answer Type Questions

63. Where is the image formed when an object is at large distance from a concave mirror?

Ans. The image formed is at the focus of the mirror.

64. Why do we see our image in a shining spoon?

[Board Question]

Ans. The shining surface of spoon behaves like a curved mirror, hence we can see our image in it.

65. A ray of light moving along the principal axis is falling on a concave mirror. In which direction is it reflected? [Board Question]

Ans. The ray is reflected back along the principal axis of mirror because here $\angle r = \angle i = 0^\circ$.

66. An object is placed in front of a concave mirror between the pole and the focus of the mirror, what is the nature of the image formed by the mirror?

Ans. Virtual, erect and magnified image is formed behind the mirror.

67. At what position the object be placed in front of a concave mirror to form a real image of the same size? [Board Question]

Ans. At the centre of curvature (or at C).

68. Which metal is the best reflector of light?

Ans. Silver metal is the best reflector of light.

69. A man standing in front of a spherical mirror, finds his image having a very small head, a fat body and legs of normal size. What type of mirror are used in their three parts?

Ans. A very small head : Convex mirror.

A fat body : Concave mirror.

Legs of normal size : Plane mirror.

70. Differentiate between virtual image formed by a concave mirror and a convex mirror.

Ans. The virtual image formed by a concave mirror is always magnified whereas the virtual image formed by a convex mirror is diminished.

71. What is the nature of the image formed by a concave mirror if the magnification produced by the mirror is + 2?

Ans. Virtual and erect.

72. Between which two points of a concave mirror should an object be placed to obtain a magnification of – 2?

Ans. Between F and C.

73. Why does a ray of light bend from its path when it travels from one medium to another?

[Board Question]

Ans. A ray of light bends from its path on entering into second medium because speed of light in second medium is different from that in first medium or refractive index are different.

74. For the same angle of incidence of 45° , the refractive angle in two transparent media P and Q is 20° and 30° , respectively. Which medium is optically denser out of P and Q and why?

[Board Question]

Ans. Medium P is optically denser than Q because in it the ray is bending more towards the normal (As $\angle r_P < \angle r_Q$).

75. A ray of light travelling from a medium X enters obliquely into another medium Y. If it bends away from the normal then state which one of the two is relatively optically denser ? Why?

[Board Question]

Ans. A light ray bends away from the normal when it passes from an optically denser medium to an optically rarer medium. Hence, medium X is optically denser and Y is optically rarer.

76. If refractive indices of water and alcohol are 1.33 and 1.46 respectively, which of the two is optically denser medium?

Ans. The refractive index of alcohol is more than water, therefore, alcohol is optically denser medium.

77. What are the two factors on which the lateral displacement of an emergent ray from a glass slab depends? [Board Question]

Ans. Lateral displacement depends on:

1. thickness of glass slab
2. angle of incidence

78. For the same angle of incidence of 45° , the refraction angle in three transparent media A, B and C are 25° , 30° and 35° , respectively. In which medium is the speed of light minimum and in which medium it is maximum? [Board Question]

Ans. Speed of light is minimum in medium A and maximum in medium C. Since refractive index is equal to ratio of sine of angle of incidence to sine of angle of refraction. Here, angle of incidence is same. The angle of refraction is greater in C. It has less refractive index, so its speed is maximum in C.

79. Name the type of lens used to obtain (i) an erect, enlarged and virtual image of an object, (ii) an erect, diminished and virtual image of an object.


[Board Question]

Ans. (i) A convex lens, (ii) A concave lens.

Reasoning Based Questions

80. Why are concave mirrors used in a solar furnace?

Ans. Concave mirrors are convergent mirrors. That is why they are used to construct solar furnaces. When solar furnace is placed at focus of concave mirror, sun rays after reflection from its surface, gets converged at focus with much intense heat and solar furnace gets very hot and become ready for use.

81. In hospital vans, why is the word 'AMBULANCE' written as ?

Ans. This is because, when we are driving our car and see the hospital van coming from behind in our rear-view convex mirror, then we would be able to read the laterally inverted image as 'AMBULANCE' and pave way for the van quickly.

82. A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Ans. The light ray bends towards the normal. When a ray of light travels from an optically rarer medium to an optically denser medium, it gets bent towards the normal. Since water is optically denser than air, a ray of light travelling from air into the water will bend towards the normal.

83. Light of a single colour is passed through a liquid having a piece of glass suspended in it. On changing the temperature of liquid, at a particular temperature the glass piece is not seen.

(i) When is the glass piece not seen?

(ii) Why is the light of a single colour used?

Ans. (i) The glass piece becomes invisible when the refractive index of the liquid becomes equal to the refractive index of glass.

(ii) Refractive index of a medium (liquid or glass) is different for light of different colours. Hence, light of single colour is used.

Short Answer Type Questions

84. Answer the following questions:

- (i) What do you mean by reflection of light?
- (ii) Which surface of a plane mirror reflects most of the light incident on it: The front smooth surface or the back silvered surface?
- (iii) Define the term angle of incidence.

Ans. (i) The return of light into the same medium after striking a surface is called reflection.

(ii) The back silvered surface of a mirror reflects most of the light incident on it.

(iii) The angle between an incident ray and the normal at the point of incidence is called angle of incidence.

85. Answer the following questions:

- (i) What is an optical medium?
- (ii) What do you mean by:
 - (a) an optically denser medium?
 - (b) an optically rarer medium?
- (iii) Define the term angle of refraction.

Ans. (i) A medium through which light can travel is called an optical medium.

(ii) (a) While passing from one medium to the other, if the speed of light slows down, then the second medium is said to be optically denser than the first medium.

(b) While passing from one medium to the other, if the speed of light increases, then the second medium is said to be optically rarer than the first medium.

(iii) The angle between the refracted ray and the normal at the point of incidence is called angle of refraction.

86. Answer the following questions:

- (i) What is a spherical mirror?
- (ii) Name two types of spherical mirrors.
- (iii) Define lateral shift.

Ans. (i) A spherical mirror is a mirror whose reflecting surface is a part of a hollow sphere of glass and has a curved surface.

(ii) The two types of spherical mirrors are: (i) Concave mirror and (ii) Convex mirror.

(iii) The perpendicular distance between the path of emergent ray and the direction of incident ray is called lateral shift.

87. Define the following terms related to spherical mirrors:

- (i) Centre of curvature
- (ii) Pole
- (iii) Aperture

Ans. (i) The centre of curvature of a spherical mirror is the centre of the sphere of which the mirror is a part.

(ii) The pole of a spherical mirror is the geometric centre of the spherical surface of the mirror.

(iii) The plane surface area of the mirror through which the light rays enter and fall on the mirror is called its aperture.

88. Answer the following questions:

- (i) Define :
 - (a) Focus of a concave mirror,
 - (b) Focus of a convex mirror.
- (ii) Name the mirror that has:
 - (a) a real focus,

(b) a virtual focus.

Ans. (i) (a) The focus of a concave mirror is a point on the principal axis through which the light rays, incident parallel to the principal axis, pass after reflection from the mirror.

(b) The focus of a convex mirror is a point on the principal axis through which the light rays, incident parallel to the principal axis, appear to pass after reflection from the mirror.

(ii) (a) A concave mirror has a real focus.

(b) A convex mirror has a virtual focus.

89. Answer the following questions:

(i) What is meant by magnification? Write its expression.

(ii) What is its sign for (a) real, (b) virtual image?

Ans. (i) The ratio of length of the image to the length of the object is called linear magnification.

If the length of the image is 'I' and that of the object is 'O', then the magnification 'm' is :

$$m = \frac{I}{O}$$

(ii) (a) For a real image, magnification is negative.

(b) For a virtual image, magnification is positive.

90. Answer the following questions:

(i) What do you mean by refraction of light?

(ii) What is the cause of refraction of light when it passes from one medium to another?

Ans. (i) The change in the path of light, when it passes from one transparent medium to another transparent medium, is called refraction of light.

(ii) Light travels with different speeds in different media, and this is the cause of refraction when it passes from one medium to another. Larger the difference in speed of light between the two media, greater will be the refraction and vice-versa.

91. Answer the following questions:

- (i) State the two laws of refraction of light.
- (ii) A light ray is incident normally on a glass block. What will be the angle of refraction?

Ans. (i) The two laws of refraction are:

(a) The incident ray, the refracted ray and the normal at the point of incidence, all lie in the same plane.

(b) The ratio of the sine of the angle of incidence (i) to the sine of angle of refraction (r) is a constant for the pair of given media. This constant is called the refractive index of the second medium with respect to the first medium.

(ii) The angle of refraction will be 0° .

92. Answer the following questions:

- (i) What is relative refractive index?
- (ii) Define one diopetre of power of a lens.
- (iii) How lateral shift depends on the angle of incidence? **[NCERT]**

Ans. (i) Refractive index of a medium with respect to another medium is called relative refractive index.

(ii) One diopetre is defined as the power of a lens of focal length 1 metre.

(iii) Lateral shift is directly proportional to angle of incidence.

93. Answer the following questions:

- (i) What is a lens?
- (ii) Define optical centre of a thin lens.
- (iii) Name the lens that has : (a) a real focus,
(b) a virtual focus.

Ans. (i) A piece of transparent glass bound by two spherical surfaces is called a lens.

(ii) Optical centre of a thin lens is a point on the principal axis of lens such that a ray of light directed towards it, passes undeviated.

(iii) (a) A convex lens has a real focus.

(b) A concave lens has a virtual focus.

94. Answer the following questions:

(i) Define the principal focus of a convex lens.

(ii) What is absolute refractive index?

(iii) Name the unit of the power of a lens.

Ans. (i) The principal focus or the second focal point of a convex lens is a point on the principal axis of the lens such that the rays of light incident parallel to the principal axis, after refraction from the lens pass through it.

(ii) Refractive index of a medium with respect to vacuum is called absolute refractive index.

(iii) Dioptre

95. Answer the following questions:

(i) Define power of a lens.

(ii) Name the lens that has :

(a) negative power.

(b) positive power.

Ans. (i) The ability of a lens to converge the rays of light falling on it is called the power of lens.

(ii) (a) The focal length of a concave lens is negative, so its power is negative.

(b) The focal length of a convex lens is positive, so its power is positive.

96. Answer the following questions:

(i) State the two laws of reflection of light.

(ii) A light ray is incident normally on a plane mirror. What is its angle of incidence?

Ans. (i) The two laws of reflection are:

1. The incident ray, the reflected ray and the normal at the point of incidence, lie in the same plane.

2. The angle of incidence is equal to the angle of reflection ($\angle i = \angle r$).

(ii) The angle of incidence will be 0° .

Differentiate Between

97. Differentiate between a concave mirror and a convex mirror.

Ans.	S.No.	Concave Mirror	Convex Mirror
	1.	A concave mirror is made by silvering the outer surface of a part of a hollow sphere and reflection takes place from the inner surface.	A convex mirror is made by silvering the inner surface of a part of a hollow sphere and reflection takes place from the outer bulging surface.
	2.	The light rays incident on a concave mirror converge after reflection.	The light rays incident on a convex mirror diverge after reflection.
	3.	The image formed by it is real as well as virtual depending on the position of object from the mirror.	The image formed by it is always virtual for all positions of the object in front of the mirror.

98. Differentiate between a real image and a virtual image.

Ans.	S.No.	Real Image	Virtual Image
	1.	A real image is formed	A virtual image is formed

	due to actual intersection of the reflected or refracted rays.	when the reflected or refracted rays meet if they are produced backwards.
2.	A real image can be obtained on a screen.	A virtual image cannot be obtained on a screen.
3.	A real image is inverted with respect to the object.	A virtual image is erect with respect to the object.

99. Differentiate between a luminous and non-luminous source of light.

Ans.	Luminous	Non-Luminous
	The objects which possess light of its own are called luminous objects. Examples : The Sun, the stars, lamp, candle etc.	The object which does not possess light of its own, but receives light from external source and scatters it to the surroundings is called non-luminous. Examples : The Moon, a chair, a book etc.

100. Differentiate between a convex lens and concave lens.

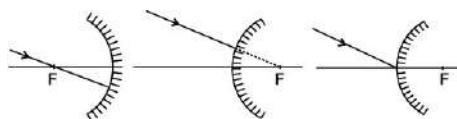
Ans.	S.No.	Convex Lens	Concave Lens
	1.	A convex lens is thick in the middle and thin at its periphery.	A concave lens is thin in the middle and thick at its periphery.
	2.	It converges the incident rays towards the principal axis.	It diverges the incident rays away from the principal axis.

3. It has a real focus.

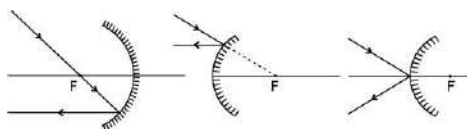
It has a virtual focus.

Diagram Based Questions

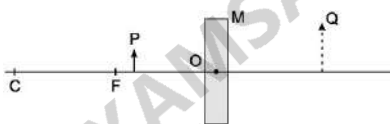
101. Draw the following diagram, in which a ray of light is incident on a concave or convex mirror, on your answer sheet. Show the path of this ray, after reflection, in each case. [\[Board Question\]](#)



Ans.



102. Consider the following diagram in which M is a mirror and P is an object and Q is its magnified image formed by the mirror. [\[Board Question\]](#)

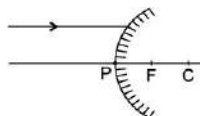


State the type of the mirror M and one characteristic property of the image Q.

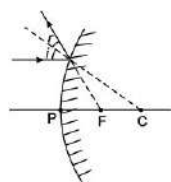
Ans. M is a concave mirror and the image is virtual.

103. A ray of light is incident on a convex mirror as shown. Redraw the diagram and complete the path of this ray after reflection from the mirror. Mark angle of incidence and angle of reflection on it.

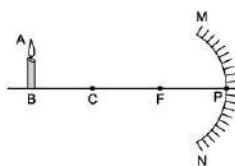
[\[Board Question\]](#)



Ans.

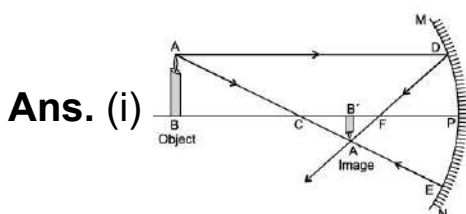


104. Answer the following question:



(i) Figure shows a concave mirror with its pole at P, focus F and centre of curvature C. Draw a ray diagram to show the formation of image of an object AB.

(ii) State three characteristics of the image formed.



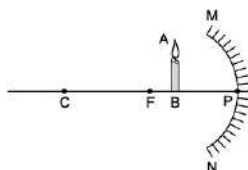
Ans. (i)

(ii) Characteristics of image formed :

1. Real and inverted.
2. Smaller in size or diminished.
3. Formed between the focus F and the centre of curvature C of the mirror.

105. Answer the following questions:

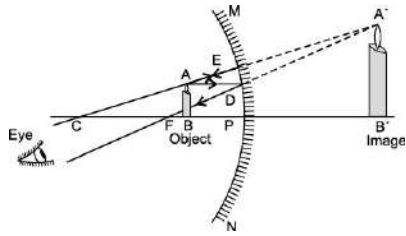
(i) The figure shows a concave mirror with its pole at P, focus F and centre of curvature C. Draw ray diagram to show the formation of image of object AB.



(ii) State three characteristics of the image formed.

(iii) Mention one application of image formed in this case.

Ans. (i)



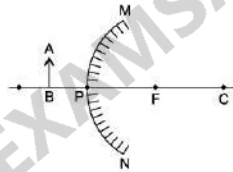
(ii) The image found is :

1. virtual and erect
2. magnified and
3. behind the mirror.

(iii) A concave mirror in this position can be used as a shaving mirror.

106. Answer the following questions:

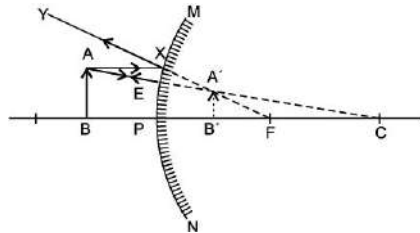
(i) The figure shows a convex mirror. C is its centre of curvature and F is its focus. Draw two rays from A and hence locate the position of image of the object AB. Label the image as A'B'.



(ii) State three characteristics of the image formed.

(iii) State one application of a convex mirror.

Ans. (i)

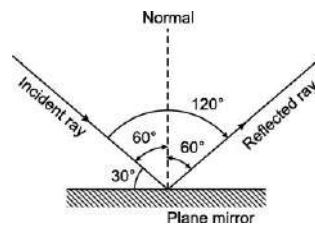


(ii) The three characteristics of the image formed are :

1. Virtual and erect
2. diminished
3. formed behind the mirror.

(iii) A convex mirror is used as reflector in street lamps.

107. The angle between an incident ray and the mirror is 30° .



(i) What is the angle of incidence?

(ii) What is the angle of reflection?

(iii) What is the total angle through which the ray of light turns?

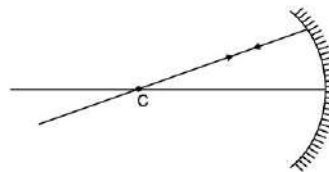
Ans. (i) 60°

(ii) 60°

(iii) 120° .

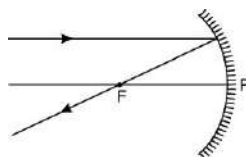
108. Explain why a ray of light passing through the centre of curvature of a concave mirror gets reflected along the same path after reflection.

Ans. This is because the angle of incidence is 0° . That is the ray passing through the centre of curvature is incident normally to the mirror. The angle of reflection should also be 0° .



109. To construct a ray diagram we use two rays which are so chosen that it is easy to know their directions after reflection from the mirror. List two such rays and state the path of these rays after reflection in case of concave mirrors. Use these two rays and draw ray diagram to locate the image of an object placed between pole and focus of a concave mirror.

Ans. A ray of light incident parallel to the principal axis after reflection passed through the principal focus.



A ray of light which passes through the centre of curvature after reflection retraces its path back.

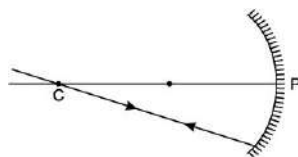
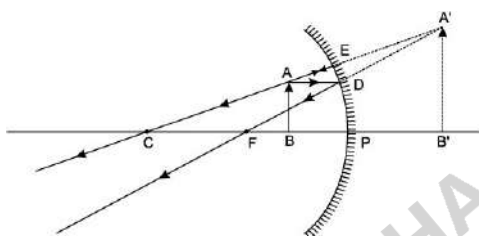


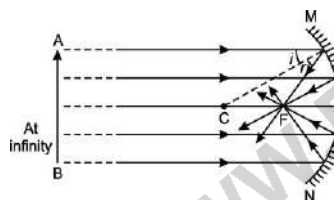
Image of an object placed between pole and focus:



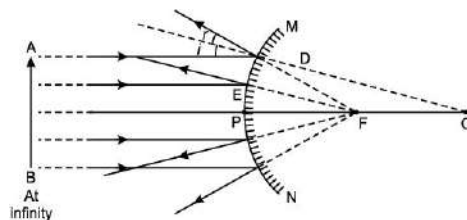
110. Draw ray diagram to show the principal focus of a:

- (i) Concave mirror
- (ii) Convex mirror.

Ans. (i)

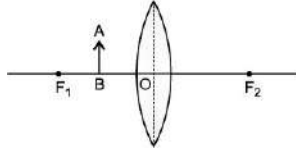


(ii)



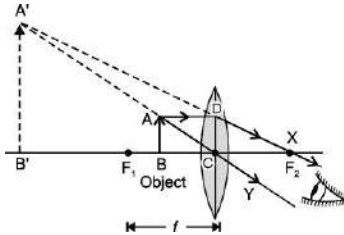
111. Answer the following questions:

- (i) The figure shows the position of an object AB in relation to a converging lens whose foci are F_1 and F_2 . Draw two rays to locate the position of image.



(ii) State three characteristics of image formed.

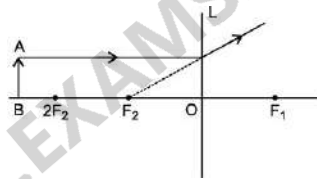
Ans. (i)



(ii) The three characteristics of the image formed are :

1. Virtual and erect
2. magnified and
3. behind the object.

112. Study the diagram in figure and answer the following questions :



(i) Name the lens L.

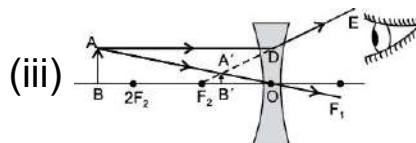
(ii) What are the points F_1 and F_2 called ?

(iii) Complete the diagram to form the image of the object AB.

(iv) State three characteristics of the image formed.

Ans. (i) The lens L is a concave or diverging lens.

(ii) The points F_1 and F_2 are called the first focal point and the second focal point respectively.

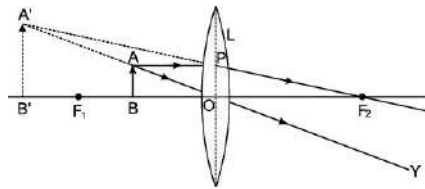


(iv) The three characteristics of the image formed are :

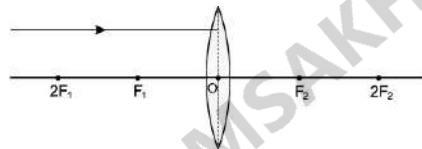
1. Virtual and erect
2. diminished and
3. formed between optical centre O and focus F_2 .

113. For which position of the object does a convex lens form a virtual and erect image?

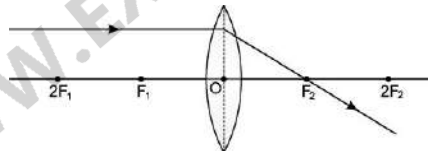
Ans. A convex lens forms a virtual and erect image when the object is placed between the optical centre (O) and focus (F_1).



114. Draw the given diagram in your answer-book and complete it for the path of ray of light beyond the lens.

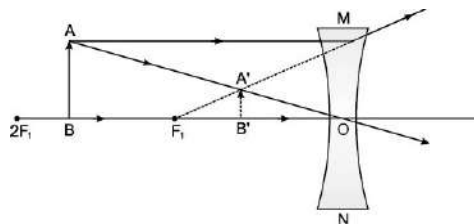


Ans.



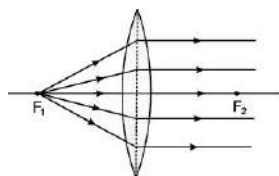
115. If the image formed by a lens for all positions of an object placed in front of it is always erect and diminished, what is the nature of this lens? Draw a ray diagram to justify your answer.

Ans. The type of the lens is concave lens, *i.e.*, it is a diverging lens.

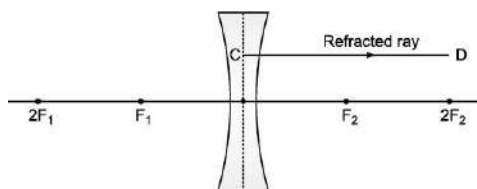


116. A candle is placed at the focus of a convex lens. What is the nature of beam of light produced by the lens?

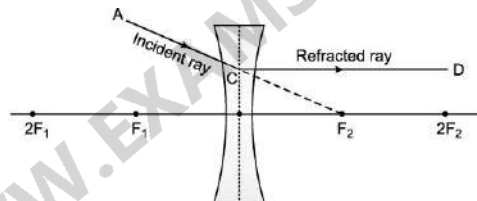
Ans. The beam of light coming out of lens is parallel beam of light as shown.



117. The diagram below shows the refracted CD through a concave lens. Complete the diagram by drawing the corresponding incident ray.

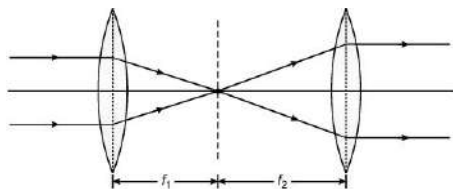


Ans. In figure the refracted ray parallel to the principal axis. So, the incident ray must be appearing to meet at the principal focus of concave lens. To find the incident ray, F_2 is joined to C and produced as shown in the figure.



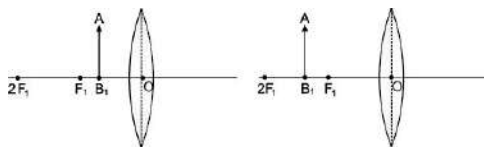
118. Show diagrammatically, how should two converging lenses be arranged so that a parallel beam becomes parallel after passing through two lenses.

Ans. If the distance between two lenses become equal to sum of their focal lengths, then the parallel beam of light will emerge parallel after passing through the second lens.

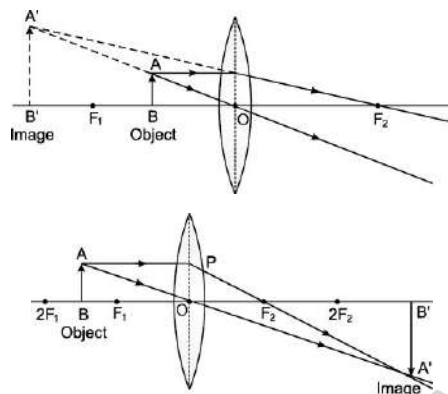


119. Draw the following diagrams in your answer book and show the formation of the image of object AB by completing

the ray diagrams.

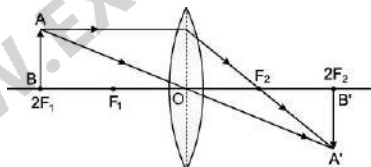


Ans.

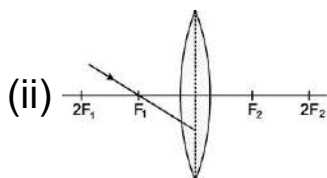
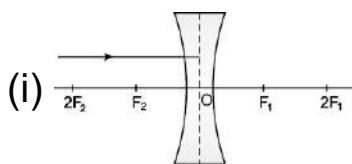


120. Where should an object be placed in case of a convex lens to form an image of same size as of the object? Show with the help of ray diagram the position and the nature of the image formed.

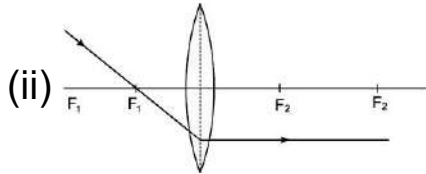
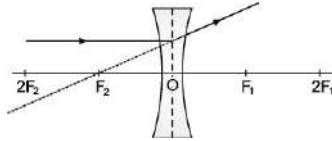
Ans. The object should be placed at $2F$.



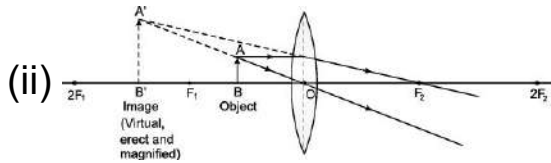
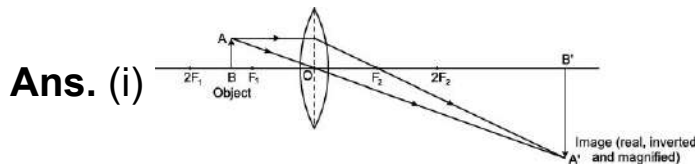
121. Redraw the diagram given below in your answer book and complete the path of ray.



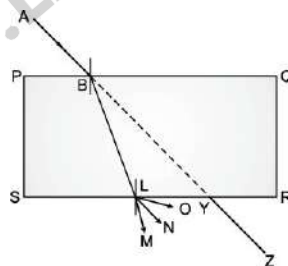
Ans. (i)



122. Draw ray diagrams to show the formation of a three times magnified (i) real image, (ii) virtual image of an object kept in front of a converging lens. Mark the position of object, F, 2F, O and position of image clearly in the diagram.

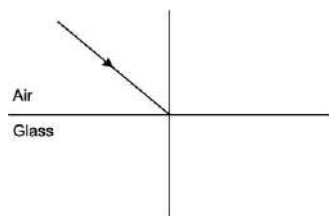


123. If a light ray AB is incident on the surface PQ as shown, identify the correct emergent ray.

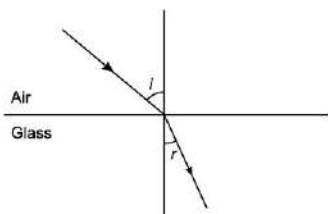


Ans. Here, LN is parallel to YZ. Therefore, LN is the correct emergent ray.

124. Complete the following diagram :



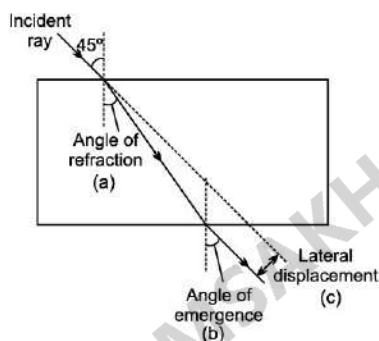
Ans.



125. Draw the path of a ray of light when it enters one of the faces of a glass slab at an angle of nearly 45° . Label on it (a) angle of refraction, (b) angle of emergence and (c) lateral displacement.

[Board Question]

Ans.



Numericals

126. Find the focal length of a convex mirror whose radius of curvature is 32 cm. [NCERT]

Ans. Radius of curvature, $R = 32$ cm

Focal length, $f = \frac{R}{2}$

$$f = \frac{32}{2} \text{ cm}$$

$$f = 16 \text{ cm}$$

127. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position and nature of the image. [NCERT]

Ans. Focal length of convex mirror, $f = +15$ cm

Object distance, $u = -10$ cm

According to the mirror formula, $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

Substituting the values, we get $\frac{1}{v} + \frac{1}{-10} = \frac{1}{15}$

$$\frac{1}{v} = \frac{1}{15} + \frac{1}{10}$$

$$\frac{1}{v} = \frac{2+3}{30}$$

$$\frac{1}{v} = \frac{5}{30}$$

$$\frac{1}{v} = \frac{1}{6}$$

$$v = + 6 \text{ cm}$$

Thus, the image is formed at a distance of 6 cm from the convex mirror. Since the image is formed behind the convex mirror, so image is virtual and erect.

128. An object 4 cm in height, is placed at 15 cm in front of a concave mirror of focal length 10 cm. At what distance from the mirror should a screen be placed to obtain a sharp image of the object. Calculate the height of the image. [\[Board Question\]](#)

Ans. Focal length of a concave mirror, $f = - 10 \text{ cm}$

Object distance, $u = - 15 \text{ cm}$

Object height, $h_1 = 4 \text{ cm}$

Using the mirror formula,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} + \frac{1}{-15} = \frac{1}{-10}$$

$$\frac{1}{v} = -\frac{1}{10} + \frac{1}{15}$$

$$\frac{1}{v} = \frac{-3+2}{30}$$

$$v = - 30 \text{ cm.}$$

Thus, to obtain a sharp image of the object, the screen should be placed at a distance of 30 cm in front of the mirror.

$$\text{Now, } m = \frac{v}{u} = \frac{h_2}{h_1}$$

$$m = \left(\frac{-30}{-15} \right)$$

$$\Rightarrow m = -2$$

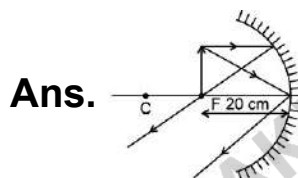
$$\text{Also, } -2 = \frac{h_2}{4}$$

$$\Rightarrow h_2 = -8 \text{ cm}$$

\ Height of the image is 8 cm.

129. The image of an object formed by a mirror is real, inverted and is of magnification – 1. If the image is at a distance of 40 cm from the mirror, where is the object placed? Where would the image be if the object is moved 20 cm towards the mirror? State reason and also draw ray diagram for the new position of the object to justify your answer.

[Board Question]



Object position : At C (centre of curvature)

Object distance : 40 cm.

If the object is moved 20 cm towards the mirror then,

Position of the image : At infinity, because the focal length of the mirror is 20 cm. If the object is moved 20 cm towards the mirror then its new position would be at the focus of the mirror.

130. The image formed by a spherical mirror is real, inverted and is of magnification – 2. If the image is at a distance of 30 cm from the mirror, where is the object placed? Find the focal length of the mirror. List two characteristics of the image formed if the object is moved 10 cm towards the mirror.

[Board Question]

Ans. Image distance, $v = -30 \text{ cm}$

Magnification, $m = -2$

Magnification produced by a mirror,

$$m = -\frac{v}{u}$$

$$-2 = -\frac{(-30)}{u}$$

$$u = -15 \text{ cm}$$

Now, using mirror formula

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{-30} - \frac{1}{15}$$

$$\frac{1}{f} = \frac{-1-2}{30}$$

$$\frac{1}{f} = \frac{-3}{30} = -\frac{1}{10}$$

$$f = -10 \text{ cm}$$

If the object is shifted 10 cm towards the mirror then, $u = -5 \text{ cm}$, i.e., object is between pole and focus, thus image formed will be virtual, erect and magnified.

131. Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is $3 \times 10^8 \text{ m/s}$. [NCERT]

Ans. Speed of light in vacuum, $c = 3 \times 10^8 \text{ m/s}$

Refractive index of glass, $n_g = 1.50$

We have, $n_g = \frac{c}{v}$

$$\text{or } v = \frac{c}{n_g}$$

$$\therefore v = \frac{3 \times 10^8}{1.5}$$

$$v = 2 \times 10^8 \text{ m/s}$$

132. The refractive indices of glass and water with respect to air are $3/2$ and $4/3$ respectively. If speed of light in glass is $2 \times 10^8 \text{ m/s}$, find the speed of light in water. [Board Question]

Ans. Refractive index of a medium

$$= \frac{\text{Speed of light in air}}{\text{Speed of light in the medium}}$$

For glass, $\frac{3}{2} = \frac{\text{Speed of light in air}}{2 \times 10^8}$

Speed of light in air = $\frac{3}{2} \times 2 \times 10^8 = 3 \times 10^8 \text{ m/s}$

For water, $\frac{4}{3} = \frac{\text{Speed of light in air}}{\text{Speed of light in water}}$

Speed of light in water = $\frac{3 \times 10^8 \times 3}{4}$

= $2.25 \times 10^8 \text{ m/s}$

133. The absolute refractive index of Ruby is 1.7. Find the speed of light in Ruby. The speed of light in vacuum is $3 \times 10^8 \text{ m/s}$. [Board Question]

Ans. We know that,

Refractive index of ruby

$$= \frac{\text{Speed of light in air (or vacuum)}}{\text{Speed of light in ruby}}$$

So, $1.70 = \frac{3 \times 10^8}{\text{Speed of light in ruby}}$

or Speed of light in ruby = $\frac{3 \times 10^8}{1.7} \text{ ms}^{-1}$

= $1.76 \times 10^8 \text{ ms}^{-1}$

Thus, speed of light in ruby is $1.76 \times 10^8 \text{ ms}^{-1}$

134. Find the power of a concave lens of focal length 2 m. [NCERT]

Ans. Focal length of concave lens, $f = -2 \text{ m}$

(Since, the focal length of concave lens is negative.)

$$P = \frac{1}{f} = \frac{1}{-2} = -0.5 \text{ D}$$

Hence, the power of the given concave lens is -0.5 D .

135. An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram

and find the position, size and the nature of the image formed.
[NCERT]

Ans. Object distance, $u = -25$ cm

Object height, $h_1 = 5$ cm

Focal length, $f = +10$ cm

Using the lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

Substituting the values,

we get $\frac{1}{v} - \frac{1}{-25} = \frac{1}{10}$

$$\frac{1}{v} + \frac{1}{25} = \frac{1}{10}$$

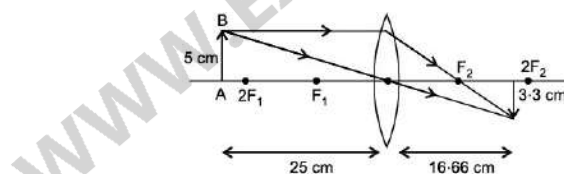
$$\frac{1}{v} = \frac{3}{50}$$

$$v = \frac{50}{3}$$

$$v = 16.67 \text{ cm}$$

The positive value of v shows that the image is formed at the other side of the lens.

$$\text{Magnification, } m = \frac{h_2}{h_1} = \frac{v}{u} = \frac{16.67}{-25} = -0.66$$



The negative sign shows that the image is real and formed behind the lens.

$$\text{Magnification, } m = \frac{h_2}{h_1}$$

$$h_2 = m \times h_1 = (-0.66) \times 5$$

$$= -3.3 \text{ cm.}$$

The negative value of image height indicates that the image formed is inverted. The position, size and nature of image are shown in the following ray diagram.

136. A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram. [NCERT]

Ans. Focal length of concave lens, $f = -15$ cm

Image distance, $v = -10$ cm

According to the lens formula,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

Substituting the values, we get

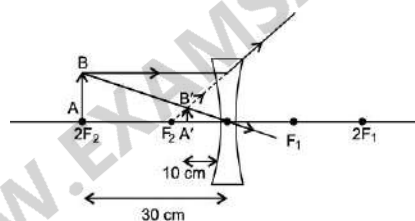
$$\frac{1}{-10} - \frac{1}{u} = \frac{1}{-15}$$

$$-\frac{1}{u} = \frac{-1}{15} + \frac{1}{10}$$

$$-\frac{1}{u} = \frac{-2+3}{30}$$

$$-\frac{1}{u} = \frac{1}{30}$$

$$u = -30 \text{ cm}$$



The negative value of u indicates that the object is placed 30 cm in front of the lens. This is shown in the following ray diagram.

137. An object is placed at a distance of 60 cm from a concave lens of focal length 30 cm.

[Board Question]

- Use lens formula to find the distance of the image from the lens.
- List four characteristics of the image (nature, position, size, erect/inverted) formed by the lens in this case.
- Draw ray diagram to justify your answer of part (ii).

Ans. (i) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ [Lens formula]

$$\frac{1}{f} + \frac{1}{u} = \frac{1}{v}$$

$$u = -60$$

$$f = -30 \text{ (In case of concave lens)}$$

By substituting the values in formula, we get

$$\frac{1}{-30} + \frac{1}{-60} = \frac{1}{v}$$

$$\frac{-2-1}{60} = \frac{1}{v}$$

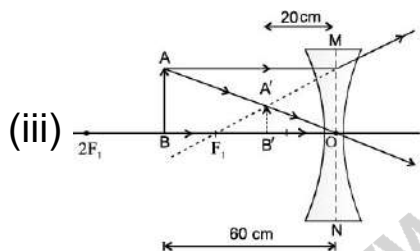
$$\frac{-3}{60} = \frac{1}{v}$$

$$\frac{1}{v} = \frac{-1}{20}$$

$$\therefore v = -20 \text{ cm}$$

$$\therefore m = \frac{v}{u} = \frac{-20}{-60} = 0.33$$

(ii) So, the image formed will be virtual, erect, small in size and image will be formed between F_1 and O.



138. An object is placed at a distance of 30 cm from a concave lens of focal length 15 cm. List four characteristics (nature, position, etc.) of the image formed by the lens. [Board Question]

Ans. Object distance, $u = -30 \text{ cm}$

Focal length of concave lens = -15 cm

We know that, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{v} - \frac{1}{-30} = \frac{1}{-15}$$

$$\frac{1}{v} = \frac{1}{-15} - \frac{1}{30}$$

$$\frac{1}{v} = \frac{-2-1}{30} = \frac{-3}{30} = \frac{-1}{10}$$

$$v = -10 \text{ cm.}$$

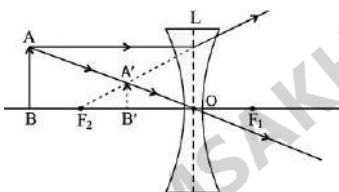
Characteristics of image :

1. The image is formed at a distance of 10 cm in front of the concave lens.
2. Image formed is virtual.
3. Image formed is erect.
4. The size of the image formed is diminished.

139. If the image formed by a lens for all positions of an object placed in front of it is always erect and diminished, what is the nature of this lens? Draw a ray diagram to justify your answer. If the numerical value of the power of this lens is -10 D , what is its focal length in the Cartesian system?

[Board Question]

Ans. It is a concave lens.



The power of a lens is given by the relation

$$P = \frac{1}{f \text{ (in metre)}}$$

$$\therefore P = -10\text{ D}$$

$$\therefore f = \frac{1}{P} = \frac{1}{-10} = -0.1\text{ m.}$$

or -10 cm , as lens is concave lens.

140. An object is placed at a distance of 15 cm from a convex lens of focal length 20 cm. List four characteristics (nature, position, etc.) of the image formed by the lens. [Board Question]

Ans. Focal length of convex lens = 20 cm

Object distance, $u = -15\text{ cm}$

Using the lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{20} = \frac{1}{v} + \frac{1}{15}$$

$$\frac{1}{v} = \frac{1}{20} - \frac{1}{15} \quad v = -60 \text{ cm}$$

Four characteristics of the image formed by the lens are :

1. Virtual
2. Erect
3. At a distance of 60 cm on the same side of the lens as the object.
4. Enlarged image.

141. Answer the following question:

(i) A divergent lens has a focal length of 20 cm. At what distance should an object of height 4 cm from the optical centre of the lens be placed so that its image is formed 10 cm away from the lens. Find the size of the image also.

[Board Question]

(ii) Draw a ray diagram to show the formation of image in above situation. **[Board Question]**

Ans. (i) Focal length of divergent lens, $f = -20 \text{ cm}$

Object height, $h_1 = 4 \text{ cm}$

Image distance, $v = -10 \text{ cm}$

Using lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{-20} = -\frac{1}{10} - \frac{1}{u}$$

$$\frac{1}{u} = -\frac{1}{10} + \frac{1}{20}$$

$$\frac{1}{u} = \frac{-2+1}{20} = \frac{-1}{20}$$

$$u = -20 \text{ cm}$$

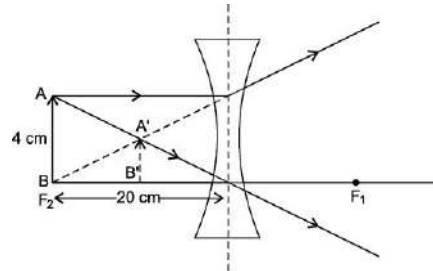
$$\text{Now, } m = \frac{h_2}{h_1} = \frac{v}{u}$$

$$\frac{h_2}{4} = \frac{-10}{-20}$$

$$2 h_2 = 4$$

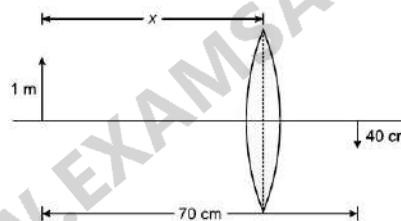
$$\Rightarrow h_2 = 2 \text{ cm}$$

(ii)



142. An object 1 m tall is placed on the principal axis of a convex lens and its 40 cm tall image is formed on the screen placed at a distance of 70 cm from the object. What is the focal length of the lens?

Ans. Since, the image is formed on the screen, so the image is real and inverted.



Given : $h = 100 \text{ cm}$, $h' = -40 \text{ cm}$

Let the object be kept at a distance x from the lens.

$$\therefore v = + (70 - x)$$

$$\text{Now } m = \frac{h'}{h} = \frac{v}{u}$$

$$\therefore \frac{-40}{+100} = \frac{(70-x)}{-x}$$

$$\text{or } 40x = 7000 - 100x$$

$$\text{i.e., } x = 50 \text{ cm}$$

$$\therefore u = -x = -50 \text{ cm}$$

$$\text{and } v = 70 - x = 70 - 50 = 20 \text{ cm}$$

Substituting the values of u and v in the lens formula,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

We have, $\frac{1}{20} - \frac{1}{-50} = \frac{1}{f}$

$$\therefore f = +\frac{100}{7}$$

$$= +14.3 \text{ cm}$$

Therefore, focal length of the lens = 14.3 cm.

143. An object of height 4.0 cm is placed at a distance of 30 cm from optical centre 'O' of a concave lens of focal length 20 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O' and principal focus 'F' on the diagram. Also find the approximate ratio of size of image to the size of object. [Board Question]

Ans. Given : $f = +20 \text{ cm}$, $u = -30 \text{ cm}$, $h_o = 4 \text{ cm}$.

We know that, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$$\frac{1}{20} = \frac{1}{v} - \frac{1}{-30}$$

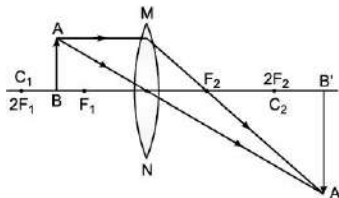
$$\frac{1}{v} = \frac{1}{60}$$

$$\Rightarrow v = 60 \text{ cm}$$

So, $\frac{h_i}{h_o} = \frac{v}{u}$

$$\frac{h_i}{4} = \frac{60}{-30}$$

$$\Rightarrow h_i = -8 \text{ cm}$$



Thus, the height or size of the image is 8 cm. The minus sign shows that this height is in the downward direction, that is, the image is formed below the axis *i.e.* it is real and inverted.

Ratio of size of image to object = -2

So image is enlarged beyond $2F_2$.

Object between F_1 and $2F_1$.

Image is formed beyond $2F_2$, real, inverted.

144. A 10 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 12 cm. The distance of the object from the lens is 18 cm. Find the nature, position and size of the image formed. [Board Question]

Ans. Height of object, $h_1 = + 10$ cm.

Focal length, $f = + 12$ cm Object distance, $u = - 18$ cm

From the lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{v} + \frac{1}{18} = \frac{1}{12}$$

$$\frac{1}{v} = \frac{1}{12} - \frac{1}{18}$$

$$\frac{1}{v} = \frac{3-2}{36} = \frac{1}{36}$$

$$v = 36 \text{ cm}$$

$$\text{Magnification, } m = \frac{v}{u} = \frac{36}{-18} = -2$$

An real, inverted and enlarged image formed is at distance of 36 cm from convex lens.

145. The power of a lens in +5 diopters. What is the nature and focal length of this lens? At what distance from this lens should an object be placed so as to get its inverted image of the same size?

Ans. Given, $P = + 5$ D

$$\text{We have, Power, } P = \frac{1}{f(\text{in meter})} + 5 = \frac{1}{f}$$

$$f = \frac{1}{5} \text{ m}$$

$$= \frac{100}{5} = 20 \text{ cm}$$

Focal length, $f = 20$ cm (or + 20 cm).

Since, focal length of the lens is positive. Therefore, the nature of lens is convex.

Same size and inverted image is formed when magnification is -1

$$\text{i.e. } m = -1$$

$$\text{Also, } m = \frac{v}{u}$$

$$v = -u$$

From the lens formula,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$-\frac{1}{u} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{-2}{u} = \frac{1}{f}$$

$$u = -2f$$

$$u = -2 \times 20 \text{ [... } f = 20 \text{ cm]}$$

$$= -40 \text{ cm}$$

Analysis and Evaluation Based Questions

146. The formula for linear magnification of a spherical mirror is $m = \frac{h_2}{h_1} = \frac{-v}{u}$. What determines the sign of m ? What is the significance of this sign?

Ans. In the formula $m = \frac{h_2}{h_1} = \frac{-v}{u}$, the sign of m is determined by the signs of h_1 and h_2 . When m is positive, the image is virtual and erect. When m is negative, the image is real and inverted.

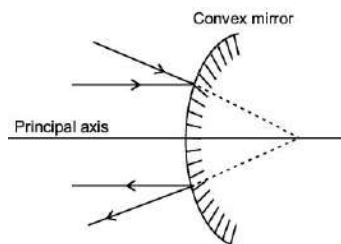
147. A concave mirror is used as a head mirror by ENT specialists. The same mirror can also be used as a shaving mirror. Why?

Ans. A concave mirror converges the ray of light falling on it in a direction parallel to the principal axis, onto its focus. This is the reason why ENT specialists use it as a head mirror.

The concave mirror is used as a shaving mirror because when an object is held between the pole and principal focus of a concave mirror, it forms a virtual, erect and magnified image of an object.

148. Convex mirror is used as a rear view mirror in vehicles, Since the image of the object formed is small in size, the field

of view is increased. Convex mirror is also used in street lights to diverge light over a large area.



(i) In driver's mirror what type of image is formed behind the vehicle?

(ii) What can you say about field of view of a convex mirror?

(iii) A convex mirror is used to form the image of an object. Then which of the following statements is wrong.

(a) The image lies between the pole and the focus.

(b) The image is diminished in size.

(c) The image is erect.

(d) The image is real.

(iv) The field of view of convex mirror is _____ compare to plane mirror.

(a) large

(b) small

(c) equal

(d) none of these

Ans. (i) Convex mirror forms an erect and diminished image of an object behind the vehicle.

(ii) The field of view of a convex mirror is large.

(iii) (d) The image is real.

(iv) (a) large.

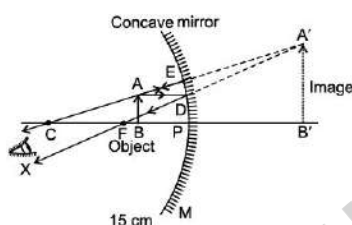
149. We wish to obtain an erect image of an object, using a concave mirror of focal length 15 cm. What should be the range

of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than the object? Draw a ray diagram to show the image formation in this case.

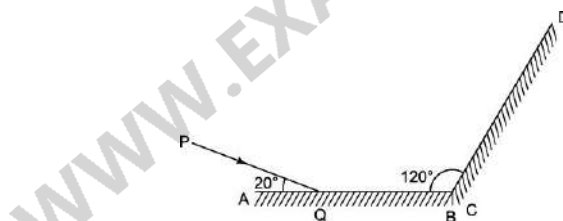
[NCERT]

Ans. Since the focal length of mirror is 15 cm, the range of object distance = 0 cm to 15 cm.

A concave mirror gives an erect image when an object is placed between its pole (P) and the principal focus (F). So, the image formed will be virtual, erect, and magnified, as shown in the given figure.



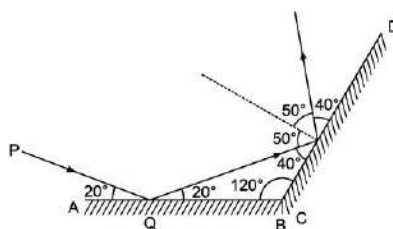
150. The given ray diagram shows a ray of light PQ striking a mirror AB. The mirror AB and CD are at an angle of 120° with each other. The ray PQ strikes the surface of the mirror AB at point Q.



(i) Draw the complete path of reflection of the ray at mirrors AB and CD.

(ii) Calculate the sum of angles which the reflected rays make with the surfaces of mirrors AB and CD.

Ans. (i)



(ii) The sum of the angles, made by reflected rays with mirrors AB and CD is $20^\circ + 40^\circ = 60^\circ$.

151. A 6 cm tall object is placed perpendicular to the principal axis of a concave mirror of focal length 30 cm. The distance of the object from the mirror is 45 cm. Use mirror formula to determine the position, nature and size of the image formed. Also draw labelled ray diagram to show the image formation in this case.[Board Question]

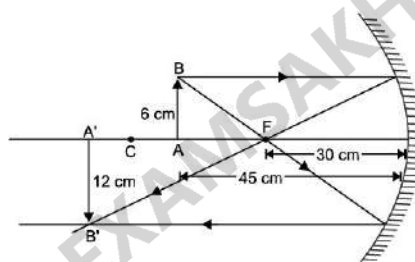
Ans. Given, Height of the object = 6 cm

Focal length, $f = -30$ cm

Object distance, $u = -45$ cm

Image distance, $v = ?$

Height of image, $h_i = ?$



We have, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

$$\frac{1}{-30} = \frac{1}{v} + \frac{1}{-45}$$

$$\frac{1}{-30} + \frac{1}{45} = \frac{1}{v}$$

$$\frac{1}{v} = \frac{-3+2}{90}$$

$$v = -90 \text{ cm}$$

Also, we have

$$m = \frac{h_i}{h_o} = \frac{-v}{u}$$

$$\frac{h_i}{6} = \frac{-(-90)}{-45}$$

$$\frac{h_i}{6} = -2$$

$$h_i = -12$$

Image is real and inverted.

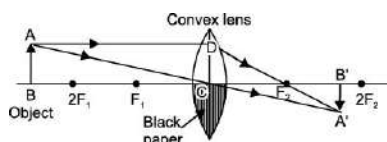
152. A 4 cm tall object is placed on the principal axis of convex lens. The distance of the object from the optical centre of the lens is 12 cm and its sharp image is formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again? How will the magnification of the image be affected?[Board Question]

Ans. He will have to move the screen towards the lens to get a sharp image of the object on it again.

Magnification of the image decreases.

153. One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations. [NCERT]

Ans. The convex lens will form complete image of an object, even if the one half is covered with black paper, because light rays can still pass through the optical centre of convex lens. We can verify this by obtaining image of any distant object on a screen by half covered convex lens. This can be more clear by the ray diagram given alongside.



154. When light ray goes from one transparent medium to another transparent medium, it suffers a change in direction, entering to second medium. The extent of the change in direction suffered by the phenomenon of change in the path of light rays when going from one medium to another medium is known as refraction. Ray in a given pair of media can be

expressed in terms of refractive index. The refractive index is related to an important physical quantity i.e., the relative speed of light in different media.

(i) When light goes from one medium to another, which of the three parameters, frequency, wavelength, velocity change?

(ii) A ray of light in air enters glass. Does it bend towards normal?

(iii) If the same ray enters water which way will it bend?

(iv) What is the unit of refractive index?

Ans. (i) Two parameters change. They are wavelength and velocity.

(ii) Yes, it bends towards normal.

(iii) The ray entering water from air will also bend towards normal as refractive index of water is more than air.

(iv) No unit.

155. Answer the following question:

(i) What happens to a ray of light when it travels from one medium to another having equal refractive indices?

(ii) State the cause of refraction of light.

Ans. (i) It does not deviate from its path.

(ii) When light travels from one medium to another medium, its speed changes because of change in refractive index of medium due to which it deviates from its path.

Practical Based Questions

156. Write the steps to obtain focal length of concave mirror.

Ans. 1. Select a well lit distance object.

2. Hold the mirror between object and screen.

3. Adjust the position of the mirror to form sharp image.

4. Measure the distance between the mirror and screen.

157. Analyse the following observation table showing variation of image-distance (v) with object distance (u) in case of a convex lens and answer the questions that follow without doing any calculations :[Board Question]

S.No.	Object distance u (cm)	Image distance v (cm)
1.	– 100	+ 25
2.	– 60	+ 30
3.	– 40	+ 40
4.	– 30	+ 60
5.	– 25	+ 100
6.	– 15	+ 120

(i) What is the focal length of the convex lens? Give reason to justify your answer.

(ii) Write the serial number of the observation which is not correct. On what basis have you arrived at this conclusion?

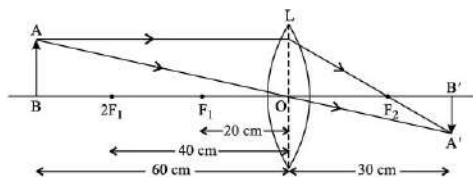
(iii) Select an appropriate scale and draw a ray diagram for the observation at S. No. 2. Also find the approximate value of magnification.

Ans. (i) From the S. No. 3, we can say that the radius of curvature of the lens is 40 cm as distance of object and the distance of the image is same.

... Focal length, $f = \frac{R}{2} = \frac{40}{2} = 20$ cm

(ii) S. No. 6 is not correct as for this observation the object distance is between focus and pole and for such cases, the image formed is

always virtual but in this case a real image is forming as the image distance is positive.



(iii) Magnification, $m = \frac{v}{u} = \frac{+30\text{ cm}}{-60\text{ cm}} = -0.5$.

158. A student places a candle flame at a distance of about 60 cm from a convex lens of focal length 10 cm and focuses the image of the flame on a screen. After that he gradually moves the flame towards the lens and each time focuses the image on the screen. [Board Question]

(i) In which direction—toward or away from the lens, does he move the screen to focus the image?

(ii) How does the size of the image change?

(iii) How does the intensity of the image change as the flame moves towards the lens?

(iv) Approximately for what distance between the flame and the lens, the image formed on the screen is inverted and of the same size?

Ans. (i) He should move the screen away from the convex lens to focus the image.

(ii) The size of the image increases.

(iii) The intensity of the image decreases as the flame moves towards the lens.

(iv) The flame should be placed at 20 cm from the convex lens on its left side.

159. Give two precautions to obtain better results to determine the focal length of convex lens.

Ans. 1. Select a lens of small diameter.

2. Select a distant object.

3. Keep lights of the room on.

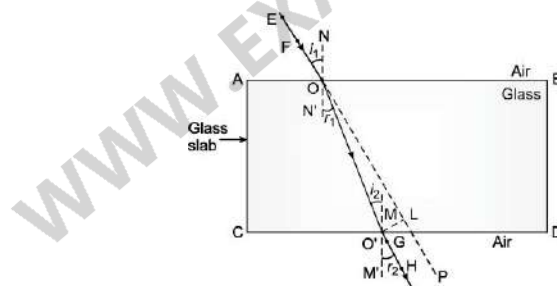
160. List four precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen. [Board Question]

Ans. Precautions are as follows :

1. Fix the lens vertically in lens holder.
2. Base of lens and white screen should be in a line with measuring scale.
3. There should not be any obstacle in path of lens.
4. Record the position of lens and screen when sharp image is formed.

161. Draw the ray diagram of ray entering a glass slab. Label angle of incidence, refraction and emergence.

Ans. It is shown in the ray diagram that light ray bends towards the normal when enters into the glass slab and away from the normal when emerges out in air.



162. What should be the angle of incidence when refracted ray will not show any deviation? What precaution should be taken so that refracted ray undergoes deviation?

Ans. When incident ray is at 90° , the refracted ray will not undergo any deviation. The angle of incidence should have value between 30° to 60° and never 90° .

163. Using the following informations form a pathway showing the reflection of a spherical mirror. And also include informations that are not mentioned below to complete it.

Reflecting surface, spherical mirror, curved inwards, curved outwards, pole, center of curvature.

Ans. Spherical mirror reflections $\square \rightarrow$ curved inwards or outwards. The reflecting mirrors $\square \rightarrow$ are curved inwards $\square \rightarrow$ called **concave mirror**. The reflecting surface $\square \rightarrow$ of **convex mirror** $\square \rightarrow$ is curved outwards. Pole is the center of **reflecting surface**. The center of spherical mirror $\square \rightarrow$ known as center of curvature.

164. Using the following informations form a pathway showing the formation of image by a convex mirror. And also include informations that are not mentioned below to complete it.

Convex, Infinity, position of image, size of image, Nature of image, between infinity and pole.

Ans. Two positions of objects $\square \rightarrow$ considered in the formation of image $\square \rightarrow$ by a convex mirror.

Position 1 : The **position of object** $\square \rightarrow$ at infinity $\square \rightarrow$ image is at the **focus F behind the mirror**, the image size is $\square \rightarrow$ **highly diminished and point sized**. The nature of image is $\square \rightarrow$ **virtual and erect**.

Position 2 : The position of object $\square \rightarrow$ between infinity and pole P $\square \rightarrow$ displays the image position between $\square \rightarrow$ **P and F behind the mirror**. Size of the image $\square \rightarrow$ is diminished. Nature of the image is $\square \rightarrow$ **virtual and erect**.

165. Using the following informations form a pathway showing the process of magnification in spherical mirror. And also include informations that are not mentioned below to complete it.

Magnification, spherical mirror, object image, ratio, height of image, positive, negative.

Ans. The spherical mirror magnifies $\square \rightarrow$ objects image to a **relative extent with respect to object size**. It is the ratio of $\square \rightarrow$ height of

image \rightarrow to the **height of object**. The positive sign in magnification value \rightarrow denotes the **virtual image**. The negative sign in magnification value denotes \rightarrow **real image**.

166. Using the following informations form a pathway showing the representation of an image in a spherical mirror. And also include informations that are not mentioned below to complete it.

Ray, centre of spherical mirror, reflection, light rays, reflecting surface.

Ans. In both **concave and convex mirror** \rightarrow for the ray passing through the **centre of curvature** \rightarrow the reflection is along **same path**. The reflection of light rays \rightarrow is along same path \rightarrow since the rays **incident on the mirror** \rightarrow is normal to the reflecting surface.

167. Using the following informations form a pathway defining refractive index. And also include informations that are not mentioned below to complete it.

Ray of light, second medium, refractive index, speed, media, air.

Ans. The refractive index \rightarrow is the **extent of change in direction** \rightarrow in second medium of given media pair. The **propagation of light** travels \rightarrow with different speed in different media. The **speed of light in air** is \rightarrow comparatively less when compared to vacuum.

168. Using the following informations form a pathway to explain the observation made by Newton regarding the sunlight. And also include informations that are not mentioned below to complete it.

Glass prism, sunlight, second prism, second glass.

Ans. The **spectrum** of sunlight was obtained by \rightarrow Newton by using a glass prism. The spectrum of **white light** \rightarrow was again tried to split by using \rightarrow second glass prism in \rightarrow which no more colours get added.

The position of second prism is $\square \rightarrow$ inverted with respect to first prism $\square \rightarrow$ adding all colours to pass $\square \rightarrow$ through the second prism $\square \rightarrow$ concluding that sunlight is made up of **seven colours**.

169. Using the following informations form a pathway to explain the phenomenon in twinkling of stars. And also include informations that are not mentioned below to complete it.

Starlight, refractive index, stationary, apparent position, medium of change.

Ans. The **atmospheric refraction** of starlight $\square \rightarrow$ makes the stars twinkle. The continuous refraction of starlight $\square \rightarrow$ occurs when it enters into atmosphere before reaching the earth. The refraction takes place in the $\square \rightarrow$ medium of change in **refractive index**. The starlight bend towards the $\square \rightarrow$ normal drifting the apparent position of star to be different from its $\square \rightarrow$ **actual position**. The apparent position $\square \rightarrow$ keeps on changing.

170. Using the following informations form a pathway to explain the phenomenon behind the clear sky. And also include informations that are not mentioned below to complete it.

Molecules, visible light, atmosphere, fine particles, dark sky.

Ans. The size of molecules of air and fine particles $\square \rightarrow$ in atmosphere has **wavelength** smaller than $\square \rightarrow$ visible light. The blue colour of shorter wavelength $\square \rightarrow$ scatters more than the **red colour** of longer wavelength. The absence of atmosphere in the earth $\square \rightarrow$ leads to dark sky. This is the reason $\square \rightarrow$ why the sky is dark for the passengers flying at **high altitudes** since **scattering** is not possible at those altitudes.

171. The results of image formation of a concave mirror for different positions of the object are given in table.

S. No.	Position of the object	Position of the image	Size of the image
1.	At infinity	At F	Highly diminished

2.	Beyond C	Between F and C	(a)
3.	At C	At C	(b)
4.	Between C and F	(c)	Magnified or enlarged
5.	At F	(d)	Highly magnified/ininitely large

Now answer the following questions :

(i) What will be (a) in the table?

(ii) What will be (b) in the table?

(iii) What will be (c) in the table?

(a) Behind the mirror

(b) Exact at C

(c) Beyond C

(d) None of the above

(iv) What will be (d) in the table?

(a) Behind the mirror

(b) Beyond C

(c) At infinity

(d) None of the above

Ans. (i) Diminished

(ii) Same size

(iii) (c) Beyond C

(iv) (c) At infinity

172. Answer the following questions:

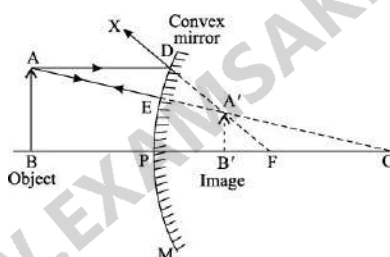
(i) If the image formed by a mirror for all positions of the object placed in front of it is always diminished, erect and virtual, state the type of the mirror and also draw a ray diagram to justify your answer. Write one use of such mirrors are put to and why? **[Board Question]**

(ii) Define the radius of curvature of spherical mirrors. Find the nature and focal length of a spherical mirror whose radius of curvature is + 24 cm. **[Board Question]**

Ans. (i) The type of the mirror is convex mirror.

The ray diagram is shown below:

Use of convex mirror: A convex mirror always produces a smaller, virtual and erect image of an object. In convex mirror, the length of the image is shorter than that of the object. Hence, it is used as a side view mirror in vehicles. The convex mirror forms images of vehicles that are spread over a relatively larger area.



(ii) **Radius of curvature** : The distance between the centre of curvature and pole of a spherical mirror is known as radius of curvature.

Given : Radius of curvature,

$$R = 24 \text{ cm}$$

$$f = \frac{R}{2} = \frac{24}{2} = +12 \text{ cm}$$

173. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.

[Board Question]

(i) What should be the range of distance of an object placed in front of the mirror ?

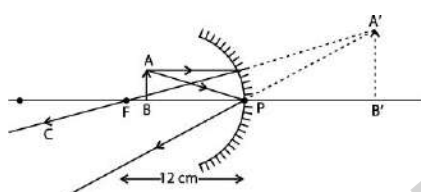
(ii) Will the image be smaller or larger than the object ? Draw ray diagram to show the formation of image in this case.

(iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror ? Draw ray diagram for this situation also to justify your answer.

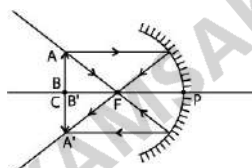
Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams.

Ans. (i) Range of distance should be 0 cm to < 12 cm.

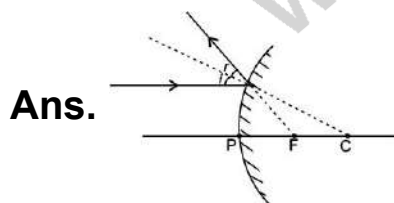
(ii) The image will be larger than the object.



(iii) Image will be formed at a distance of 24 cm in front of the mirror.



174. Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a convex mirror and show the angle of incidence and angle of reflection on it. [\[Board Question\]](#)



175. A student holding a mirror in his hand, directed the reflecting surface of the mirror towards the Sun. He then directed the reflected light on to a sheet of paper held close to the mirror.

[\[Board Question\]](#)

(i) What should he do to burn the paper ?

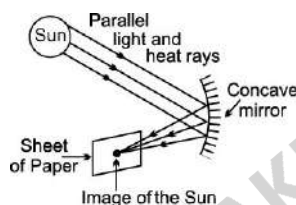
(ii) Which type of mirror does he have ?

(iii) Will he be able to determine the approximate value of focal length of this mirror from this activity? Give reason and draw ray diagram to justify your answer in this case.

Ans. (i) He should place the sheet of paper at the focus of the mirror to burn the paper.

(ii) He has a concave mirror.

(iii) Yes, the sheet of paper will start burning at the focus of the mirror which will give approximate value of focal length, *i.e.*, the distance between mirror and the point where the sheet of paper starts burning.



A concave mirror forms a real image of the sun.

176. Answer the following questions:

(i) Define focal length of a divergent lens.

[Board Question]

(ii) A divergent lens of focal length 30 cm forms the image of an object of size 6 cm on the same side as the object at a distance of 15 cm from its optical centre. Use lens formula to determine the distance of the object from the lens and the size of the image formed.

[Board Question]

(ii) Draw a ray diagram to show the formation of image in the above situation.

[Board Question]

Ans. (i) The point from which parallel rays of light, after refraction from a lens, appear to diverge is called focus of divergent lens, and

the distance between optical centre and this focus of a divergent lens is called focal length of divergent lens.

(ii) Focal length of divergent lens,

$$f = -30 \text{ cm}$$

Image distance, $v = -15 \text{ cm}$

Object height, $h_1 = 6 \text{ cm}$

We know that, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$$\text{or } \frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

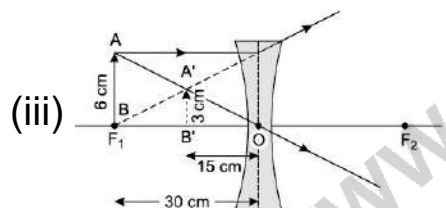
$$\Rightarrow u = \frac{vf}{f-v} = \frac{-15 \times (-30)}{-30+15}$$

$$= \frac{450}{-15} = -30 \text{ cm}$$

$$\text{Now, } m = \frac{h_2}{h_1} = \frac{v}{u}$$

$$\Rightarrow h_2 = \frac{v}{u} \times h_1$$

$$= \frac{-15}{-30} \times 6 = 3 \text{ cm}$$



177. Answer the following questions:

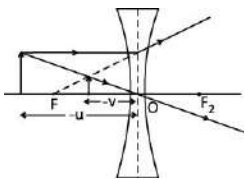
(i) Draw a ray diagram to show the formation of image by a concave lens when an object is placed in front of it. **[Board Question]**

(ii) In the same diagram mark the object-distance (u) and the image-distance (v) with their proper signs (+ve or -ve as per the new Cartesian sign convention) and state how these distances are related to the focal length (f) of the concave lens in this case. **[Board Question]**

(iii) Find the nature and power of a lens which forms a real and inverted image of magnification -1 at a distance of 40 cm from its optical centre.

[Board Question]

Ans. (i)



(ii) The object distance (u) and image distance (v) are marked in the diagram of part (a).

Relation : $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

(iii) As, $m = -1$; hence, the lens is convex.

Now, Magnification, $m = \frac{v}{u} = -1$

$\therefore v = -u$

Thus, object is at $2f$.

$2f = 40 \text{ cm}$

$f = 20 \text{ cm} = 0.2 \text{ m.}$

$P = \frac{1}{f} = \frac{1}{0.2}$

$= +5 \text{ D (convex lens).}$

178. Answer the following questions:

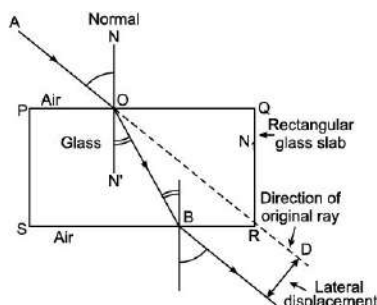
(i) Draw a ray diagram to show the refraction of light through a glass slab and mark angle of refraction and the lateral shift suffered by the ray of light while passing through the slab.

[Board Question]

(ii) If the refractive index of glass for light going from air to glass is $\frac{3}{2}$, find the refractive index of air for light going from glass to air.

[Board Question]

Ans. (i)



(ii) Given : $n_g = \frac{3}{2}$

$$n_a = \frac{1}{n_g} = \frac{1}{\frac{3}{2}} = \frac{2}{3}$$

Self-Assessment

179. A student very cautiously traces the path of a ray through a glass slab for different values of the angle of incidence ($\angle i$). He then measures the corresponding values of the angle of refraction ($\angle r$) and the angle of emergence ($\angle e$) for every value of the angle of incidence. On analysing these measurements of angles, his conclusion would be: **[Board Question]**

- (a) $\angle i > \angle r > \angle e$
- (b) $\angle i = \angle e > \angle r$
- (c) $\angle i < \angle r < \angle e$
- (d) $\angle i = \angle e < \angle r$

Ans. (b) $\angle i = \angle e > \angle r$.

180. Four students P, Q, R and S traced the path of a ray of light passing through a glass slab for an angle of incidence 40° and measured the angle of refraction. The values as measured them were 18° , 22° , 25° and 30° respectively. The student who has performed the experimental methodically is :

[Board Question]

- (a) P
- (b) Q
- (c) R

(d) S

Ans. (c) R

181. Define the following terms related to spherical mirrors :

(i) Pole

(ii) Principal axis

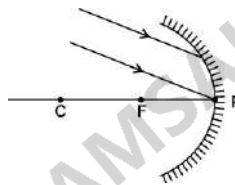
(iii) Aperture

182. (i) Define lateral shift.

(ii) State the factors on which it depends.

183. What is the unit of refractive index ?

184. Complete the ray diagram shown in figure to show the formation of image for parallel rays incident on a concave mirror. State the position, nature and size of the image formed.



185. The refractive index of water with respect to air is $\frac{4}{3}$. What is the refractive index of air with respect to water?

Ans. 0.75

186. The focal length of a convex lens is 50 cm. Express its power and sign.

Ans. + 2 D

187. A concave lens has focal length of 15 cm. At what distance should the object from the lens be placed so that it forms an image at 10 cm from the lens ? Also, find the magnification produced by the lens.

Ans. – 30 cm, + 0.33

188. The refractive index of water with respect to air is ${}_a n_w$ and of glass with respect to air is ${}_a n_g$. Express the refractive index of glass with respect to water.

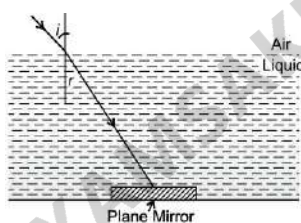
189. Refractive indices of carbon disulphide and ethyl alcohol are 1.63 and 1.36 respectively. Which is optically denser ?

Ans. ${}^w n_g = \frac{{}^a n_g}{{}^a n_w}$

190. Draw the ray diagrams showing the image formation by a concave mirror when an object is placed.

- (i) Between the pole and focus of the mirror.
- (ii) Between focus and centre of curvature of the mirror.
- (iii) At centre of curvature of the mirror.
- (iv) A little beyond centre of curvature of the mirror.
- (v) At infinity.

191. A ray of light enters a liquid from air, as shown in figure. The angle i is 45° and angle r is 30° .



- (i) Calculate the refractive index of the liquid.
- (ii) Show in the diagram the path of the ray after it strikes the mirror and re-enters in air. Mark in the diagram the angles wherever necessary.

192. Differentiate between the image formed by a convex and a concave lens.

193. Assertion : When a ray of light travels from air to water, its speed will increase.

Reason : The speed of light is higher in a denser medium than in a rarer medium.

The Human Eye and Colourful World

Chapter 11

Summary

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The Human Eye

The human eye uses light and enables us to see the colourful world, beautiful nature and natural phenomenon.

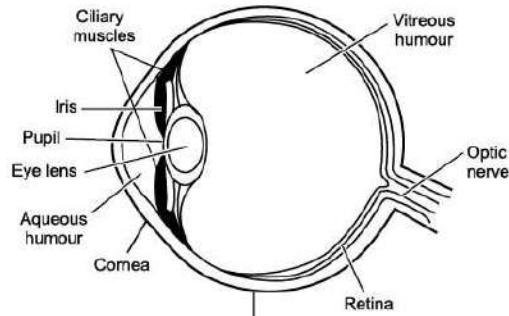
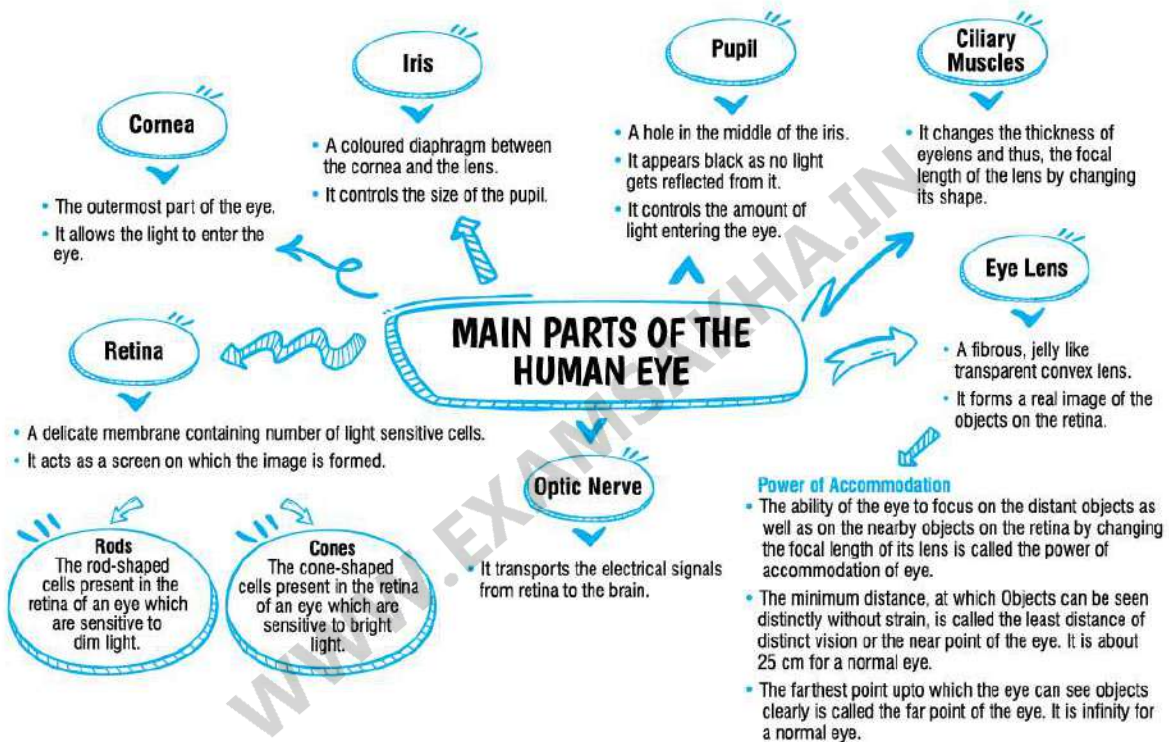
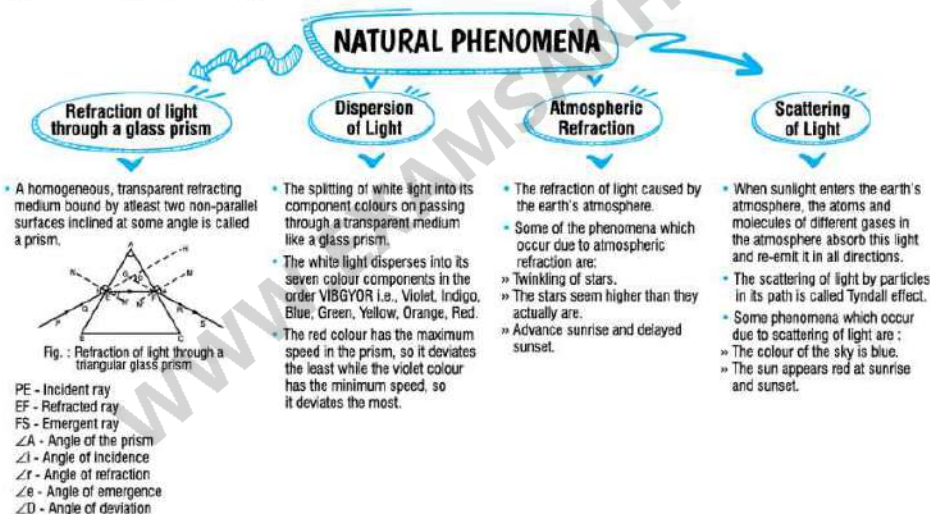
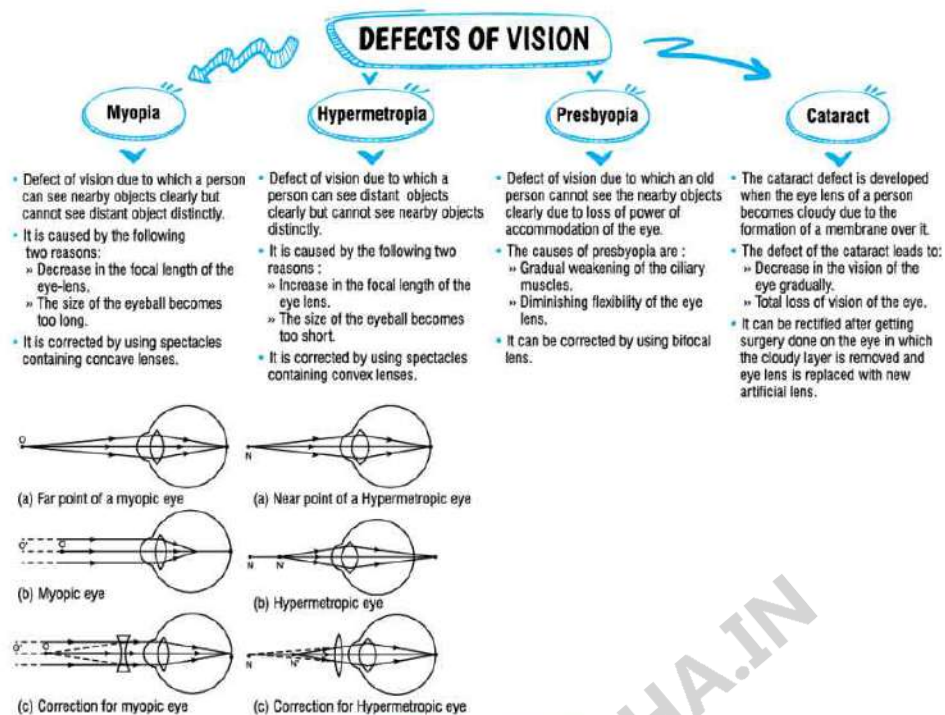


Fig. Structure of the eye





Multiple Choice Questions

1. The least distance of distinct vision for a young adult with normal vision is about :

- (a) 25 m
- (b) 2.5 cm
- (c) 25 cm

(d) 2.5 m

Ans. (c) 25 cm

Explanation :

The least distance of distinct vision for a young adult with normal vision is 25 cm. The range of vision of a normal human eye is from infinity to 25 cm.

2. The change in focal length of an eye lens is caused by the action of the :

(a) Pupil

(b) Retina

(c) Ciliary muscles

(d) Iris

Ans. (c) Ciliary muscles

Explanation :

The change in focal length of an eye lens is caused by the action of the ciliary muscles. The ciliary muscles help in changing the shape of the lens, thus changing its focal length.

3. The image formed by the retina of the human eye is :

(a) Virtual and erect

(b) Real and inverted

(c) Virtual and inverted

(d) Real and erect

Ans. (b) Real and inverted

Explanation :

The image formed on the retina of the human eye is real and inverted. Then in the retina, the image is converted into electrical impulses and sent to the brain. The brain flips that image into a

virtual and erect image.

4. The coloured light that refracts most while passing through a prism is :

- (a) Yellow
- (b) Violet
- (c) Blue
- (d) Red

Ans. (b) Violet

Explanation :

White light is dispersed into its seven-color components by a prism. Different colors of light bend through different angles with respect to the incident ray, as they pass through a prism. So, the Violet light refracts the most while passing through a prism.

5. The amount of light entering the human eye is controlled by :

- (a) Ciliary muscles
- (b) Pupil
- (c) Cornea
- (d) Iris

Ans. (b) Pupil

Explanation :

A small opening in the iris is known as a pupil. Its size is controlled with the help of iris. It controls the amount of light that enters the eye.

6. The part of the eyes refracts light entering the eye from external objects ?

- (a) Lens
- (b) Cornea
- (c) Iris

(d) Pupil

Ans. (b) Cornea

Explanation :

The cornea refracts light entering the eye from external objects. It is the transparent layer forming the front of the eye.

7. The value of least distance of distinct vision for a normal human eye is _____.

(a) 35 cm

(b) 25 cm

(c) 45 cm

(d) 70 cm

Ans. (b) 25 cm

Explanation :

Least distance of distinct vision for a normal human being is 25 cm. It varies with age. For infants, it is 5 to 8 cm. The human eye can distinguish about 10 million colors.

8. The defect caused by the weakening of ciliary muscles is :

(a) Myopia

(b) Hypermetropia

(c) Presbyopia

(d) Astigmatism

Ans. (c) Presbyopia

Explanation :

Presbyopia occurs due to progressive weakness of the ciliary muscles and decreasing eye lens flexibility.

9. The defect of vision in which a person is able to see nearby objects clearly, but not far objects is called :

- (a) Long-sightedness or Hypermetropia
- (b) Short-sightedness or myopia
- (c) Cataract
- (d) Astigmatism

Ans. (b) Short-sightedness or myopia

Explanation :

Myopia is a defect of vision in which a person clearly sees all the nearby objects, but is unable to see the distant objects.

10. Hypermetropia can be corrected by :

- (a) Convex lens
- (b) Plano-convex lens
- (c) Concave lens
- (d) Plano-concave lens

Ans. (a) Convex lens

Explanation :

In hypermetropia, the image is formed behind the retina and a person cannot see nearby objects clearly. It can be corrected by using a convex lens. It helps in focusing the rays entering the eye on the retina.

11. The sky appears dark to passengers flying at very high altitudes mainly because :

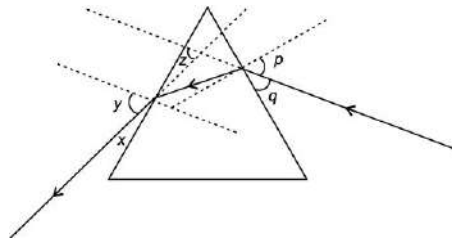
- (a) Scattering of light is not enough at such heights.
- (b) There is no atmosphere at great heights.
- (c) The size of molecules is smaller than the wavelength of visible light.
- (d) The light gets scattered towards the earth.

Ans. (a) Scattering of light is not enough at such heights.

Explanation :

The scattering of light takes place due to the presence of particles in the atmosphere. This is because the atmospheric medium is very rare at higher altitudes, the scattering of light that takes at these places is very low due to which the sky appears dark to the passengers flying at very high altitudes.

12. Study the following ray diagram :



In this diagram, the angle of incidence, the angle of emergence and the angle of deviation respectively have been represented by :

(a) y, p, z

(b) x, q, z

(c) p, y, z

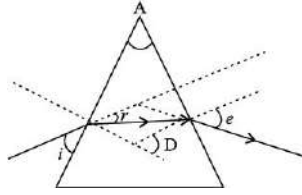
(d) p, z, y

Ans. (c) p, y, z

Explanation :

It is clear from the ray diagram that: The angle which is formed between the incident ray and the normal is called angle of incidence (p) The angle which is formed between emergent ray and the normal is called angle of emergence (y) The angle which is formed between the emergent ray and incident ray is called angle of deviation (z). Thus, angle of incidence, emergence and deviation is p, y and z respectively.

13. In the following diagram the correctly marked angles are :



- (a) $\angle A$ and $\angle e$
- (b) $\angle i$, $\angle A$ and $\angle D$
- (c) $\angle A$, $\angle i$ and $\angle e$
- (d) $\angle A$, $\angle r$ and $\angle D$

Ans. (a) $\angle A$ and $\angle e$

Explanation :

It is clear from the ray diagram that $\angle A$, $\angle r$ and $\angle D$ are correctly marked. $\angle A$ represents the angle of prism which is correctly marked. $\angle D$ represents the angle of deviation which is formed between the emergent ray and incident ray is incorrectly marked. $\angle r$ represents the angle of refraction which is formed by the refracted ray with the normal is incorrectly marked. $\angle i$ is the angle formed by the incident ray with the normal is incorrectly marked.

14. If a person can see a doll at the far distance, but he cannot read the newspaper in his hands. What lens should he wear to make correct his eyesight?

- (a) Convex lens
- (b) Concave lens
- (c) Bi-focal lens
- (d) Prism

Ans. (a) Convex lens

Explanation :

If a person is unable to read newspaper, this means the person can't see the nearby objects. Thus, he is suffering from hypermetropia and it can be treated by using a pair of convex lenses.

15. The persistence of vision for the human eye is :

- (a) $\frac{1}{10}$ th of a second
- (b) $\frac{1}{16}$ th of a second
- (c) $\frac{1}{6}$ th of a second
- (d) $\frac{1}{10}$ th of a second

Ans. (b) $\frac{1}{16}$ th of a second

Explanation :

The persistence of vision of human eye is $\frac{1}{16}$ th of a second. Persistence of vision is the optical phenomenon where the illusion of motion is created because the brain interprets multiple still images as one.

16. The light-sensitive cell present on the retina and is sensitive to the intensity of light is :

- (a) Cones
- (b) Rods
- (c) Both rods and cones
- (d) None of these

Ans. (b) Rods

Explanation :

The light-sensitive cell present on the retina and is sensitive to the intensity of light is rods.

17. The phenomena of light responsible for the working of the human eye is :

- (a) Reflection
- (b) Refraction
- (c) Power of accommodation

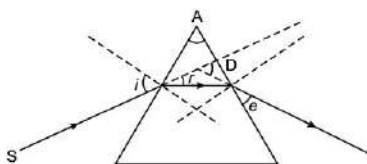
(d) Persistence of vision

Ans. (b) Refraction

Explanation :

The phenomenon of light responsible for the working of the human eye is refraction. This phenomenon helps in the formation of image.

18. Study the following diagram and select the option having correctly marked angles:



(a) $\angle i$, $\angle A$, $\angle D$

(b) $\angle i$, $\angle r$, $\angle D$

(c) $\angle i$, $\angle e$, $\angle A$

(d) $\angle r$, $\angle e$, $\angle D$

Ans. (a) $\angle i$, $\angle A$, $\angle D$

Explanation :

It is clear from the ray diagram that $\angle A$, $\angle i$ and $\angle D$ are correctly marked. $\angle A$ represents the angle of prism which is correctly marked. $\angle D$ represents the angle of deviation which is formed between the emergent ray and incident ray is incorrectly marked. $\angle i$ is the angle formed by the incident ray with the normal is incorrectly marked.

19. A person cannot see distinctly objects kept beyond 2 m. This defect can be corrected by using a lens of power:

(a) + 0.5 D

(b) – 0.5 D

(c) + 0.2 D

(d) – 0.2 D

Ans. (b) – 0.5 D

Explanation :

The lens of power -0.5 D can be used to correct the defect as:

$$F = -2\text{ m}$$

$$P = 1/f = 1/(-2) = -0.5\text{ D}$$

20. The defect of vision in which a person cannot see the distant objects clearly but can see nearby objects clearly is called:

- (a) myopia
- (b) hypermetropia
- (c) presbyopia
- (d) bifocal eye

Ans. (a) myopia

Explanation :

A person with myopia can see nearby objects clearly but cannot see distant objects distinctly. Myopia is also known as short-sightedness.

21. The splitting of white light into different colours on passing through a prism is called:

- (a) reflection
- (b) refraction
- (c) dispersion
- (d) deviation

Ans. (c) dispersion

Explanation :

The splitting of light into its constituent colour is called dispersion. It occurs because refraction or bending differs with the colour.

22. At noon, the Sun appears white as:

- (a) blue colour is scattered the most
- (b) red colour is scattered the most
- (c) light is least scattered
- (d) all the colours of the white light are scattered away

Ans. (c) light is least scattered

Explanation :

At noon, the sun is directly overhead and has lesser air to travel through and thus will be reduced if the distance to be travelled in air is reduced. Less scattering leads to the sun appearing white as only a little of the blue and violet colour is scattered.

23. Twinkling of stars is due to:

- (a) reflection of light by clouds
- (b) scattering of light by dust particles
- (c) dispersion of light by water drops
- (d) atmospheric refraction of starlight

Ans. (d) atmospheric refraction of starlight

Explanation :

Twinkling of stars is due to atmospheric refraction of starlight. The refraction of light occurs in a medium of various layers of gradually changing refractive indices. A star always emits light but the different layers of refractive indices in our atmosphere allows it to seem like a twinkle. When a light enters the earth and hits the atmosphere from a distance, it begins to refract the light into any layer that reaches. Thus, the star appears to twinkle.

24. When white light enters a glass prism from air, the angle of deviation is least for:

- (a) blue light

(b) yellow light

(c) violet light

(d) red light

Ans. (d) red light

Explanation :

When white light enters a glass prism from air, the angle of deviation is least for red light. The white light consists of seven colours in which the violet has least wavelength and red colour has the maximum wavelength.

25. When white light enters a glass prism from air, the angle of deviation is maximum for:

(a) blue light

(b) yellow light

(c) red light

(d) violet light

Ans. (d) violet light

Explanation :

The white light consists of seven colours in which the violet has least wavelength and red colour has the maximum wavelength.

26. The medical condition in which the lens of the eye of a person becomes progressively cloudy resulting in blurred vision is called:

(a) myopia

(b) hypermetropia

(c) presbyopia

(d) cataract

Ans. (d) cataract

Explanation :

Cataract is the medical condition in which the lens of the eyes become progressively opaque, resulting in blurred vision.

Assertion and Reasoning Based Questions

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.
- (c) Assertion is true, but reason is false.
- (d) Assertion is false, but reason is true.

27. Assertion: The human eye is one of the most valuable and sensitive sense organs.

Reason: Eye enables us to see the wonderful world and the colours around us.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

We know that human eye is the most valuable sense organ because it enables us to see this colourful world. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

28. Assertion: The human eye works like a camera.

Reason: The human eye's lens system forms an image on a light-sensitive screen called the retina.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Human eye works like a camera because of its lens system. Light enters the eye through a thin membrane called the cornea. It forms the transparent bulge on the front surface of the eyeball. The eye lens forms an inverted real image of the object on the retina. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

29. Assertion: The curvature of the eye lens can be modified to some extent by the ciliary muscles.

Reason: The ciliary muscles are used to modify the curvature of lens.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

The curvature of the eye lens is modified to change the focal length. When the muscles are relaxed, the lens becomes thin. Therefore, there is an increase in the focal length. This enables us to see distant objects clearly. This modification in lens is done by ciliary muscles. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

30. Assertion: Sometimes, the eye may gradually lose its power of accommodation.

Reason: The crystalline lens of people at old age becomes milky and cloudy.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

The person cannot see the objects distinctly and comfortably because of accommodation. The vision becomes blurred due to the refractive defects of the eye. Therefore, the given assertion is correct but reason is not the correct explanation of assertion.

31. Assertion: Hypermetropia is also known as near-sightedness.

Reason: The image of a distant object is formed in front of the retina.

Ans. (d) Assertion is false but reason is true.

Explanation :

Myopia is known as near-sightedness and hypermetropia is known as far-sightedness. The image of a distant object is formed in front of retina. Thus, assertion is false but reason is true.

32. Assertion: Cataract causes partial or complete loss of vision.

Reason: The eyeball is approximately elliptical shape.

Ans. (c) Assertion is true but reason is false.

Explanation :

Sometimes, the crystalline lens of people at old age becomes milky and cloudy. This condition is called cataract. This causes partial or complete loss of vision. The eyeball is spherical in shape and not elliptical. Thus, the given assertion is true and reason is false.

33. Assertion: The image of a distant object is formed in front of the retina and not at the retina itself.

Reason: The excessive curvature of the eye lens is a defect of myopia.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

A person with myopia can see nearby objects clearly but cannot see distant objects distinctly. A person with this defect may see clearly up to a distance of a few metres. In a myopic eye, the image of a distant object is formed in front of the retina but not at the retina itself. This defect may arise due to excessive curvature of the eye lens. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

34. Assertion: The power of accommodation of the eye usually

increases with ageing.

Reason: Presbyopia arises due to the gradual strengthening of the ciliary muscles.

Ans. (d) Assertion is false but reason is true.

Explanation :

The power of accommodation of the eye usually decreases with ageing and presbyopia arises due to the gradual weakening of the ciliary muscles. Thus, assertion is false but reason is true.

35. Assertion: It is possible to correct the refractive defects with contact lenses or through surgical interventions.

Reason: The eye lens is composed of fibrous jelly-like material.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

The refractive defects can be corrected by contact lenses and eye lens is composed of fibrous jelly-like material. Thus, both assertion and reason are correct but the reason is not the correct explanation of assertion.

36. Assertion: The farthest point up to which the eye can see objects clearly is called the far point of the eye.

Reason: The nearest point up to which the eye can see objects clearly is called the least point of the eye.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.

Explanation :

The farthest and the nearest point of the eye is based on the distance of the object is placed. Thus, both assertion and reason are correct but the reason is not the correct explanation of assertion.

37. **Assertion:** There exist two angles of incidence for the same

magnitude of deviation (except minimum deviation) by a prism kept in the air.

Reason: In a prism kept in air, a ray is incident on first surface and emerges out of second surface. Now, if another ray is incident on second surface (or prism) along the previous emergent ray, then this ray emerges out of first surface along the previous incident ray. This phenomenon is called the principle of reversibility of light.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

When a prism is kept in air, then two angles of incidence will exist for the same magnitude of deviation. This is due to the principle of reversibility of light. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

38. Assertion: The sequence of rainbow colour is represented as VIBGYOR.

Reason : Formation of VIBGYOR sequence colour is due to the dispersion of white light.

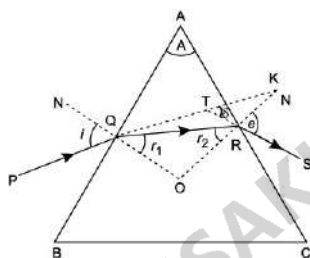
Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

We know that the rainbow has seven constituent colours such as Violet, Indigo, Blue, Green, Yellow, Orange and Red. These colours are represented as VIBGYOR. It occurs due to the dispersion of white light *i.e.*, when the white light passes through a glass prism, this phenomenon of splitting white light into VIBGYOR. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

39. Read the passage given below and answer the following questions from (i) to (v).

A prism is a transparent refractive medium bounded by two plane surfaces inclined to each other at a certain angle. The refraction of light through a prism follows the laws of refraction. In the prism, refraction takes place on its refracting surface *i.e.*, entrance and exit. The refraction through a prism is shown in the figure. Here, A is the angle of the prism, $\angle i$ is the angle of incidence of the face AB and $\angle e$ is the angle of emergence at another face AC . The incident ray suffers a deviation or bending through an $\angle d$ due to the refraction through the prism. This angle is called the angle of deviation as shown in the figure:



$$\angle d + \angle A = \angle i + \angle e$$

(i) The angle between the two refracting surfaces of a prism is called:

- (a) Angle of prism
- (b) Angle of incidence
- (c) Angle of deviation
- (d) Angle of emergence

Ans. (a) Angle of prism

(ii) The angle between the incident ray and the emergent ray is called:

- (a) Angle of emergence
- (b) Angle of deviation
- (c) Angle of incidence

(d) Angle of the prism

Ans. (b) Angle of deviation

(iii) When a ray is refracted through a prism, then

(a) $\angle i = \angle d$

(b) $\angle i = \angle e + \angle d$

(c) $\angle d = \angle e$

(d) $\angle i > \angle r$

Ans. (d) $\angle i > \angle r$

(iv) The angle of deviation depends upon:

(a) Refractive index of the prism

(b) Angle of incidence

(c) Size of the prism

(d) Both (a) and (b)

Ans. (c) Size of the prism

(v) The rectangular surfaces of a prism are known as:

(a) Reflecting surfaces

(b) Dispersing surfaces

(c) Refracting surfaces

(d) Scattering surfaces

Ans. (c) Refracting surfaces

40. Read the passage given below and answer the following questions from (i) to (v).

Different colours in the white light travel at the same speed in a vacuum for all wavelengths. But in any transparent medium (glass or water), the light of different colours travel with different speeds for different wavelengths. This means that the refractive index of a particular material is different for different wavelengths. As there is a difference in their speeds, the different colours bend through

different angles. The speed of violet colour is maximum and the speed of red colour is minimum in the glass. Hence, red colour deviates the least and violet the most. The relationship is - higher the wavelength of a colour of light, smaller is the refractive index and less is the bending of light.

(i) Which of the following statements is correct regarding the propagation of light of different colours of white light in the air?

- (a) Red light moves fastest.
- (b) Blue light moves faster than green light.
- (c) All the colours of the white light move at the same speed.
- (d) Yellow light moves with the mean speed as that of the red and violet light.

Ans. (c) All the colours of the white light move at the same speed

(ii) Which of the following is the correct order of wavelength?

- (a) Red > Green > Yellow
- (b) Red > Violet > Green
- (c) Yellow > Green > Violet
- (d) Red > Yellow > Orange

Ans. (c) Yellow > Green > Violet

(iii) Which of the following is the correct order of speed of light in glass?

- (a) Red > Green > Blue
- (b) Blue > Green > Red
- (c) Violet > Red > Green
- (d) Green > Red > Blue

Ans. (b) Blue > Green > Red

(iv) Which colour has the maximum frequency?

- (a) Red

(b) Violet

(c) Blue

(d) Green

Ans. (b) Violet

(v) Which of the following is the correct order of:

(a) Red > Green > Blue

(b) Blue > Yellow > Orange

(c) Orange > Red > Green

(d) Blue > Green > Violet

Ans. (b) Blue > Yellow > Orange

41. Read the passage given below and answer the following questions from (i) to (v).

The spreading of light by the air molecules is called the scattering of light. The light having the least wavelength scatters more. The Sun appears red at sunrise and sunset and the sky appears blue. It is due to the scattering of light. The colour of the scattered light depends on the size of the particles. The amount of scattering of light depends on the wavelength of light. When light from the Sun enters the earth's atmosphere, it gets scattered by the dust particles and the air molecules present in the atmosphere. The path of sunlight entering the dark room through a fine hole is seen because of the scattering of the sunlight by dust particles present in its path.

(i) To an astronaut in a spaceship, the colour of the earth appears:

(a) Red

(b) Blue

(c) White

(d) Black

Ans. (b) Blue

(ii) At the time of sunrise and sunset, the light from the sun has to travel:

- (a) Longest distance through the atmosphere
- (b) Shortest distance through the atmosphere
- (c) Double distance of what it travels during the daytime
- (d) Half the distance of what it travels during the daytime

Ans. (a) Longest distance through the atmosphere

(iii) The colour of the sky appears blue due to:

- (a) Refraction of light through the atmosphere
- (b) Dispersion of light through the air molecules
- (c) Scattering of light by air molecules.
- (d) All of the above

Ans. (c) Scattering of light by air molecules.

(iv) Twinkling of stars and non-twinkling of planets is accounted for by:

- (a) atmospheric refraction
- (b) atmospheric scattering
- (c) total internal reflection
- (d) dispersion of light

Ans. (a) atmospheric refraction

(v) Danger signals are always painted in red. Choose the incorrect statement.

- (a) Red light can be seen from the farthest distance
- (b) The wavelength of red light is maximum
- (c) Scattering of red light is least
- (d) Red is the colour of courage and fear

Ans. (d) Red is the colour of courage and fear

42. Read the passage given below and answer the following questions from (i) to (v).

Atmospheric refraction is the phenomenon of bending of light on passing through the earth's atmosphere. As we move above the surface of the earth, the density of air goes on decreasing. Local conditions like temperature etc. also affect the optical density of the earth's atmosphere. On account of atmospheric refraction, stars seen appear higher than they actually are. Advanced sunrise, delayed sunset, the oval appearance of the sun at sunrise and sunset, twinkling of stars, all can be explained with atmospheric refraction.

(i) Due to atmospheric refraction, the apparent length of the day.

- (a) Increases
- (b) Decreases
- (c) Remains same
- (d) None of the above

Ans. (a) Increases

(ii) Apparent position of the stars appears raised due to:

- (a) Atmospheric refraction
- (b) Scattering of light
- (c) Dispersion of light
- (d) Reflection of light

Ans. (a) Atmospheric refraction

(iii) The sun appears oval-shaped or flattened due to:

- (a) Dispersion
- (b) Scattering
- (c) Atmospheric refraction
- (d) Atmospheric reflection

Ans. (c) Atmospheric refraction

- (iv) Which of the following given statement is incorrect?
- (a) Atmospheric refraction explains the non-twinkling of planets
 - (b) Atmospheric refraction explains the twinkling of stars
 - (c) Atmospheric refraction explains floating images around a bonfire
 - (d) Atmospheric refraction alone explains the rainbow formation

Ans. (d) Atmospheric refraction alone explains the rainbow formation

- (v) In absence of atmosphere, the colour of the sky appears:

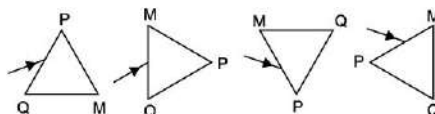
- (a) Blue
- (b) Black
- (c) Red
- (d) Yellow

Ans. (b) Black

43. Read the passage carefully and answer the following questions from (i) to (v).

Splitting of white light into its seven constituent colours when passed through a glass prism is known as 'dispersion'. All the colours travel at the same speed when they travel in vacuum. But when they pass through a medium, such as a glass prism, the colours bend or refract at different angles, and therefore the speed changes. Red colour bends the least and violet deviates the most.

- (i) A prism PQM (QM as the base) is placed in four different orientations as shown in the figure below. A narrow beam of sunlight is incident on the prism (in all orientations).



In which case, after dispersion, the third colour from the top corresponds to the primary colour Blue?

- (a) (i)

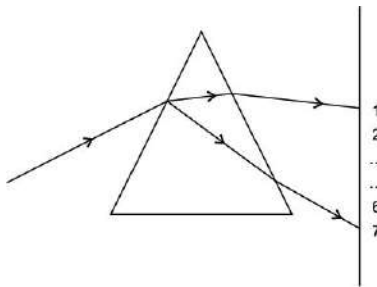
(b) (ii)

(c) (iii)

(d) (iv)

Ans. (c) (iii)

(ii) Which of the following statements is correct for the figure below?



(a) The colours in the order of increasing Wavelength are $1 < 2 < 3 < 4 < 5 < 6 < 7$

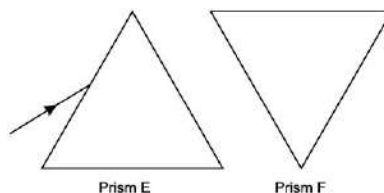
(b) The colours in the order of increasing frequency are $1 < 2 < 3 < 4 < 5 < 6 < 7$

(c) The colours in the order of decreasing speed are $7 > 6 > 5 > 4 > 3 > 2 > 1$

(d) The colours in the order of decreasing deviation are $1 > 2 > 3 > 4 > 5 > 6 > 7$

Ans. (b) The colours in the order of increasing frequency are $1 < 2 < 3 < 4 < 5 < 6 < 7$

(iii) Consider statements S_1 and S_2 for the figure given below:



S_1 : The ray of light which emerges out of Prism F will be white light.

S_2 : The refraction produced by the prism F is equal and opposite to that of Prism E.

(a) Both S_1 and S_2 are true and S_2 is the correct explanation of S_1 .

(b) Both S_1 and S_2 are true but S_2 is not the correct explanation of S_1 .

(c) S_1 is true but S_2 is false.

(d) S_2 is true but S_1 is false.

Ans. (a) Both S_1 and S_2 are true and S_2 is the correct explanation of S_1

(iv) Which of the following statements is incorrect?

(a) In the primary rainbow, red colour is formed on the outside and violet colour on the inside.

(b) A normal human eye cannot clearly see all the objects at different distances.

(c) A beam of white light gives a spectrum on passing through a hollow prism.

(d) All of the above.

Ans. (c) A beam of white light gives a spectrum on passing through a hollow prism

(v) Red colour is selected for danger signals because:

(a) Red light has the highest speed among all colours so it reaches our eyes fast.

(b) Since red is the colour of human blood so it is directly associated with danger and courage.

(c) Highest frequency of the colour red makes the wave move repeatedly multiple times in a direction.

(d) Red light has the highest wavelength among all colours so it is scattered least.

Ans. (d) Red light has the highest wavelength among all colours so it is scattered least

44. What is Power of accommodation?

Ans. It is the ability of the eye lens to focus near and far objects clearly on the retina by adjusting its focal length.

45. What is Persistence of Vision?

Ans. It is the time for which the sensation of an object continues in the eye. It is about $\frac{1}{16}$ th of a second.

46. What is Far Point of the eye?

Ans. The far point is the farthest point at which an object can be placed (along the optical axis of the eye) for its image to be focused on the retina within the eye's accommodation.

47. Define the Near point of the eye.

Ans. The near point is the nearest point within the eye's accommodation range at which an object can be positioned and still form a focused image on the retina.

48. What is Colour Blindness?

Ans. A person having defective cone cells is not able to distinguish between the different colours. This defect is known as Colour Blindness.

49. What is Myopia?

Ans. This is also called as the short-sightedness. A person with this eye defect can only see the nearby objects clearly compared to distant objects. This condition can be corrected using a concave lens.

50. What is Hypermetropia?

Ans. This is also called as the farsightedness. A person with this eye defect can only see the distant objects clearly compared to near objects. This condition can be corrected using a convex lens.

51. What is Presbyopia?

Ans. This is an age-related condition caused due to the weakening of ciliary muscles, hardening of the lens, and reduced lens flexibility. A person with this defect usually finds difficulties to focus on nearby objects unable to read or write.

52. Define Cataract.

Ans. This is an age-related condition caused due to the loss of transparency of the lens by erosion of lens proteins. It usually results in blurry vision, cloudy lenses and can be corrected by replacing the old lens with an artificial lens.

53. What is Dispersion of light?

Ans. The separation of visible light into its different colours is known as dispersion.

54. What is Scattering of light?

Ans. It is the phenomenon in which light rays get deviated from its straight path on striking an obstacle like dust or gas molecules, water vapours etc.

Very Short Answer Type Questions

55. Name the part of the eye :[\[Board Question\]](#)

(i) that controls the amount of light entering into the eye.

(ii) that has real, inverted image of the object formed on it.

Ans. (i) Pupil

(ii) Retina.

56. What is the function of the crystalline lens of the eye?[\[Board Question\]](#)

Ans. It provides the fine adjustment of focal length of eye lens system so as to focus images of objects situated at different distances on the retina.

57. Name the part of our eyes that helps us to focus near and distant objects in quick succession.

[Board Question]

Ans. Ciliary muscles help in changing the focal length of the eye lens.

58. State the role of ciliary muscles in accommodation of eye. [Board Question]

Ans. To adjust/modify the shape (curvature) of eye lens so that its focal length can be increased or decreased.

59. A person is able to see objects clearly only when these are lying at distances between 50 cm and 300 cm from his eyes. Name the kind of defects of vision he is suffering from. [Board Question]

Ans. The person is suffering from 'presbyopia'.

60. Name the condition resulting due to the eye lens becoming cloudy. [Board Question]

Ans. Cataract.

61. What happens to the image distance in the normal human eye when we decrease the distance of an object, say 10 m to 1 m ? Justify your answer.

[Board Question]

Ans. The image distance will remain unaffected even if we change the object distance because the image is formed on the retina.

62. Write the structure of eye lens and state the role of ciliary muscles in the human eye.

[Board Question]

Ans. The eye lens of the human eye is a convex lens that is thick in the middle and thin from the edges. It converges the incident light rays and forms the image on retina.

Role of ciliary muscles :

1. It changes the shape of the lens in eye to help with focussing.
2. It helps to regulate the flow of aqueous humor in eye.

63. What is atmospheric refraction? List two phenomena which can be explained on the basis of atmospheric refraction. [Board Question]

Ans. In atmosphere, there are layers of different densities and refractive indices, when light ray is passed through these layers, refraction of light takes place which is called atmospheric refraction.

Two phenomenon that can be explained on the basis of atmospheric refraction are :

1. Twinkling of stars.
2. Early sunrise and delayed sunset.

64. Name the principle on which a prism form the image of an object?

Ans. Refraction of light.

65. In which direction a ray of light bends while emerging out of a prism?

Ans. The light ray on emerging out of a prism always bends towards the base of the prism.

66. Name the factor on which the colour of light depends?

Ans. Wavelength is the factor on which the colour of light depends.

67. Give an example in nature which shows that sunlight may be made up of different colours.

Ans. Formation of rainbow.

Reasoning Based Questions

68. Why is a normal eye not able to see clearly, the objects placed closer than 25 cm?

Ans. The normal eye is not able to see clearly the objects placed closer than 25 cm because the focal length of eye lens cannot be

decreased beyond a certain minimum length.

69. Explain why the planets do not twinkle.

Ans. The planets are much closer to the earth and thus seen as extended sources. If we consider a planet as a collection of a large number of point-sized sources of light, the total variation in the amount of light entering our eye from all the individual point sized sources will average out to zero, thereby nullifying the twinkling effect. Hence, the planets do not twinkle.

70. Why does the sky appear dark instead of blue to an astronaut?

Ans. There is a vacuum in the space and hence no particle is available for scattering of light. In the absence of scattering, none of the colours from the visible spectrum reach the viewer's eye and the sky appears dark to the astronaut.

71. What is meant by scattering of light? The sky appears blue. Explain this phenomena with reason. [\[Board Question\]](#)

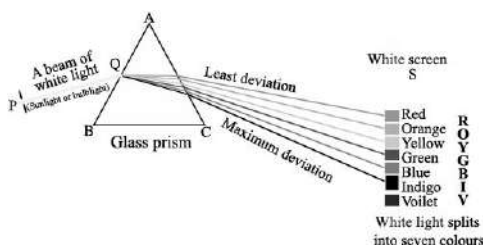
Ans. Scattering is the process of absorption and then re-emission of light energy in different directions on interaction with the particles present in the medium.

The light from sun has to travel a long distance of the earth's atmosphere before reaching us. As light travels through the atmosphere, it gets scattered in different directions by the air molecules present in its path. The blue (or violet) light due to its short wavelength is scattered more as compared to the red light of long wavelength. Thus, the light reaching our eye directly from sun is rich in red colour, while the light reaching our eye from all other directions is the scattered blue light. Therefore, the sky in direction other than the direction of sun, is seen blue.

72. Why do the component colours of incident white light split into a spectrum while passing through a glass prism? Explain. [\[Board Question\]](#)

Ans. The splitting up of white light into its constituent colours on passing through a refracting medium like a glass prism is called

dispersion of light. The dispersion of white light occurs because different colours of light bend through different angles with respect to the incident ray, as they pass through a prism. Thus, each colour emerges along a different path, forming a spectrum. The red light bends the least while the violet light the most as shown in figure below.



73. Why does the sky at noon appear white?

Ans. At noon, the sun is directly above our head and we get the light rays directly from the sun after travelling the shortest distance, without much scattering of any particular colour. Hence, the sky appears white.

74. Why do clouds appear white? Explain.

Ans. The clouds contain dust particles and water molecules of size bigger than the wavelength of visible light, so they scatter all colours of incident white light from sun to the same extent and hence when the scattered light reaches our eyes, the clouds are seen white.

75. The danger signal is red. Why?

Ans. The wavelength of red light is longest, so it is scattered least by the air molecules of the atmosphere and it can travel longer without becoming weak. Hence, red light is used for danger signal.

Short Answer Type Questions

76. Answer the following questions:

- (i) What is meant by power of accommodation of the eye? [\[NCERT\]](#)
- (ii) What do you mean by far point of human eye?
- (iii) What do you mean by near point of human eye?

Ans. (i) The ability of the eye to focus on the distant objects as well as on the nearby objects on the retina by changing the focal length of its lens is called the power of accommodation of the eye.

(ii) The most distant point at which an object can be seen clearly by the eye is called the far point of the eye.

(iii) The point at closed distance at which an object can be seen clearly by the eye is called the near point of the eye.

77. Answer the following questions:

(i) What is hypermetropia?

(ii) How hypermetropia can be corrected?

(iii) How is myopia corrected?

Ans. (i) The defect of the human eye in which a person can see the objects lying at long distances clearly but cannot see the nearby objects distinctly is called hypermetropia or long-sightedness.

(ii) To correct a hypermetropic eye, the person is allowed to wear spectacles with a convex lens of suitable power or focal length.

(iii) A myopic eye can be corrected by using spectacles with concave lens of suitable power or focal length.

78. Answer the following questions:

(i) What is persistence of vision?

(ii) Define the term angle of deviation.

(iii) Define the term power of accommodation. Write the modification in the curvature of the eye lens which enables us to see the nearby objects clearly? **[Board Question]**

Ans. (i) The image of any object formed on the retina persists for about $\frac{1}{16}$ of a second. This continuance of sensation of eye for sometime even after the removal of the object is called persistence of vision.

(ii) The angle between the incident ray produced forward and the emergent ray produced backward is called angle of deviation.

(iii) The ability of the eye lens to adjust its focal length, is called the power of accommodation. There should be a contraction of ciliary muscles, that will increase the curvature of the eye lens and becomes thicker, so the focal length of the eye lens will decrease. It will thus enable us to see the objects clearly.

79. What is scattering of light? Explain how the colour of the scattered light depends on the size of the scattering particles.
[Board Question]

Ans. Scattering of light is the phenomenon in which part of the incident light is dispersed in different directions.

Dependence of colour and scattered light on the size of particles :

1. When the particles like dust and water droplets present in the atmosphere are large in size, the scattered light appears white.
2. When the particles are extremely minute in size, they will scatter blue light present in the white sunlight.

Differentiate Between

80. Differentiate between myopia and hypermetropia.

Ans.	S.No.	Myopia	Hypermetropia
	1.	In this defect of human eye, a person can see the objects lying at short distances clearly but cannot see the far objects distinctly.	In this defect of human eye, a person can see the objects lying at long distances clearly but cannot see the nearby objects distinctly.
	2.	Myopia is also called short-sightedness.	Hypermetropia is also called long-sightedness.
	3.	Myopia may arise due to decrease in focal length of	Hypermetropia may arise due to increase in focal

	eye lens.	length of eye lens.
4.	The size of eye ball becomes too long.	The size of eye ball becomes too short.
5.	A person suffering from myopia must wear spectacles with concave lens of suitable power.	A person suffering from hypermetropia must wear spectacles with convex lens of suitable power.

81. Differentiate between presbyopia and cataract.

Ans.	S.No.	Presbyopia	Cataract
	1.	It is a defect of vision due to which an old person cannot see the nearby objects clearly due to loss of power of accommodation of eye.	It is the medical condition in which the lens of the eye of a person becomes progressively cloudy resulting in blurred vision.
	2.	It can be corrected by using spectacles having bifocal lens of suitable power.	It cannot be corrected by any type of spectacle lenses.
	3.	Surgical operations is not required to rectify presbyopia.	The vision of a person can be restored by getting surgery done on the eye having cataract.

82. Differentiate between dispersion and scattering of light.

Ans.	S.No.	Dispersion of Light	Scattering of Light
	1.	The phenomenon of splitting of white light into its constituent colours by a	The process of absorption and then re-emission of light energy in different directions on interaction with the particles

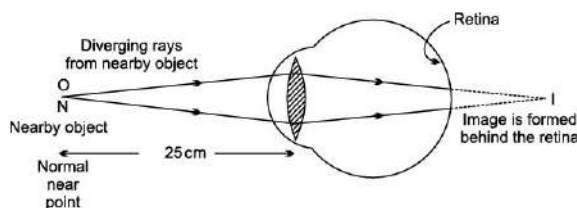
	transparent medium such as a glass prism is called dispersion of light.	present in the medium is called scattering of light.
2.	The dispersion of white light occurs because different colours of white light travel at different speeds while passing through the glass prism.	Scattering of light occurs when the air molecules of size smaller than the wavelength of incident light absorb the energy of incident light and then re-emit it in different directions without change in its wavelength.
3.	Formation of a rainbow is due to dispersion of light.	Blue colour of sky is due to scattering of light.

Diagram Based Questions

83. When do we consider a person to be myopic or hypermetropic? List two causes of hypermetropia. Explain using ray diagrams how the defect associated with hypermetropic eye can be corrected.

[\[Board Question\]](#)

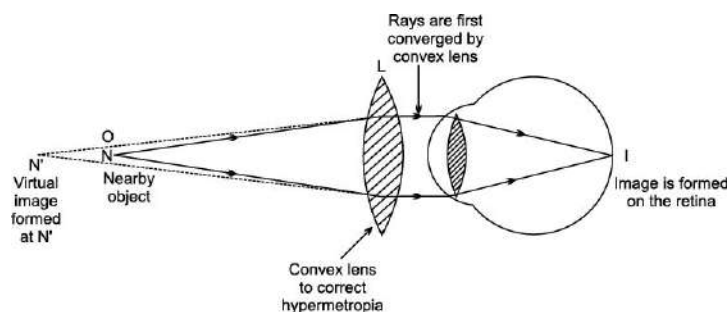
Ans. Myopia is the defect in vision in which a person cannot see the distant objects clearly whereas in hypermetropia is the defect in which a person cannot see nearby objects clearly.



Hypermetropia is caused due to :

1. Decrease in converging power of eye-lens.
2. Too short eye ball.

In a hypermetropic eye, the image of nearby object lying at normal near point N (at 25 cm) is formed behind the retina.

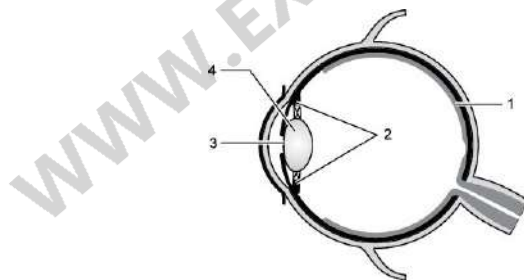


Hypermetropia and its correction by using convex lens.

Hypermetropic eye can be corrected using convex lenses. When a convex lens of suitable power is placed in front of hypermetropic eye, then the diverging rays of light from the object are converged first by the convex lens used. This forms a virtual image of the object at another near point N'.

Now, the rays can be easily focused by the eye lens to form an image on retina.

84. Name the four parts labelled as 1, 2, 3 and 4 in the given diagram.



Ans. 1. Retina

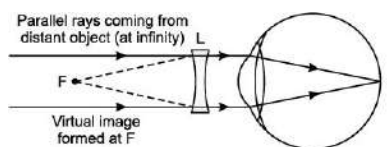
2. Ciliary muscles

3. Pupil

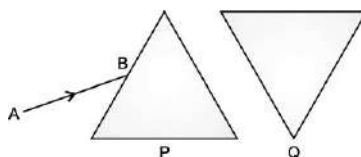
4. Crystalline lens

85. A student sitting at the back of the classroom cannot read clearly the letters written on the blackboard. What advice will a doctor give to her? Draw a ray diagram for the correction of this defect.

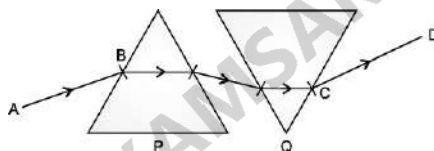
Ans. Doctor will advice her to use concave lens for suitable power.



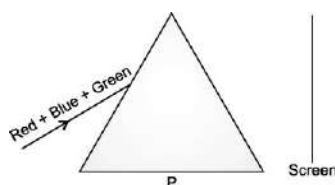
86. The given figure shows two identical prisms P and Q placed with their faces parallel to each other. A light ray of yellow colour AB is incident at the face of the prism P. Complete the diagram to show the path of the ray till it emerges out of the prism Q.



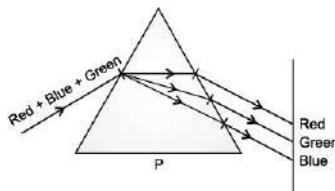
Ans. The completed diagram is as follows in which the ray CD which is emerging out of the prism Q is parallel to the ray AB which is incident on the prism P.



87. The figure shows a light (red + blue + green) incident on a prism P. Complete the diagram by drawing the refracted and the emergent rays.



Ans. The completed ray diagram shows the dispersion of (Red + Blue + Green) light by the prism.



88. Draw a neat diagram to show refraction of a light ray through a triangular glass prism. Mark angle of incidence,

angle of emergence, incident ray, refracted ray, emergent ray and the angle of deviation. **[Board Question]**

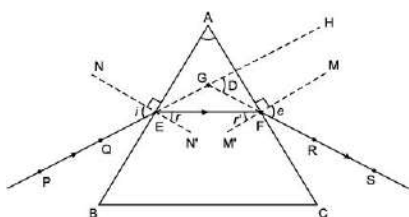
Ans. The labelled diagram has been shown in figure given below, in which

PE — Incident ray $\angle i$ — Angle of incidence

EF — Refracted ray $\angle r$ — Angle of refraction

FS — Emergent ray $\angle e$ — Angle of emergence

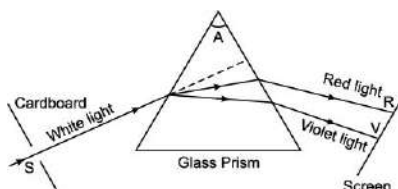
$\angle A$ — Angle of the prism $\angle D$ — Angle of deviation



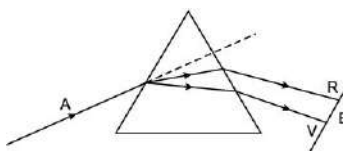
89. What is meant by the dispersion of white light ? Draw a diagram to show dispersion of white light by the glass prism. **[Board Question]**

Ans. When a beam of white light passes through a glass prism it splits up into its constituent seven colours. The splitting of white light into its constituent colours when light passes through a dispersive medium is called “dispersion of light”. The seven colours, usually expressed as ‘VIBGYOR’ constitute the spectrum of white light.

The ray diagram showing dispersion is given in fig.



90. What phenomenon is depicted in the given diagram ? Explain the phenomenon and label A and B in the diagram. **[Board Question]**

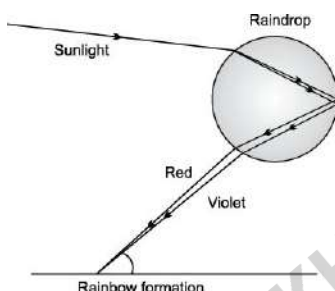


Ans. The diagram depicts the phenomenon of dispersion of light. Label A indicates incident white light. Label B indicates spectrum consisting of seven colours (VIBGYOR).

91. What is a rainbow? Draw a labelled diagram to show the formation of a rainbow.

[Board Question]

Ans. The Rainbow is a natural phenomenon in which the white light or sunlight splits into beautiful 7 colours by the water droplets which remain suspended in air after rain.

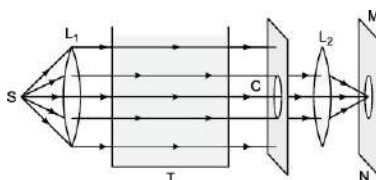


92. Answer the following questions:

(i) Draw a figure which show the arrangement for observing the phenomenon of scattering of light in the laboratory.

(ii) What colours would you observe in the experiment? Why?

Ans. (i) An arrangement for observing the scattering of light in the laboratory is as shown below.



(ii) 1. On the screen, first orange red colour and then bright crimson red colour patch is observed.

2. From the other three sides of colloidal solution of sulphur in a glass tank (T), blue colour is observed.

This is because the very fine colloidal sulphur particles scatter away the blue colour from the path of beam and only red colour (least

scattered) of the beam of white light reaches the screen through the solution.

Numericals

93. The near point of a hypermetropic eye is 1 m. What is the nature and power of the lens required to correct this defect? [Assume that the near point of the normal eye is 25 cm.]

Ans. The eye defect, hypermetropia can be corrected by using a convex lens.

Here,

The object distance, $u = -25$ cm

The image distance, $v = -1$ m = -100 cm

Using lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

On substituting the values, we get

$$\frac{1}{-100} - \frac{1}{-25} = \frac{1}{f}$$

$$\frac{1}{-100} + \frac{1}{25} = \frac{1}{f}$$

$$\frac{-1+4}{100} = \frac{1}{f}$$

$$\frac{3}{100} = \frac{1}{f}$$

$$f = \frac{100}{3}$$

$$f = 33.3 \text{ cm}$$

The focal length of the convex lens required is + 33.3 cm. In order to calculate power, we need to use the formula,

$$\text{Power, } P = \frac{1}{f(\text{in metre})}$$

On substituting the value of f , we get

$$P = \frac{1}{0.33}$$

$$P = +\frac{100}{33}$$

$$P = +3.0 \text{ D}$$

The power of convex lens required is + 3.0 D.

94. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the defect?

Ans. Myopia is corrected by using a concave lens. So, the person requires concave lens.

The far point of the myopic person is 80 cm.

Here,

The object distance, $u = -\infty$

The image distance, $v = -80$ cm

Using the formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

Substituting the values, we get $\frac{1}{-80} - \frac{1}{-\infty} = \frac{1}{f}$

$$-\frac{1}{80} + 0 = \frac{1}{f}$$

$$-\frac{1}{80} = \frac{1}{f}$$

$$f = -80 \text{ cm}$$

Thus, the focal length of the required concave lens is -80 cm or -0.8 m. In order to calculate power, we need to use the formula,

$$\text{Power, } P = \frac{1}{f(\text{in metre})}$$

Substituting the value of f , we get $P = \frac{1}{-0.8}$

$$= -\frac{10}{8}$$

$$= -1.25 \text{ D}$$

The required power of concave lens is -1.25 D.

95. The far point of a myopic person is 120 cm in front of the eye. What is the nature and power of the lens required to correct the problem?

Ans. The person is suffering from an eye defect called myopia. In this defect, the image is formed in front of the retina. Hence, a concave lens is used to correct this defect of vision.

Here,

The object distance, $u = -\infty$

The image distance, $v = -120$ cm $= -1.2$ m

Using the formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$$\text{We get } -\frac{1}{1.2} - \frac{1}{-\infty} = \frac{1}{f}$$

$$-\frac{1}{1.2} + 0 = \frac{1}{f}$$

$$f = -1.2 \text{ m}$$

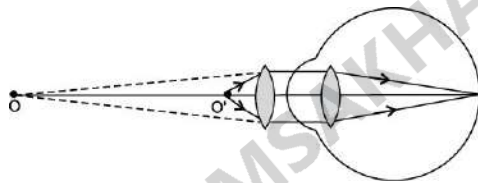
In order to calculate power,

$$\text{We know } P = \frac{1}{f(\text{in metre})} \text{ or } P = \frac{1}{-1.2} = -0.833 \text{ D}$$

So, a concave lens of power -0.83 D is required to correct this defect.

96. Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 0.8 m . What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm .

Ans. Hypermetropia can be corrected by using a convex lens of appropriate power. The ray diagram is as follows :



Here,

$$\text{The object distance, } u = -25 \text{ cm} = -0.25 \text{ m}$$

$$\text{The image distance, } v = -0.8 \text{ m}$$

$$\text{Using the formula, } \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\text{We get } \frac{1}{-0.8} - \frac{1}{-0.25} = \frac{1}{f}$$

$$\frac{11}{4} = \frac{1}{f}$$

$$f = \frac{4}{11} = 0.36 \text{ m}$$

In order to calculate power,

$$\text{We know, } P = \frac{1}{f(\text{in metre})}$$

$$P = \frac{1}{0.36} = 2.78 \text{ D}$$

A convex lens of power $+2.78 \text{ D}$ is required to correct the defect.

97. Parthiv with normal near point (25 cm) reads a book with small print using a magnifying glass, a thin convex lens of focal length 5 cm. What are the closest and farthest distances at which he can read the book viewing through the magnifying glass?

Ans. Focal length of convex lens, $f = 5$ cm

For the closest distance, $v = -25$ cm

Using the formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

$$-\frac{1}{u} = \frac{1}{f} - \frac{1}{v}$$

$$= \frac{1}{5} + \frac{1}{25} = \frac{6}{25}$$

$$u = \frac{-25}{6} \text{ cm} = -4.17 \text{ cm}$$

The closest distance at which Parthiv can read the book is -4.17 cm.

For the farthest distance, $v' = \infty$

Using the formula, $\frac{1}{v'} - \frac{1}{u'} = \frac{1}{f}$

$$-\frac{1}{u'} = \frac{1}{f} - \frac{1}{v'}$$

$$= \frac{1}{5} - \frac{1}{\infty} = \frac{1}{5}$$

$$u' = -5 \text{ cm}$$

The farthest distance at which Parthiv can read the book is -5 cm.

98. A student needs spectacles of power -0.5 D for the correction of his vision. [Board Question]

(i) Name the defect in vision the student is suffering from.

(ii) Find the nature and focal length of the corrective lens.

(iii) List two causes of this defect.

Ans. (i) Myopia.

(ii) Concave lens with the focal length of 200 cm

Given, $P = -0.5$ D

We have, $P = \frac{1}{f} \text{ m}$

$$f = \frac{1}{P} = \frac{1}{(-0.5)}$$

$$f = -2 \text{ m}$$

$$f = -200 \text{ cm}$$

(iii) Two causes of Myopia are :

1. Elongation of eye ball. 2. High converging power of eye lens.

99. If Ram, a myopic person uses spectacles of power – 0.5 D, then what will be the distance of far point of his eye?

Ans. Power, $P = -0.5 \text{ D}$

Let x be the distance of the far point.

The focal length, $f = -x$

Power of a lens is given by,

$$P = \frac{1}{f(\text{in metre})}$$

$$-0.5 = \frac{1}{-x}$$

$$x = \frac{1}{0.5} = +2 \text{ m}$$

100. Mala can see the objects lying between 25 cm and 100 cm from her eye. Her vision can be corrected by using lens of power – 0.1 D. Is the statement true or false?

Ans. Here,

The distance of far point, $x = 100 \text{ cm}$

Focal length, $f = -x = -100 \text{ cm}$

Using the formula, $P = \frac{100}{f}$

Substituting the values, we get $P = \frac{100}{-100} = -1 \text{ D}$

\therefore The statement is wrong.

101. Does myopia or hypermetropia imply necessarily that the eye has partially lost its ability of accommodation? If not, what cause these defects of vision?

Ans. No, a person may have normal ability of accommodation and yet he may be myopic or hypermetropic. In fact, myopia may arise when length of eye ball is elongated and hypermetropia may arise when length of eye ball gets shortened.

102. Ram can read a book clearly only if he holds it at an arm's length from him. Name the defect of vision if he is an old man.

Ans. He is suffering from presbyopia.

103. When we increase the distance of an object from the eye, what happens to the image distance in the eye?

Ans. For a normal eye, image distance in the eye is fixed, being equal to distance of retina from the eye lens. When we increase the distance of an object from the eye, the focal length of eye lens is changed on account of accommodation power of the eye, so as to keep the image distance constant.

104. Ahmed cannot distinguish between red and green colour. Why? Does he have normal vision?

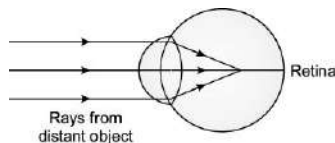
Ans. Ahmed who is blind to red and green colour may be deficient in cone shaped cells having red and green pigment in the retina of his eyes. It is a genetic disorder and not a refractive defect of vision. So, he may not have normal vision.

105. In a certain murder investigation, it was important to discover whether the victim was long-sighted or short-sighted. How could a detective decide by examining his spectacles?

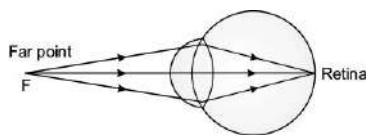
Ans. If the spectacle lenses are concave, then the person was short-sighted and if the spectacle lenses are convex, the person was long-sighted.

106. The cause of myopia are the eyeball gets elongated and the focal length of the eye lens became too short or power of eye lens becomes too high. By elongation of eye ball we mean that the distance between the eye lens and retina is increased.

When the distance becomes more than the focal length of the lens, the eye lens cannot form a sharp image of the distant object on the retina but forms an image in front of it as shown in the figure.



If focal length of the eyelens is short, it will form a sharp image of the distant object in front of the retina and not over it.



- (i) Is eye lens made of glass?
- (ii) A myopic person uses specs of power -0.2 D , What is the distance of far point of his eye?
- (iii) Which lens is used for correcting a myopic eye?
 - (a) Convex lens
 - (b) Concave lens
 - (c) Bifocal lens
 - (d) None of the above
- (iv) The human eye forms the image of an object at its:
 - (a) Cornea
 - (b) Pupil
 - (c) Iris
 - (d) Retina

Ans. (i) No, eye lens is not made of glass, it is made of fibrous jelly like material.

(ii) We know,

$$P = -0.2\text{ D}$$

$$f = \frac{1}{\frac{1}{P} - \frac{1}{-0.2}} = -5\text{m}$$

Distance of far point of his eye is 5 m.

(iii) (b) Concave lens

(iv) (d) Retina

107. By how much time the day would have been shorter if the earth had no atmosphere?

Ans. The day would have been shortened by about 4 minutes.

108. A beam of blue, green and yellow light passes through the earth's atmosphere. Name the colour which is scattered (i) the most, (ii) the least.

Ans. (i) Blue, (ii) Yellow. (Depending on their wavelength)

109. Name four colours of the spectrum of white light which have wavelength longer than blue light.

Ans. Green, yellow, orange and red light have wavelength longer than blue light.

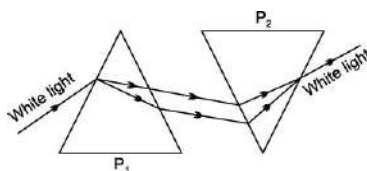
110. What happens to a beam of white light when it gets refracted through glass prism? Which colour deviates the most and the least after refraction through a prism? What is likely to happen if a second identical prism is placed in an inverted position with respect to the first prism. Justify your answer.

[Board Question]

Ans. When white light is refracted through a glass prism, it gets split into its constituting colours at different angles. This phenomenon is called dispersion of light.

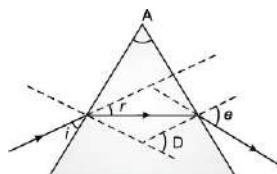
Least deviated colour is red whereas most deviated colour is violet.

When second identical prism is placed in an inverted position with respect to first prism, recombination of the spectrum will take place and white light will be obtained.



Practical Based Questions

111. In the following ray diagram which angles are properly labelled and what do we call these angles?



Ans. $\angle A$ and $\angle e$ are correctly labelled. $\angle A$ is angle of prism whereas $\angle e$ is angle of emergence.

112. While doing the experiment to trace the path of rays of light through a glass prism, what should be done in the beginning of experiment and why?

Ans. Draw the boundary of prism on the drawing sheet.

It is done so as to readjust the prism to same position if it gets displaced while doing experiment.

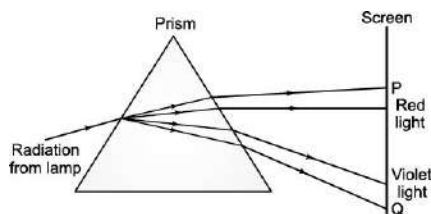
113. Give two precautions to be observed in the experiment to trace the path of light through prism. [Board Question]

Ans. 1. Always use white paper to place the prism.

2. Prism table should be labelled properly.

3. Use proper straight pins as object.

114. The diagram shows radiations from a lamp passing through a prism.



Which type of radiations are found at P and Q?

Ans. Infrared is found at P and ultraviolet is found at Q.

Creating Based Questions

115. Babin was diagnosed with a long sight problem. He was advised to wear lens but he was worried that wearing lens should be given an utmost care in his busy schedule. What would you suggest Babin other than usage of lens?

Ans. It was a big problem for Babin to take care of the lens in his busy schedule due to this reason I suggested him to undergo laser operation which would correct all common vision problems like near sight, a long sight which reduce the dependency on the lens. The eye treatment using laser is safe and effective.

116. Richie's grandmother was affected by cataract in which the crystalline lens of his mother become so hard cloudy substance. Though the doctor advised opting for traditional cataract surgery, Richie needs something better in which his grandma shouldn't suffer a lot but it should be carefully and precisely done. As a young medico student, what would you opt for?

Ans. As a young medico student I would suggest Richie opt for laser cataract surgery in which the hard cloudy substance would be broken very easily by laser instead of microsurgical instrument used in traditional cataract surgery. This laser treatment would be very effective and very precise incisions are made in very less time.

117. Using the following informations form a pathway to illustrate the defects of vision in Myopia. And also include informations that are not mentioned below to complete it.

Sight, objects view, concave lens, correction of myopia.

Ans. In myopia defect, the nearby objects are seen → clearly than distant objects. The image of the distant object → is formed in front of the retina in myopic eye → due to **excessive curvature** of the eye lens → and **elongation of the eyeball** → leads to myopia. The rectification of myopia is corrected → by using a concave lens which brings back the **image on to the retina**.

118. What would be your suggestion to your grandfather who is undergoing the eye defects both hypermetropia and myopia?

Ans. Myopia is the near-sightedness and hypermetropia is the far-sightedness. The person who is suffering from both eye defects is advised to wear spectacles with a bi-focal lens which consists of both concave and convex lens. The upper portion would be a concave lens which rectifies the distant vision and lower portion is a convex lens which rectifies the near vision.

119. John has undergone all medication including wearing spectacles, lens and laser treatment. None of the treatment helped him to recover his eyesight. What would be your suggestion to overcome his problem in his eyesight?

Ans. Though all the treatment for recovering from his eye problems did not help him out, I would suggest him to opt for eye transplantation which would get his eyesight back to normal. In transplantation of eye, the entire diseased eye cannot be replaced. Only the diseased cornea can be replaced by the donated cornea.

120. In today's digital world, every human spends around a minimum eight hours with the digital electronic items which make their eyes to strain more and causes many eye problems. Still they undergo many exercises for their eyes during their working hours what would be your medical suggestion to reduce the stress and strain caused in the eyes?

Ans. In addition to the exercise for the strained eyes, my medical suggestion would be the usage of the anti-glare lens in their spectacles which reduces the impact of blue light emitted from digital items and artificial lighting. This would reduce the stress and strain caused. But still the exercise for eyes in repeated time interval should also be regularly followed.

121. Zia has been suggested by doctor to avoid blue light to her eyes which is emitted from all digital items. But in today's world, the day doesn't finish off without the usage of digital items. What would be the preventive measures given by you to your friend?

Ans. As all digital items and artificial lighting is enriched with blue light which is harmful to our eyes and body, I would suggest Zia to use the digital items in some warmer colour light like yellow or red which does not harm our eye or body when compared with the blue light. Blue light filter application can be installed in computer, mobile or other digital items we use.

122. White light is a mixture of seven colours is violet, indigo, blue, green, yellow, orange and red. Every colour has its own characteristic wavelength. Different colours with their wavelengths are given below in the table.

S. No.	Colour	Wavelength
1.	Red	7900 Å
2.	Orange	6000 Å
3.	Yellow	5800 Å
4.	Green	5400 Å
5.	Blue	4800 Å
6.	Indigo	4500 Å
7.	Violet	4000 Å

The phenomenon of splitting white light into seven colours when it passes through a glass prism is called dispersion of white light.

- (i) Name the phenomenon occurring in nature due to dispersion of light.
- (ii) Light of two colours A and B pass through a glass prism. 'A' deviates more than B from its path of incidence. Which colour has a higher speed in the prism ?
- (iii) Choose the correct option.

- (a) Each colour of light travels with same speeds in a given medium.
- (b) Each colour of light travels with different speeds in a given medium.
- (c) Only red colour of light travels with fast speed in a given medium.
- (d) All of the above.

(iv) The speed of light depends upon :

- (a) frequency
- (b) wavelength
- (c) density
- (d) none of the above

Ans. (i) Rainbow.

(ii) Colour B has higher speed than that of colour 'A'.

(iii) (b) Each colour of light travels with different speeds in a given medium.

(iv) (b) Wavelength

Miscellaneous Questions

123. Due to gradual weakening of ciliary muscles and diminishing flexibility of the eye lens, a certain defect of vision arises. Write the name of this defect. Name the type of lens required by such persons to improve the vision. Explain the structure and function of such a lens.

[Board Question]

Ans. The defect caused due to gradual weakening of ciliary muscles and diminishing flexibility of the eye lens is presbyopia. Presbyopia is the defect of eye in which a person cannot see nearby objects comfortably and distinctly without corrective eye glasses. A presbyopic eye has its near point greater than 25 cm and is gradually increases as the eye becomes older. The type of lens required by such person to improve the vision is bifocal lens.

A bifocal lens consists of both convex lens and concave lenses. The convex lens used in bifocal lens is used to correct hypermetropia (far sightedness) and concave lens is used to correct myopia (short sightedness).

124. Write the function of each of the following parts of human eye : Cornea; iris; crystalline lens; ciliary muscles.[Board Question]

Ans. Cornea : Refracts the rays of light falling on the eye.

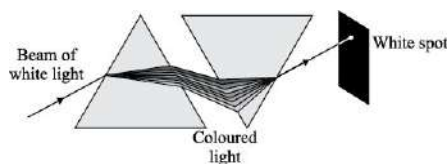
Iris : Controls the size of the pupil.

Crystalline lens : Focuses the image of the object on the retina.

Ciliary muscles : Holds the eye lens and adjusts its focal length.

125. What is “dispersion of white light”? Draw a labelled diagram to illustrate the recombination of the spectrum of white light. Why is it essential that the two prisms used for the purpose should be identical and placed in an inverted position with respect to each other?[Board Question]

Ans. The phenomenon of splitting of white light into its constituent colours on passing through a prism is known as the dispersion of white light. This splitting of the light rays occurs because of the different angles of bending for each colour and this different angles of bending occurs because different component of light faces different refractive indices when passing through the glass prism.



It is essential that the two prisms used for the purpose should be identical and placed in an inverted position with respect to each other so that the second prism completely nullifies the dispersion caused by the first prism and we get pure white light.

Self-Assessment

126. Having two eyes gives a person :

- (a) Rear field of view
- (b) Wider field of view
- (c) Deeper field of view
- (d) Coloured field of view

Ans. (b) Wider field of view

127. The defect of vision which cannot be corrected by using spectacles is :

- (a) Cataract
- (b) Myopia
- (c) Hypermetropia
- (d) Presbyopia

Ans. (a) Cataract

128. Define the term 'power of accommodation' of human eye.

129. Name the part of the eye :

- (i) Which is sensitive to dim light.
- (ii) Which is sensitive to bright (or normal) light.
- (iii) Which controls the amount of light entering the eye.
- (iv) Which changes the focal length of eye lens.

130. Draw a diagram to show how an eye can focus the nearby object by changing the thickness of its lens.

131. An eye has a far point of 2 m. What type of lens in spectacles would be needed to increase the far point to infinity? Also calculate the power of the lens required.

Ans. Concave lens, -0.5 D

132. An eye has a near point distance of 0.75 m. What kind of lens in spectacles would be needed to reduce the near point distance to 0.25 m? Also calculate the power of the lens required.

Ans. Convex lens, $+2.67\text{ D}$

133. The figure shows a human eye suffering from a certain type of defect in the eye.

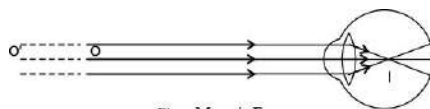


Fig. : Myopic Eye

- (i) Name the defect of eye.
- (ii) What type of lens is needed to rectify the above defect?
- (iii) Draw a diagram to show how the above defect can be corrected by using the above lens.

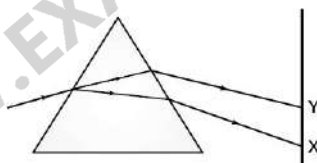
Ans. (i) Myopia or short-sightedness,

(ii) Concave lens.

134. Draw a well labeled diagram of the Human eye and explain the functions of any five parts.

135. What is the range of the vision of the normal human eye?

136. In the given figure, a narrow beam of white light is shown to pass through a triangular glass prism. After passing through the prism it produces a spectrum XY on a screen.



- (i) State the colour seen at X and Y ?
- (ii) Why do different colours of white light bend through different angles with respect to the incident beam of light ?

137. Explain how rain drops in the atmosphere act like many small prisms.

138. To construct a ray diagram we use two rays which are so chosen that it is easy to know their directions after reflection from the mirror. List two such rays and state the path of these rays after reflection in case of concave mirrors. Use these two rays and draw ray diagram to locate the image of an object placed between pole and focus of a concave mirror.

139. What is atmospheric refraction and what causes it?

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Electricity

Chapter 12

Summary

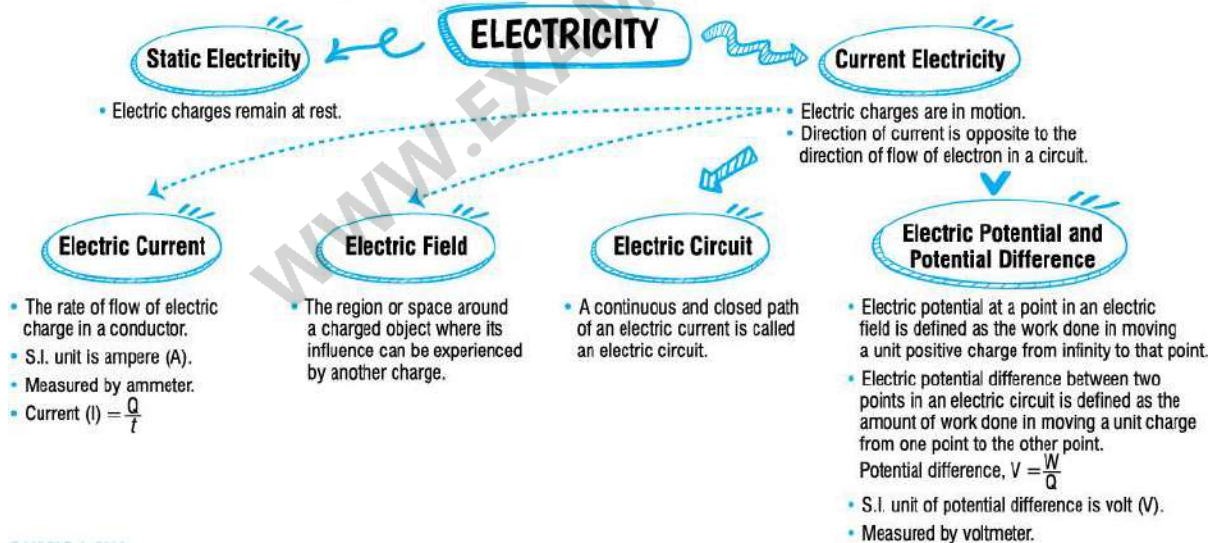
CHARGE

- A physical property of a substance which causes it to experience a force when placed near other matter or substances.
- Unit of electric charge is Coulomb.
- Like charges repel each other.
- Unlike charges attract each other.



ELECTRICITY

- It is the term used to represent a set of physical phenomenon associated with the presence of electric charge.
- It is used in our homes for lightning operating fans, heating purpose etc.



OHM'S LAW

- According to Ohm's law,
 $V \propto I$ (at constant temperature) \rightarrow
i.e., $V = IR$

RESISTANCE

- The obstruction offered to the flow of current by a conductor.
- Resistance (R) = $\frac{V}{I}$
- S.I. unit of resistance is ohm.

Factors affecting Resistance

- Length of the conductor ($R \propto l$)
- Area of cross-section of the conductor ($R \propto \frac{1}{A}$)
- Nature of the material of the conductor.

Resistivity

- $R \propto l$ and $R \propto \frac{1}{A}$
 $R \propto \frac{l}{A} \Rightarrow R \propto \frac{\rho l}{A}$
 \therefore where ρ is constant known as resistivity or specific resistance.
- S.I. unit is ohm-metre.

Combination of Resistance

Series

- When two (or more) resistances are connected end to end consecutively.
- Current remains constant but voltage varies.
 $V = V_1 + V_2$ ($V = IR$)
- $R_s = R_1 + R_2$

Parallel

- When two (or more) resistances are connected between the same two points.
- Voltage remains constant but current varies.
 $I = I_1 + I_2$ ($I = \frac{V}{R}$)
- $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$

Heating Effect of Electric Current

When an electric current is passed through a high resistance wire, like nichrome wire, the resistance wire becomes very hot and produces heat.

Joule's Law of Heating

- According to Joule's law of heating,
 $H \propto I^2$
 $H \propto R$
 $H \propto t$
 \therefore Heat produced, $H = I^2 R t$

Practical Applications

- In the working of electrical heating appliances such as electric iron, electric kettle, electric toaster etc.
- In electric bulbs for producing light.
- In electric fuse for protecting household wiring and electrical appliances.

ELECTRIC POWER

- The rate at which the electrical energy is dissipated or consumed per unit time in an electric circuit.

$$\text{Power (P)} = \frac{\text{Work done (W)}}{\text{Time (t)}}$$
$$= VI = \frac{V^2}{R} = I^2 R$$

- S.I. unit of electric power is watt (W).

- Bigger units of power are :

$$\begin{aligned} 1 \text{ kilowatt} &= 1 \text{ kW} \\ &= 1000 \text{ W} \\ &= 10^3 \text{ W} \\ 1 \text{ megawatt} &= 1 \text{ MW} \\ &= 10^6 \text{ W} \end{aligned}$$

Electrical Energy

- Using Power (P) = $\frac{\text{Electrical energy dissipated (E)}}{\text{Time (t)}}$

$$\Rightarrow E = P \times t$$

- The S.I. unit of electrical energy is watt hour.
- The commercial unit of electrical energy is kilowatt hour (kWh) commonly known as 'unit'.
- $1 \text{ kWh} = 1000 \text{ watt} \times 3600 \text{ second}$
 $= 3.6 \times 10^6 \text{ watt second}$
 $= 3.6 \times 10^6 \text{ joule}$

Multiple Choice Questions

1. Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then in parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combinations would be:

- (a) 1 : 2
- (b) 2 : 1
- (c) 1 : 4
- (d) 4 : 1

Ans. (c) 1 : 4

Explanation :

As the two conducting wires are of the same material, equal lengths and equal diameters. They will have the same resistance.

Let the resistance of each wire be R and applied potential difference, V .

$$R_{\text{series}} = R_1 + R_2$$

$$= R + R = 2R$$

$$P_{\text{series}} = \frac{V^2}{R_{\text{series}}}$$

$$= \frac{V^2}{(2R)} \dots (i)$$

$$\frac{1}{R_{\text{parallel}}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$= \frac{1}{R} + \frac{1}{R}$$

$$R_{\text{parallel}} = \frac{R}{2}$$

$$P_{\text{parallel}} = \frac{V^2}{R_{\text{parallel}}}$$

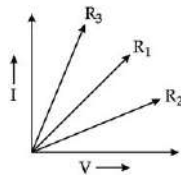
$$= \frac{2V^2}{R} \dots (ii)$$

Dividing equation (i) by equation (ii)

$$\frac{P_{\text{series}}}{P_{\text{parallel}}} = \frac{1}{4}$$

Hence, the ratio of heat produced is $1/4$ or $1 : 4$.

2. A student plots V-I graphs for three samples of nichrome wire with resistances R_1 , R_2 and R_3 . Choose from the following statement that holds true of this graph.



(a) $R_1 = R_2 = R_3$

(b) $R_1 > R_2 > R_3$

(c) $R_3 > R_2 > R_1$

(d) $R_2 > R_1 > R_3$

Ans. (d) $R_2 > R_1 > R_3$

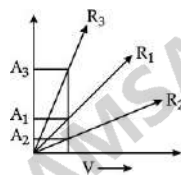
Explanation :

As it is clear from the graph, the current for A_2 conductor is less than A_1 and A_1 is less than A_3 we can say $I_{A2} < I_{A1} < I_{A3}$.

We know

$$R = \frac{V}{I}$$

$$\text{or } R \propto \frac{1}{I}$$



If I is less, then R will be more.

$$I_{A2} < I_{A1} < I_{A3}$$

$$\therefore R_2 > R_1 > R_3.$$

3. The instrument used for measuring electric current is:

(a) galvanometer

(b) ammeter

(c) voltmeter

(d) potentiometer

Ans. (b) ammeter

Explanation :

Ammeter is a device used for measuring electric current in amperes.

4. Which of the following does not apply to silver ?

- (a) The resistance provided is directly proportional to its length.
- (b) The resistance provided is inversely proportional to the area of cross section.
- (c) Their resistivity is in the range $10^{-8} \Omega - m$ to $10^{-6} \Omega - m$.
- (d) The movement of electrons on their outer most orbital is tightly held together.

Ans. (d) The movement of electrons on their outer most orbital is tightly held together.

Explanation :

For a given continuous piece of uniform wire, the resistance is directly proportional to its length. Thus, silver which is a good conductor of electricity and the resistance in it is directly proportional to its length.

Silver is a good conductor of electricity, thus, the resistance provided is inversely proportional to the area of cross-section.

Silver has resistivity in the range of $10^{-8} \Omega - m$ to $10^{-6} \Omega - m$. Therefore, it is considered as very good conductors.

Hence, the statement that does not apply to silver is the movement of electrons on their outer most orbital is tightly held together.

5. R_1 and R_2 are two resistors and r_1 and r_2 are equivalent resistances in series and parallel respectively, then $\frac{R_1}{R_2}$:

- (a) $\frac{r_1 r_2}{r_1 + r_2}$
- (b) $\frac{r_1 + r_2}{r_1 r_2}$
- (c) $\frac{r_1 + \sqrt{r_1^2 - 4r_1 r_2}}{r_1 + \sqrt{r_1^2 + 4r_1 r_2}}$

$$(d) \frac{r_1 + \sqrt{r_1^2 - 4r_1r_2}}{r_1 - \sqrt{r_1^2 - 4r_1r_2}}$$

$$\text{Ans. (d) } \frac{r_1 + \sqrt{r_1^2 - 4r_1r_2}}{r_1 - \sqrt{r_1^2 - 4r_1r_2}}$$

Explanation :

Here, $r_1 = R_1 + R_2 \dots(i)$

$$\text{and } r_2 = \frac{R_1 R_2}{R_1 + R_2}$$

$$\Rightarrow R_1 R_2 = r_2 r_1 \dots(ii)$$

$$\text{Now } (R_1 - R_2)^2 = (R_1 + R_2)^2 - 4 R_1 R_2$$

$$= r_1^2 - 4 r_2 r_1$$

$$R_1 - R_2 = \sqrt{r_1^2 - 4r_2r_1}$$

$$\text{and } R_1 + R_2 = r_1$$

$$\therefore R_1 = \frac{r_1 + \sqrt{r_1^2 - 4r_1r_2}}{2}$$

$$\text{and } R_2 = \frac{r_1 - \sqrt{r_1^2 - 4r_1r_2}}{2}$$

$$\therefore \frac{R_1}{R_2} = \frac{r_1 + \sqrt{r_1^2 - 4r_1r_2}}{r_1 - \sqrt{r_1^2 - 4r_1r_2}}$$

6. There are three resistors connected in parallel, the resistance of each resistor is 3 ohm. What is the total resistance of all the three resistors ?

(a) 1 Ω

(b) 6 Ω

(c) 15 Ω

(d) 3 Ω

Ans. (a) 1 Ω

Explanation :

It is given that the three resistors are connected in parallel and the resistance of each resistor is $3\ \Omega$. Therefore,

$$R_1 = R_2 = R_3 = 3\ \Omega$$

From the formula given below, we can calculate the total resistance of all the three resistors:

$$\begin{aligned}\frac{1}{R_p} &= \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \\ &= \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{3}{3}\end{aligned}$$

$$\therefore R_p = 1\ \Omega$$

Hence, the total resistance is $1\ \Omega$.

7. The accumulator which is used for the domestic purpose has the electromotive force of 10 V and with an internal resistance of $0.8\ \Omega$ is externally charged by 150 V of the direct current power supply using a series resistor $18\ \Omega$. Calculate the terminal voltage of the accumulator during using.

(a) 16.8 V

(b) 17.1 V

(c) 11.3 V

(d) 15.9 V

Ans. (d) 15.9 V

Explanation :

$$E = V - Ir$$

$$V = E + Ir$$

$$= 10 + \left(\frac{150 - 10}{18 + 0.8} \right) \times 0.8$$

$$= 15.9\text{ V}$$

8. If a person has five resistors each of value $\frac{1}{5}\ \Omega$, then the

maximum resistance he can obtain by connecting them is:

- (a) 1 Ω
- (b) 5 Ω
- (c) 10 Ω
- (d) 25 Ω

Ans. (a) 1 Ω

Explanation :

Resistance of one resistor = $\frac{1}{5} \Omega$

Number of resistors = 5

Maximum resistances can be obtained by combining the resistors in series:

$$R_S = R_1 + R_2 + R_3 + R_4 + R_5$$


$$= \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$$

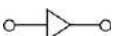
$$= \frac{1+1+1+1+1}{5} = \frac{5}{5} = 1 \Omega$$


Hence, a person on combining five resistors in series gets resistance 1 W.


9. Match the Symbols in column A with the Components in column B.

Column A Column B

(A)  (1) Wire joint

(B)  (2) Capacitor

(C)  (3) Diode

(D)  (4) Earth

(a) A-3; B-4; C-3; D-2

(b) A-1; B-2; C-1; D-4

(c) A-4; B-1; C-2; D-3

(d) A-2; B-3; C-4; D-1


Ans. (d) A-2; B-3; C-4; D-1


Explanation :


The correct options are:


A-2; B-3; C-4; D-1

Column A Column B

(A)  (2) Capacitor

(B)  (3) Diode

(C)  (4) Earth

(D)  (1) Wire joint

10. The resistance of the wire when the length of the wire increases two times :

(a) becomes 2 times

(b) becomes 3 times

(c) becomes 6 times

(d) becomes 4 times

Ans. (a) becomes 2 times

Explanation :

The electrical resistance of a wire can be expressed as:

$$R = r \frac{L}{A}$$

Where, A = Area of cross section of the conductor

L = Length of the conductor

ρ = Resistivity

From this relation, it is clear that the resistance is directly proportional to the length and inversely proportional to area of cross-section.

If length becomes $2L$, then

$$R' = \frac{\rho(2L)}{A} = 2 \frac{\rho L}{A}$$

So, $R' = 2R$

Thus, the resistance becomes 2 times if the length of the wire is doubled.

11. Which among the following is the correct way of connect ammeter and voltmeter in the circuit to determine the equivalent resistance of two resistors in series ?

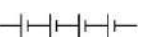
- (a) Both ammeter and voltmeter in series
- (b) Both ammeter and voltmeter in parallel
- (c) Ammeter in parallel and voltmeter in series
- (d) Ammeter in series and voltmeter in parallel

Ans. (d) Ammeter in series and voltmeter in parallel

Explanation :

The correct way of connecting ammeter and voltmeter in the circuit to determine the equivalent resistance of two resistors is connecting ammeter in series and voltmeter in parallel. Ammeter is connected in series, so that whole current passes through it and voltmeter is connected in parallel to so that it could measure the complete voltage of the circuit.

12. The proper representation of series combination of cells for obtaining maximum potential is:

- (a) 

(b)

(c)

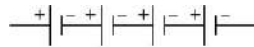
(d)

Ans. (a)

Explanation :

The maximum potential is obtained when cells are connected in series such that the negative terminal of the first cell is connected to the positive terminal of the second cell and so on.

E.g.,



13. The equivalent resistance of a series combination of two resistances is X ohm. If the resistances are of 10 Ω and 40 Ω respectively, the value of X will be:

(a) 10 Ω

(b) 20 Ω

(c) 50 Ω

(d) 40 Ω

Ans. (c) 50 Ω

Explanation :

We know that

Total Resistance

$$R = R_1 + R_2$$

$$= 10 + 40$$

$$= 50 \Omega$$

Hence, the value of X is 50 W.

14. A cylindrical conductor of length ' l ' and uniform area of cross-section ' A ' has resistance ' R '. The area of cross-section of another conductor of same material and same resistance but of length ' $2l$ ' is :

[NCERT Exemplar]

(a) 0.5 A

(b) 1.5 A

(c) 2 A

(d) 3 A

Ans. (c) 2 A

Explanation :

A cylindrical conductor of length ' l ' and uniform area of cross-section ' A ' has resistance ' R '. The area of cross-section of another conductor of same material and same resistance but of length ' $2l$ ' will be 2 A. This can be explained as:

$$R = \rho \frac{l}{A}$$

$$\frac{R_1}{R_2} = \left(\frac{L_1}{L_2} \right) \times \left(\frac{A_2}{A_1} \right)$$

$$A_2 = \left(\frac{R_1}{R_2} \right) \times \left(\frac{L_2}{L_1} \right) \times A_1$$

$$A_2 = \left(\frac{R}{R} \right) \times \left(\frac{2l}{l} \right) \times A$$

$$A_2 = 2 A$$

15. The maximum resistance which can be made using four resistors each of resistance $\frac{1}{2} \Omega$ is :

(a) 2 Ω

(b) 1 Ω

(c) 2.5 Ω

(d) 8Ω

Ans. (a) 2Ω

Explanation :

The maximum resistance which can be made using four resistors each of resistance $1/2 \Omega$ is 2Ω . This can be explained as:

In series combination, the current in each resistance remains constant and the voltage gets added up. As a result, the individual resistances also get added up.

So, Equivalent Resistance = $R_1 + R_2 + R_3 + R_4$

$$= \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$$

$$= \frac{4}{2}$$

$$= 2 \Omega$$

16. A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R' , then the ratio R/R' is :

(a) $\frac{1}{25}$

(b) $\frac{1}{5}$

(c) 5

(d) 25

Ans. (d) 25

Explanation :

Given,

A piece of wire with resistance (R) is cut into 5 equal parts

$$R = \frac{R}{5} + \frac{R}{5} + \frac{R}{5} + \frac{R}{5} + \frac{R}{5}$$

$$R = \frac{5R}{5} = R \dots (i)$$

Now, these pieces of wire are connected in parallel then the resistance is (R')

$$\frac{1}{R'} = \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R}$$

$$\text{So, } \frac{1}{R'} = \frac{25}{R}$$

$$R' = \frac{R}{25} \dots (ii)$$

Now,

$$\frac{R}{R'} = \frac{R}{\frac{R}{25}} \text{ [Using (i) and (ii)]}$$

$$\frac{R}{R'} = \frac{25R}{R}$$

$$\frac{R}{R'} = 25$$

17. On which of the given factors, resistance does not depend:

- (a) length of conductor
- (b) area of cross-section
- (c) temperature
- (d) density

Ans. (d) density

Explanation :

The resistance of wire can be expressed as:

$$R = \rho \frac{L}{A}$$

Where, A = Area of cross-section of the conductor

L = Length of the conductor

ρ = Resistivity

From the above relation, we can see that resistance of a wire is directly proportional to its length and inversely proportional to the area of cross-section. Hence, resistance does not depend on the

density.

18. Which of the following obeys Ohm's law ?

- (a) Filament of a bulb
- (b) LED
- (c) Nichrome
- (d) Transistor

Ans. (c) Nichrome

Explanation :

In conductors, resistance remains constant when the current passing through them is increased, they are known as Ohmic conductors. Nichrome which is an alloy is made in such a way that its resistance remains constant for a wide range of temperature. Hence, nichrome obeys Ohm's Law. Whereas, transistor, LED, bulb filament do not obey Ohm's law because with the varied change in temperature their resistance changes.

19. Electrical resistivity of an alloy of copper and nickel is _____ when compared with the electrical resistivity of an alloy of copper, manganese and nickel.

- (a) same
- (b) double
- (c) more
- (d) less

Ans. (c) more

Explanation :

Electrical resistivity of an alloy of copper and nickel is more when compared with the electrical resistivity of an alloy of copper, manganese and nickel. The electrical resistivity of Cu-Ni alloys with

increasing temperature rises steeply. At 200°C, the electrical resistivity of Cu-Ni alloy is

$49 \times 10^{-8} \Omega\text{-m}$ whereas of copper, manganese and nickel $44 \times 10^{-8} \Omega\text{-m}$.

20. There is a dual of 8 ohm resistance on the aerial. Determine the aerial's new resistance.

(a) 2Ω

(b) 4Ω

(c) 7Ω

(d) 10Ω

Ans. (a) 2Ω

Explanation :

Let l be the length and A be the area of cross section.

$$R = \rho \frac{l}{A} = 8 \Omega$$

$$l' = \frac{l}{2}$$

$$A' = 2A$$

$$R' = \rho \frac{l'}{A'}$$

$$= \rho \frac{\frac{l}{2}}{2A}$$

$$= \frac{1}{4} \left(\rho \frac{l}{A} \right)$$

$$= \frac{1}{4} \times 8$$

$$= 2 \Omega$$

Hence, the aerial's new resistance is 2Ω .

21. Electrical resistivity of a given metallic wire depends upon:

(a) its length

- (b) its thickness
- (c) its shape
- (d) nature of the material

Ans. (d) nature of the material

Explanation :

The resistivity of a material is constant at a constant temperature. Resistivity of material does not depend on length, thickness and shape of the material. It only depends on the temperature.

22. An electric heater is rated at 2 kW. Electrical energy costs ₹ 4 per kWh. What is the cost of using the heater for 3 hours?

- (a) ₹ 12
- (b) ₹ 24
- (c) ₹ 36
- (d) ₹ 48

Ans. (b) ₹ 24

Explanation :

Consumption of electrical energy in 3 hours can be calculated by using the formula:

$$E = P \times t$$

$$= 2 \text{ kW} \times 3 \text{ hour} = 6 \text{ kWh}$$

Unit cost of electrical energy

$$= ₹ 4 \text{ per kWh}$$

Therefore, the cost of energy used for three hours will be: $4 \times 6 = ₹ 24$

23. Consider the room temperature is 24°C in summer, the electrical resistance of thermocoil which is used in the AC unit

is $150\ \Omega$. Then calculate the temperature of the thermocoil if the electrical resistance is $175\ \Omega$. Given the temperature coefficient of the thermocoil is $2.98 \times 10^{-4}\ ^\circ\text{C}^{-1}$.

(a) 597°C

(b) 583°C

(c) 546°C

(d) 512°C

Ans. (b) 583°C

Explanation :

$$R_t = R_0 (1 + a \Delta T)$$

$$175 = 150 (1 + 2.98 \times 10^{-4} \Delta T)$$

$$\frac{25}{150} = 2.98 \times \Delta T \times 10^{-4}$$

$$\Delta T = 559.28^\circ\text{C}$$

$$T - 24 = 559.28^\circ\text{C}$$

$$T = 559.28^\circ\text{C} + 24$$

$$T = 583.28^\circ\text{C}$$

Hence, the temperature of the thermocoil is 583°C .

24. The values of mA and μA are :

(a) 10^{-6} and 10^{-9} A respectively

(b) 10^{-3} and 10^{-6} A respectively

(c) 10^{-3} and 10^{-9} A respectively

(d) 10^{-6} and 10^{-3} A respectively

Ans. (b) 10^{-3} and 10^{-6} A respectively

Explanation :

An ampere is the SI unit of electric current.

$$1 \text{ A} = 1000 \text{ mA or } 1 \text{ mA} = \frac{1}{1000} \text{ A} = 10^{-3} \text{ A}$$

$$\therefore 1 \mu\text{A} = 10^{-3} \times 10^{-3} \text{ A} = 10^{-6} \text{ A}$$

25. The resistance of a resistor is reduced to half of its initial value. In doing so, if other parameters of the circuit remain unchanged the heating effects on the resistor will become:

- (a) two times
- (b) half
- (c) one - fourth
- (d) four times

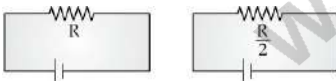
Ans. (a) two times

Explanation :

Resistance of a resistor $R \ \Omega$

New resistance of a resistor $\frac{R}{2} \ \Omega$.

All other parameters of the circuit remain unchanged



By applying Joule's law of heating $H = I^2 R t$

As per Ohm's law $V = IR$

$$\text{or } I = \frac{V}{R}$$

$$\therefore H = \frac{V}{R} \times \frac{V}{R} \times R \times t$$

$$\text{or } = \frac{V^2}{R} \times t$$

Case-I Case-II

$$H = \frac{V^2}{R} \times t \quad H' = \frac{V^2}{\frac{R}{2}} \times t$$

$$= \frac{V^2 \times 2}{R} \times t$$

$$H' = H \times 2$$

Hence, the heating effect in the resistor will become two times if all other parameter of the circuit remain same.

26. An electric fuse is connected with :

- (a) live wire
- (b) earthing
- (c) neutral wire
- (d) parallel to the line wire

Ans. (a) live wire

Explanation :

An electric fuse is connected with live wire because it gets blown up when an excess current tries to pass through it in order to save the electrical appliances by restricting the flow of that current.

27. Which of the following terms does not represent electrical power in a circuit ?

- (a) I^2R
- (b) IR^2
- (c) VI
- (d) V^2/R

Ans. (b) IR^2

Explanation :

We know that,

$$P = VI \dots(i)$$

Where, P = Power

V = Potential difference

I = Current

$$V = IR \dots(ii)$$

On substituting equation (ii) in equation (i), we get

$$P = I^2R \dots(iii)$$

Again, from Ohm's law

$$I = \frac{V}{R} \dots(iv)$$

On substituting equation (iv) in equation (i), we get,

$$P = \frac{V^2}{R}$$

Hence, option (b) IR^2 does not represent power.

28. An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, the power consumed will be:

(a) 100 W

(b) 75 W

(c) 50 W

(d) 25 W

Ans. (d) 25 W

Explanation :

We know that,

$$P = \frac{V^2}{R}$$

Where, P = Electric power

V = Potential difference in a circuit

R = Resistance

$$\text{Now, } R = \frac{V^2}{P}$$

$$R = \frac{220 \times 220}{100} = 484 \, \Omega$$

As the voltage drop across the bulb is 110 V. The power consumed by the bulb is:

$$P_b = \frac{V^2}{R}$$

$$= \frac{110 \times 110}{484}$$

$$P_b = 25 \, W$$

Hence, the power consumed will be 25 W.

29. Let us consider the flow of the current through a metallic wire, if the temperature of the entire system increases. What will happen from the following options ?

- (a) Potential difference (V) increases
- (b) Resistance (R) decreases
- (c) Potential difference (V) decreases
- (d) V and R remain the same

Ans. (c) Potential difference (V) decreases

Explanation :

If the temperature of the entire system increases when the current is flowing through a metallic wire, the power (VI) is dissipated in the form of heat. Hence the potential difference (V) decreases.

30. Which of the following terms does not represent electrical energy in a circuit?

- (a) $I^2 R t$
- (b) $I R^2 t$

(c) VIt

(d) $\frac{V^2 t}{R}$

Ans. (b) IR^2t

Explanation :

Electric power, $P = VI = I^2R = \frac{V^2}{R}$

\therefore Electrical Energy = $Pt = VIt = I^2Rt = \frac{V^2 t}{R}$

Assertion and Reasoning Based Questions

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.
- (c) Assertion is true, but reason is false.
- (d) Assertion is false, but reason is true.

31. Assertion: In a series circuit, the current is constant throughout the electric circuit.

Reason: All electric devices do not need equal currents to operate properly.

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

Current is constant in a series circuit as there is only one path for the flow of current. But different devices connected in a circuit have different power ratings and therefore draw different amount of currents. Thus, both assertion and reason are correct and reason is

not the correct explanation of the assertion.

32. Assertion: When area of the conductor is halved then the resistance of the material gets doubled when length is kept constant.

Reason: Because resistance is inversely proportional to the area of a cross-section of the material.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

According to the formula: $R = \rho \frac{l}{A}$

Where, R : resistance

ρ : resistivity

l : length of conductor

A : area of cross section of conductor

Here, resistivity of the material never varies. If length is also kept constant and when area is halved then resistance of the material gets doubled as the resistance depends on 3 factors, i.e., length, area and nature of the material.

Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

33. Assertion: In a circuit which is having three series resistors of R Ω each, the total resistance of the circuit will be 3 R.

Reason: As in parallel circuit the resultant resistance will be

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

Resultant resistance is the addition of individual resistance present

in the series circuit. So, according to the above statement,

Resultant resistance (R) = $R_1 + R_2 + R_3$. So total resistance will be $3R$. In parallel combination, resultant resistance will be $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$.

Thus, both assertion and reason are correct, but reason is not the correct explanation of assertion.

34. Assertion: The connecting wires are made of copper.

Reason: The electrical conductivity of copper is high.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Due to high electrical conductivity of copper, it conducts the current without offering much resistance. The copper being diamagnetic material does not get magnetised due to current through it and hence does not disturb the current in the circuit. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

35. Assertion: Voltmeter is always connected in parallel across the circuit while measuring the potential difference.

Reason: As the voltage in parallel circuits is measured to be the same.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Voltage measured in parallel circuits is always equal. As all the parallel circuits start from one point and end at another point and the potential difference between these two points will always be same. So, this is the reason why voltmeter is always connected in parallel across the circuit. Thus, both assertion and reason are correct and

reason is the correct explanation of assertion.

36. Assertion: Electric current flowing through a metallic wire is directly proportional to the potential difference across its ends.

Reason: Ohm's law expression $V = IR$, where R (resistance) of the wire is always varying.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Ohm's law states that the electric current flowing through a metallic wire is directly proportional to the potential difference across its two ends. The expression is written as :

$$V = IR$$

Here, R (resistance of the wire) is constant value then only the statement will be valid.

$$V \propto I \text{ only if } \frac{V}{I} = \text{constant}$$

Thus, assertion is true, but reason is false.

37. Assertion: Alloys are commonly used in electrical heating devices like electric iron and heater.

Reason: Resistivity of an alloy is generally higher than that of its constituent metals but the alloys have low melting points than their constituent metals.

[Board Question]

Ans. (c) Assertion is true, but reason is false.

Explanation :

Alloys are the combination of metals and they are used in the heating devices due to their high resistance which produces more heat energy. Alloys are made up of weak bonds, their melting point is higher than their constituents metals. Thus, assertion is true but

reason is false.

38. Assertion: An ammeter is always connected in parallel with the circuit for which current has to be measured.

Reason: As the current in a series circuit is same.

Ans. (d) Assertion is false, but reason is true.

Explanation :

In a series circuit the current measured will be same, this is the reason why ammeter is always connected in series with the circuit for which the measurement has to be done. Thus, assertion is false, but reason is true.

39. Assertion: When more current flows to an electrical equipment it shows more heating of the same.

Reason: Heat flow is directly proportional to the square of current only.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Heat flow is dependent on three factors :

1. Current flowing through it
2. Time period of flow of current
3. Resistance of the conductor

So, the reason is false that heat flow only depends on square of current. Thus, assertion is true, but reason is false.

40. Assertion: Bulbs are filled with inactive nitrogen and argon gases.

Reason: As there is a requirement of thermal isolation of the filament.

Ans. (a) Both assertion and reason are correct and reason is the

correct explanation of assertion.

Explanation :

Most part of the power consumed by bulb is dissipated as heat but very less part gets converted into light. So, there is a need for thermal isolation in order to reduce heat losses. This is the reason why bulbs are filled with inactive nitrogen and argon. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

Case Based Questions

41. Read the passage given below and answer the following questions from (i) to (v).

Ohm's law is the relationship between potential difference and current in a circuit which was first established by George Simon Ohm. The law states that the current passing through a metallic conductor is directly proportional to the potential difference applied between its ends. $V \propto I$ i.e., $V = kI$ where k is the resistance offered by the conductor and is constant for a given conductor. Although a large class of materials is known to follow Ohm's law, there do exist materials used in circuits that do not follow the direct relationship between V & I .

(i) If in a circuit both the potential difference and resistance are doubled, then:

- (a) current is doubled.
- (b) current is halved.
- (c) current remains same.
- (d) current is four times.

Ans. (c) Current remains same

(ii) When a battery of 9 V is connected across a conductor and the current flowing is 0.1 A, the resistance is:

- (a) $90\ \Omega$
- (b) $0.9\ \Omega$
- (c) $9\ \Omega$
- (d) $900\ \Omega$

Ans. (a) $90\ \Omega$

(iii) By increasing voltage across a conductor:

- (a) current will increase.
- (b) current will decrease.
- (c) resistance will decrease.
- (d) resistance will increase.

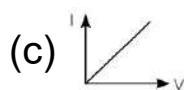
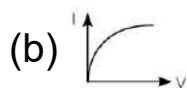
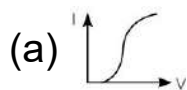
Ans. (a) current will increase

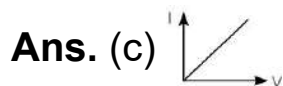
(iv) The slope of the V-I graph shall give:

- (a) resistance
- (b) reciprocal of resistance
- (c) power
- (d) charge

Ans. (a) resistance

(v) Four students have plotted the graph between V-I for a conductor. Which one is correct?





42. Read the passage given below and answer the following questions from (i) to (v).

In a circuit, several resistors may be combined to form a network. The combination must have two endpoints to connect it with a battery or other elements of the circuit. When the resistors are connected in series then the current flowing in each remains the same but potential differences across each resistor will vary. When the resistances are connected in parallel, the potential difference across each resistor will be the same though a different amount of current will flow in each resistor.

(i) The household circuits are connected in:

- (a) series
- (b) parallel
- (c) both series and parallel
- (d) neither series nor parallel

Ans. (b) parallel

(ii) The equivalent resistance of two resistors x and y is Z when connected in series and M when connected in parallel. $Z:M$ is:

- (a) xy
- (b) $x + y \times y$
- (c) $(x + y)^2/xy$
- (d) $xy (2x + 2y)$

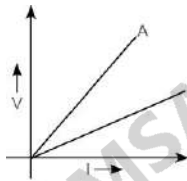
Ans. (c) $(x + y)^2/xy$

(iii) Two resistances $10\ \Omega$ and $3\ \Omega$ are connected in parallel across a battery. If there is a current of $0.2\ \text{A}$ in $10\ \Omega$ resistor, the voltage supplied by the battery is:

- (a) $2\ \text{V}$
- (b) $1\ \text{V}$
- (c) $4\ \text{V}$
- (d) $8\ \text{V}$

Ans. (a) $2\ \text{V}$

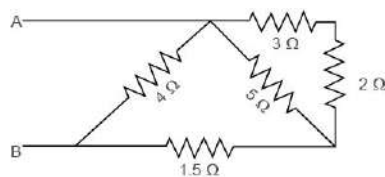
(iv) Two wires each having a resistance value equal to R are first connected in series and then connected in parallel. The plot shows the graphical representation of resistances in both cases.



- (a) A denotes parallel combination
- (b) B denotes series combination
- (c) A denotes series combination and B denotes parallel combination
- (d) None of the above

Ans. (c) A denotes series combination and B denotes parallel combination

(v) The equivalent resistance (in Ω) of the network across A and B is:



- (a) 2
- (b) 1.5

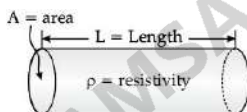
(c) 2.5

(d) 3

Ans. (a) 2

43. Read the passage given below and answer the following questions from (i) to (v).

Resistivity or electrical resistivity is the inverse of the electrical conductivity. Resistivity is a fundamental property of a material and it demonstrates how strongly the material resists or conducts electric current. A low resistivity is a clear indication of a material which readily allows electric current. The common representation of resistivity is by the Greek letter ρ . Also, the SI unit of electrical resistivity is ohm-meter ($\Omega\cdot\text{m}$). Resistivity refers to the electrical resistance of a conductor of a particular unit cross-sectional area and unit length.



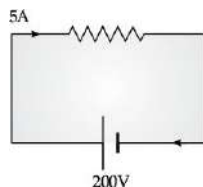
Experts can use resistivity for comparing different materials on the basis of their ability to conduct electric currents. High resistivity is the designation of poor conductors.

(i) The value of resistivity depends upon:

- (a) length of wire
- (b) area of cross-section
- (c) nature of conductor
- (d) radius of wire

Ans. (c) nature of conductor

(ii) A wire has the same resistance as the one given in the figure. Calculate its resistivity if the length of the wire is 10 m and its area of cross section is 2 m^2 .



- (a) $16\ \Omega - m$
- (b) $8\ \Omega - m$
- (c) $16\ k\Omega - m$
- (d) $8\ k\Omega - m$

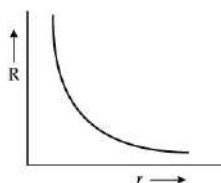
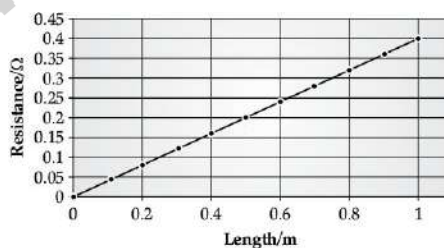
Ans. (b) $8\ \Omega - m$

(iii) The resistivity of alloys is:

- (a) very low
- (b) very high
- (c) generally lower than its constituent metals
- (d) more than resistivity of insulators

Ans. (b) very high

(iv) A student plotted the graphs as shown below to study the variation of resistances R of a wire with its length l and radius r .



(I) The resistance of a wire is inversely related to the length of the wire, i.e., $R \propto \frac{1}{l}$.

(II) The resistance of a wire is directly related to the length of the wire, *i.e.*, $R \propto l$.

(III) The resistance of a wire is inversely related to the radius of the wire, *i.e.*, $R \propto \frac{1}{r}$.

(IV) The resistance of a wire is inversely related to the square of the radius of the wire, *i.e.*,
 $R \propto \frac{1}{r^2}$.

(a) Both (I) and (III)

(b) Both (II) and (III)

(c) Both (I) and (IV)

(d) Both (II) and (IV)

Ans. (d) Both (II) and (IV)

(v) A wire of length l and of radius of cross-section r has a resistance of $R \Omega$. Another wire of same material and of radius of cross-section $2r$ will have the same R if the length is:

(a) $\frac{l}{4}$

(b) $2l$

(c) $4l$

(d) $\frac{l}{2}$

Ans. (c) $4l$

44. Read the passage given below and answer the following questions from (i) to (v).

The electrical energy consumed by an electrical appliance is given by the product of its power rating and the duration for which it is used. SI unit of electrical energy is the joule. Where a large quantity of energy is involved, using a joule is not convenient as a unit. So, for commercial purposes, bigger units of electrical energy are

involved. 1 kilowatt-hour is equal to 3.6×10^6 joules of electrical energy.

(i) The value of energy dissipated by a certain heater is E . If the duration of operation of the heater is doubled, the energy dissipated will be:

- (a) halved
- (b) doubled
- (c) four-times
- (d) remains same

Ans. (b) doubled

(ii) 60 W is the power of a lamp. The energy dissipated in one minute is:

- (a) 360 J
- (b) 36 J
- (c) 3.6 J
- (d) 3600 J

Ans. (d) 3600 J

(iii) Calculate the energy transformed by a 5 A current flowing through a resistor of 2Ω for 30 minutes.

- (a) 90 kJ
- (b) 80 kJ
- (c) 60 kJ
- (d) 40 kJ

Ans. (a) 90 kJ

(iv) Choose the correct statement:

(a) 1 watt-hour = 3600 J

(b) 1 kWh = 36×10^6 J

(c) Energy in kWh = power in W(watt) \times time in hour(h)

(d) Energy in kWh = $V \times I \times T \times 1000$

Ans. (a) 1 watt-hour = 3600 J

(v) Choose the incorrect statement.

(a) Higher the resistance, the lesser the power consumed.

(b) Lower the resistance, more the voltage drawn.

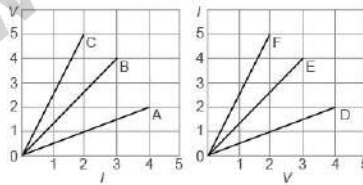
(c) Higher the resistance, the higher the current flown.

(d) Higher the resistance, the lesser the voltage drawn.

Ans. (c) Higher the resistance, the higher the current flown.

45. Observe the figure given below and answer the following questions from (i) to (v).

The following graphs represent the current versus voltage and voltage versus current for six conductors A, B, C, D, E, and F.



(i) Among conductors A, B, C, D, E, F, the maximum resistance is shown by:

(a) curve C

(b) curve A

(c) curve F

(d) curve D

Ans. (a) curve C

(ii) Which of the following does not indicate the resistance of curve B?

- (a) The slope of curve B
- (b) The ratio of V-intercept to I-intercept
- (c) The ratio of total grids on the y-axis to total grids on the x-axis
- (d) $\frac{3}{4} \Omega$

Ans. (d) $\frac{3}{4} \Omega$

(iii) Which indicates the correct sum of least resistances of two graphs?

- (a) Curve C + Curve F
- (b) Curve A + Curve D
- (c) Curve A + Curve F
- (d) Curve C + Curve D

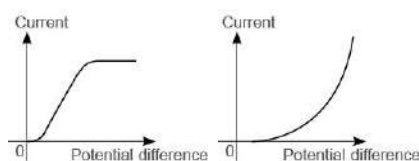
Ans. (c) Curve A + Curve F

(iv) If resistances shown by curve A and curve E are added, the value will be:

- (a) 1.83Ω
- (b) 1.50Ω
- (c) 1.64Ω
- (d) 1.25Ω

Ans. (d) 1.25Ω

(v) Which is true for these graphs?

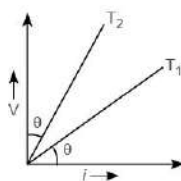


- (a) Both are ohmic conductors
- (b) Curve A is ohmic and B is non-ohmic conductor
- (c) Both are non-ohmic conductors
- (d) Curve B is ohmic and A is non-ohmic conductor

Ans. (c) Both are non-ohmic conductors

46. Read the passage carefully and answer the following questions from (i) to (v).

The graph below is a V-I graph of a metallic circuit drawn at two different temperatures T_1 and T_2 .



(i) For the above graph choose the correct option depicting which of the two temperatures is higher with justification.

- (a) $T_2 > T_1$; Slope of V-I graph at T_2 is greater than slope at T_1 .
- (b) $T_1 > T_2$; resistance increases with increase in temperature.
- (c) $T_2 > T_1$; resistance increases with decrease in temperature.
- (d) $T_1 > T_2$; Slope of V-I graph at T_1 is greater than slope at T_2 .

Ans. (a) $T_2 > T_1$; Slope of V-I graph at T_2 is greater than slope at T_1 .

(ii) For the above graph, at which temperature the resistance is higher?

- (a) At T_1
- (b) At T_2

(c) Resistance does not depend upon temperature

(d) None of these

Ans. (b) At T_2

(iii) Choose the correct set containing factors on which resistance depends?

(a) Length, Area of cross-section, Temperature, Nature of the material.

(b) Area of cross-section, Temperature, Nature of the material, Colour.

(c) Length, Area of cross-section, Temperature, intermolecular attraction.

(d) Temperature, Nature of the material, Length, physical state of material.

Ans. (a) Length, Area of cross-section, Temperature, Nature of the material.

(iv) What is likely to happen if current in a wire is passed for a longer time than required?

(a) The wire may get burnt and may melt.

(b) Length of the wire may decrease resulting in lower resistance.

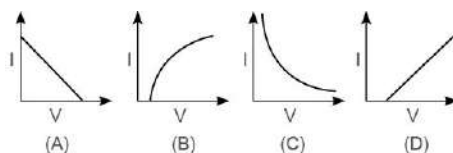
(c) Resistance of wire will drop as it will be very difficult to stop the electrons.

(d) Resistance of the wire will get increased due to joule's heating effect.

Ans. (d) Resistance of the wire will get increased due to joule's heating effect.

(v) If the vertical and horizontal axes of a typical V-I straight line graph are reversed, which graph below is likely to represent the I-V

graph? (I on vertical, V on horizontal for I-V graph).

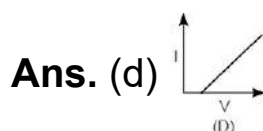


(a) (A)

(b) (B)

(c) (C)

(d) (D)



Definitions

47. Define resistance of a conductor.

Ans. The obstruction offered to the flow of current by a conductor is called its resistance.

48. Define resistivity.

Ans. The resistivity of a substance is numerically equal to the resistance of a rod of that substance which is 1 metre long and 1 square metre in cross-section.

49. What are ohmic conductors ?

Ans. The conductors which obey Ohm's law are called ohmic conductors. The V-I graph for ohmic conductor is a straight line.

50. What are non-ohmic conductors?

Ans. The conductors which does not obey Ohm's law are called non-ohmic conductors. The V-I graph for non-ohmic conductors is not a straight line.

51. State Joule's law of heating.

Ans. Joule's law of heating states that the amount of heat produced in a conductor is directly proportional to:

1. Square of current (I^2)
2. Resistance of wire (R)
3. Time (t), for which current is passed.

52. Define electric power.

Ans. The electrical work done per unit time is called electric power.

53. What does an electric circuit mean?

[NCERT]

Ans. A continuous conducting path consisting of wires and other electrical components (like resistance or electric bulb, switch etc.) between the two terminals of a cell or battery, along which an electric current flows, is called an electric circuit.

Formula or S.I. Unit Based Questions

54. Name and define S.I. unit of resistance.

[Board Question]

Ans. The S.I. unit of resistance is ohm (Ω).

The resistance of a conductor is said to be 1 ohm if 1 ampere current flows through it when a potential difference of 1 volt is applied across the ends of the conductor.

$$1 \text{ ohm} = \frac{1 \text{ volt}}{1 \text{ ampere}}$$

55. Write the formula for the equivalent resistance (R) when three resistors R_1 , R_2 and R_3 are connected in (i) series, (ii) parallel.

Ans. (i) $R = R_1 + R_2 + R_3$

$$(ii) \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

56. Write the S.I . unit of resistivity.

Ans. Ohm-metre.

57. What happens to resistance of a conductor when its area of cross-section is increased ?

[Board Question]

Ans. Resistance decreases as $R \propto \frac{1}{A}$.

58. How many joules are equals to 1 kWh ?

Ans. 3.6×10^6 J.

59. A given length of a wire is doubled on itself. By what factor does the resistance of the wire change ?

[Board Question]

Ans. When given length of wire is doubled on itself, its new length $L' = \frac{L}{2}$ and new cross-section area $A' = 2A$. Hence, its new resistance

$$R' = \frac{\rho L'}{A'} = \frac{\rho \left(\frac{L}{2}\right)}{(2A)} = \frac{1}{4} \frac{\rho L}{A} = \frac{R}{4}$$

Thus, resistance is reduced to one-fourth of its original value.

60. Derive the relation $R = R_1 + R_2 + R_3$, when resistors are joined in series.

[Board Question]

Ans. In series combination, the same current flows in all the resistances but the potential difference across each of the resistance is different.

According to Ohm's law, we have

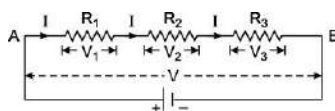
$$V_1 = IR_1, V_2 = IR_2, V_3 = IR_3$$

If the total potential difference between A and B is V, then

$$V = V_1 + V_2 + V_3$$

$$= IR_1 + IR_2 + IR_3$$

$$= I(R_1 + R_2 + R_3)$$



Let the equivalent resistance be R , then

$$V = IR$$

$$\text{and hence } IR = I(R_1 + R_2 + R_3)$$

$$\Rightarrow R = R_1 + R_2 + R_3.$$

61. Derive the relation $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ when resistors are joined in parallel.

[Board Question]

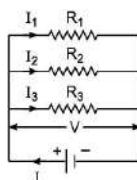
Ans. In parallel combination of three resistance R_1 , R_2 and R_3 , the current in each of the resistance is different. If I is the current drawn from the cell then it is divided into branches as I_1 , I_2 and I_3 . Thus,

$$I = I_1 + I_2 + I_3$$

The potential difference across each of these resistances is the same.

Thus, from Ohm's law

$$I_1 = \frac{V}{R_1}, I_2 = \frac{V}{R_2}, I_3 = \frac{V}{R_3}$$



If R is the equivalent resistance then,

$$I = \frac{V}{R}$$

$$\therefore \frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

and $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$.

62. Out of 60 W and 40 W lamps, which one has a higher electrical resistance when in use.

Ans. Power (P) = $\frac{V^2}{R}$.

From the above formula, P is inversely proportional to R (resistance) as voltage remaining the same. Hence, 40 W lamp has high resistance.

63. Write the formula for current 'I' flowing through a conductor if 'n' electrons flow through the cross-section of a conductor in time 't'.

Ans. If 'n' electrons pass through the cross-section of a conductor in time 't', the total charge 'Q' passing through the conductor is :

$$Q = ne \text{ (e is the charge on an electron = } 1.6 \times 10^{-19} \text{ C)}$$

The current 'I' in the conductor is :

$$I = \frac{Q}{t} = \frac{ne}{t}$$

64. What is commercial unit of electrical energy ? Convert it into joules.

Ans. The commercial unit of electrical energy is kWh.

$$1 \text{ kWh} = 1000 \text{ W} \times 1 \text{ hour}$$

$$= \frac{1000 \text{ J}}{\text{s}} \times 60 \times 60 \text{ s}$$

$$= 3.6 \times 10^6 \text{ J}$$

65. Name the practical unit of power and state its relation with the S.I. unit.

Ans. The practical unit of power is Horse Power (H.P.)

$$1 \text{ H.P.} = 746 \text{ watt.}$$

66. Write the formula of electric power (P) in terms of :

(i) Potential difference (V) and current (I).

(ii) Current (I) and resistance (R).

(iii) Potential difference (V) and resistance (R).

Ans. (i) $P = VI$

(ii) $P = I^2R$

(iii) $P = \frac{V^2}{R}$

67. Write the formula for the heat produced (H) when a current (I) is passed through a conductor of resistance (R) for time (t).

Ans. Heat produced, $H = I^2Rt$.

68. What is the formula of, (a) Resistance (R) of an electric appliance, (b) Safe current (I) in terms of power rating (P) and voltage rating (V).

Ans. 1. Resistance of appliance

$$= \frac{(\text{Voltage rating of appliance})^2}{(\text{Power rating of appliance})} \quad R = \frac{V^2}{P}$$

$$2. \text{ Safe current} = \frac{\text{Power rating of appliance}}{\text{Voltage rating of appliance}} \quad I = \frac{P}{V}$$

69. Name the physical quantity that represents the ratio of potential difference and current.

Ans. Resistance.

70. Name and define the S.I. unit of electric power.

Ans. The S.I. unit of electric power is watt (W). One watt is the power consumed by an electrical device when it is operated at a potential difference of one volt and carries a current of one ampere.

$$1 \text{ watt} = 1 \text{ volt} \times 1 \text{ ampere.}$$

71. What is meant by saying that the potential difference between two points is 1 V?

[NCERT]

Ans. The potential difference between two points is said to be 1 volt if 1 joule of work is done in moving 1 coulomb of electric charge from one point to the other.

72. Define kWh.

Ans. A kilowatt hour (kWh) is the commercial unit of electrical energy. It is the energy consumed when 1 kW (1000 W) power is used for 1 hour.

Very Short Answer Type Questions

73. The radius of conducting wire is doubled. What will be the ratio of its new specific resistance to the old one?

Ans. 1 : 1, specific resistance does not change as it depends on the nature of material only.

74. How are bulbs connected in a fairy light circuit used for decoration of buildings in festivals ?

Ans. Series combination.

75. What will happen to the resistivity of a wire of length L if it is cut into three parts?

Ans. Resistivity of the wire will not change even when the wire is cut into three parts as resistivity is a characteristic of the material of the conductor and does not depend on the physical dimensions of the conductor.

76. The following table gives the value of electrical resistivity of some materials :

[Board Question]

Material	Copper	Silver	Constantan
Electrical resistivity (in W-m)	1.62×10^{-8}	1.6×10^{-8}	49×10^{-8}

Which one is the best conductor of electricity out of them ?

Ans. Silver, because its electrical resistivity is least out of the given materials.

77. What is the resistance of an (i) ideal ammeter and (ii) ideal voltmeter ?

Ans. (i) Zero

(ii) Infinite

78. In series combination which remains constant—current or voltage ?

Ans. Current.

79. Name two devices in which electricity is converted into heat.

Ans. Electric heater and electric iron.

80. Name the alloy which is used for making the filament of bulbs.

Ans. Tungsten is used for making the filament of bulbs.

81. Would you connect a fuse in series or in parallel to an electric circuit ?

Ans. In series, of the electric circuit before appliances are present in the circuit.

82. Why do electricians wear rubber hand gloves while working ?

[Board Question]

Ans. Rubber is an electrical insulator. Hence, electrician can work safely while working on an electric circuit without a risk of getting any electric shock.

83. Electric current flows through a metallic conductor from its one end A to other end B. Which end of the conductor is at

higher potential ? Why ?

Ans. Since, current flows from a region higher potential to a lower potential. So, it flows from A to B where A is the end with higher potential.

84. Write the function of voltmeter in an electric circuit.

[Board Question]

Ans. Voltmeter measures the potential difference across two points in a circuit. It is always connected in parallel in the circuit.

85. Should the resistance of a voltmeter be low or high ? Give reason.

[Board Question]

Ans. The resistance of a voltmeter should be high, because voltmeter is connected parallel to the component of a circuit and it also takes negligible current from the circuit in order to measure the potential difference accurately.

86. Which material is the best conductor of electricity ?

[Board Question]

Ans. Silver.

87. Which substance is used for making resistance coil of electric heater and why ?

Ans. Nichrome, due to its high resistivity.

88. Why is an ammeter connected in series in an electric circuit ?

Ans. It is connected in series so that whole of electric current, which it has to measure, passes through it.

Reasoning Based Questions

89. Two wires P and Q are made of copper. The wire P is long

and thin, while the wire Q is short and thick. Which will have more specific resistance? Give a reason for your answer.

Ans. Both the wires will have same specific resistance, since they are both made of same material (*i.e.*, copper) and there is no change in temperature.

90. Why should a connection wire be thick?

Ans. Resistance of a wire is inversely proportional to its area of cross-section (or thickness). Hence, a connection wire should be thick to reduce its resistance.

91. Why is a series arrangement not used for domestic circuits?

Ans. Series arrangement is not used for domestic circuits for the following reasons :

1. The voltage of the source gets divided in all the appliances connected in series, in the ratio of their resistances, so each appliance does not operate at its rated voltage.
2. The resistance of the circuit increases and it reduces the current in the circuit, so each appliance gets less power.
3. If any one appliance in series arrangement is switched off (or gets spoilt), no other appliance connected with it in series will then operate.

92. Answer the following questions:

(i) List the factors on which the resistance of a conductor in the shape of wire depends.

(ii) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.

Ans. (i) Resistance of a conductor depends directly on its length and is inversely proportional to the area of cross-section.

(ii) Metals have free electrons and they move and conduct electricity,

whereas glass does not have free electrons and charges to flow as it is an insulator.

93. Name a material which is used for making standard resistors. Give a reason for your answer.

Ans. Standard resistors are made from alloys such as constantan, manganin etc., because they have high specific resistance and the effect of change in temperature on their resistance is negligible.

94. Which of the cables, one rated 5 A and the other 10 A will be of thicker wire? Give a reason for your answer.

Ans. The cable carrying 10 A current will be of thicker wire because to carry a heavy current, the resistance of wire should be low, hence its area of cross-section should be large.

95. Why are copper and aluminium wires used as connecting wires?

[Board Question]

Ans. Copper and aluminium wires are used as connecting wires because they have low resistivity and are good conductors of electricity.

96. Why is tungsten used for filaments of electric lamps?

[Board Question]

Ans. Tungsten has high melting point and great tensile strength that's why it is used as light bulb filament in electric lamps.

97. Why is lead-tin alloy used for fuse wires?

[Board Question]

Ans. Lead-tin alloy is used for fuse wires because it has low melting point. It will melt when high supply come to prevent the electric circuit from fire.

98. Why are the heating elements of electric toasters and

electric irons made of an alloy rather than a pure metal?

[Board Question]

Ans. The resistivity of an alloy is generally higher than that of its constituent metals. Alloys do not oxidise (burn) readily at higher temperatures. Therefore, conductors of electric heating devices, such as toasters and electric irons, are made up of an alloy rather than pure metal.

99. Why are coils of electric heaters and electric irons made of an alloy rather than a pure Metal?

Ans. The resistivity of alloys are generally higher than that of its constituent metals and alloys do not oxidize (burn) readily at high temperatures, hence they are commonly used in electrical heating devices, like electric heaters, electric irons etc.

Short Answer Type Questions

100. Answer the following questions:

- (i) Define resistance of a conductor.
- (ii) State Ohm's law.
- (iii) State Joule's law of heating.

Ans. (i) The obstruction offered to the flow of current by a conductor is called its resistance.

(ii) According to Ohm's law, the current flowing in a conductor is directly proportional to the potential difference applied across its ends, provided the temperature and other physical conditions of the conductor remain constant.

(iii) Joule's law of heating states that the amount of heat produced in a conductor is directly proportional to :

1. square of current (I^2),

2. resistance of wire (R), and
3. time (t), for which current is passed.

101. Answer the following questions:

- (i) What is an ammeter?
- (ii) What is a voltmeter?
- (iii) Define resistivity.

Ans. (i) Ammeter is an instrument which is used to measure electric current in a circuit. It is always connected in series with the circuit.

(ii) A voltmeter is an instrument which is used to measure electric potential in the circuit between two points. It is always connected in parallel with the circuit.

(iii) The resistivity of a substance is numerically equal to the resistance of a rod of that substance which is one metre long and one square metre in cross-section.

102. Answer the following questions:

- (i) Define electric power.
- (ii) What is a super conductor? Give two examples.
- (iii) What does an electric circuit mean?
- (iv) Define conductors and insulators.

[NCERT]

Ans. (i) The electrical work done per unit time is called electric power.

(ii) A superconductor is a substance of zero resistance at very low temperatures.

Example : Mercury below 4.2 K, Lead below 7.25 K.

(iii) A continuous conducting path consisting of wires and other

electrical components (like resistance or electric bulb, switch etc.) between the two terminals of a cell or battery, along with an electric current flows, is called an electric circuit.

(iv) The substances through which electricity can flow are called conductors and the substances through which electricity cannot flow are called insulators.

Differentiate Between

103. Write three points of difference between Ohmic resistor and non-Ohmic resistor.

Ans.

S. No.	Ohmic Resistor	Non-Ohmic Resistor
1.	Ohmic resistors obey Ohm's law.	Non-Ohmic resistors do not obey Ohm's law.
2.	The graph for potential difference (V) versus current (I) is a straight line.	The graph for potential difference (V) versus current (I) is not a straight line.
3.	The slope of V-I graph is constant at all values of V or I at a given temperature.	The slope of V-I graph is different at different values of V or I even at a given temperature.

104. Write two points of difference between resistance and resistivity (or specific resistance).

Ans.

S. No.	Resistance	Resistivity (Specific Resistance)
1.	The S.I. unit of resistance is Ohm (W).	The S.I. unit of resistivity is ohm-metre (W m).

2.	Resistance of a substance depends on its length and thickness.	Resistivity of a substance is independent of its length and thickness.
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105. Write three points of difference between series combination and parallel combination of resistors.

Ans.

S. No.	Series Combination	Parallel Combination
1.	The current has a single path for its flow, hence, same current flows through each resistor.	The main current from the source divides itself in different arms. The current in each resistors is inversely proportional to its resistance.
2.	The potential difference across the entire circuit is equal to the sum of the potential difference across the individual resistor.	The potential difference across each resistor is same and it is equal to the potential difference across the terminals of the battery (or source).
3.	The equivalent resistance in series combination is greater than the highest resistance in the series combination.	The equivalent resistance in parallel combination is less than the least resistance in the parallel combination.

106. Distinguish between an open and a closed circuit.

Ans. An electric circuit is said to be an open circuit when the switch is in 'off' mode (or key is unplugged) and no current flows in the circuit.

The circuit is said to be a closed circuit when the switch is in 'on'

mode (or key is plugged) and a current flows in the circuit.

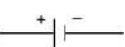
107. Write two points of difference between electrical energy and electric power.


Ans.

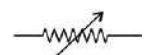
S. No.	Electrical Energy	Electric Power
1.	Electrical energy consumed by an electrical appliance is given by the product of its power rating and time for which it is used.	It is the rate at which electrical energy is consumed.
2.	It is measured in kWh.	It is measured in watt or kilo-watt.

Diagram Based Questions

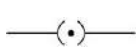
108. Identify the components used in circuit diagrams represented by the following symbols :


(i) 

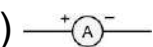
(ii) 

(iii) 

(iv) 

(v) 

(vi) 

(vii) 

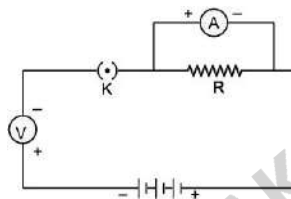
(viii) 

Ans. (i) An electric cell

(ii) A fixed resistance

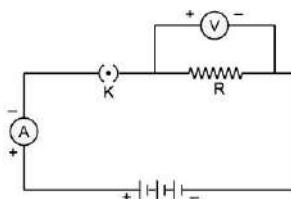
- (iii) A variable resistance
- (iv) Plug key (open)
- (v) Plug key (closed)
- (vi) A battery or combination of cells
- (vii) Ammeter
- (viii) Voltmeter

109. What do you mean by an electric circuit ? Carefully study the circuit diagram given below and make the necessary corrections.

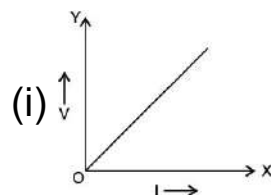


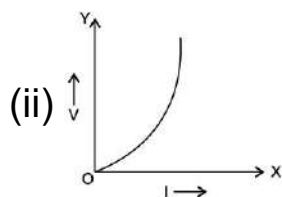
Ans. An electrical circuit is a continuous path comprising conducting wires and other electrical components between the terminals of a battery along which an electric current is set up. It is represented by drawing a circuit diagram.

The corrected circuit diagram given in the question is :



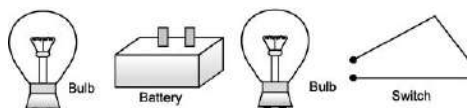
110. The given figure shows the V-I graphs for two resistors. Identify the resistor that obeys Ohm's law. Give a reason for your answer



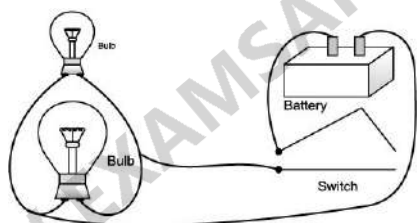


Ans. The figure (i) obeys Ohm's law because the V-I graph is a straight line and its slope (or resistance) is constant.

111. The given figure shows a battery, a switch and two bulbs. Complete the diagram to show the electric connections of the bulbs to the battery. How have you joined the bulbs ? Give a reason.

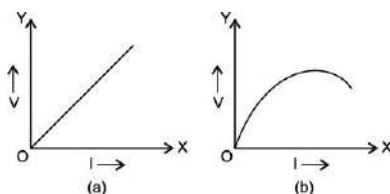


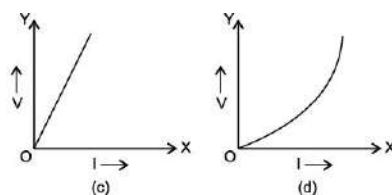
Ans. The two bulbs are connected in parallel and the complete circuit diagram is drawn below :



The reason for connecting the two bulbs in parallel is that (i) both the bulbs glow at the same voltage, and (ii) if one bulb stops glowing, the other bulb remains unaffected.

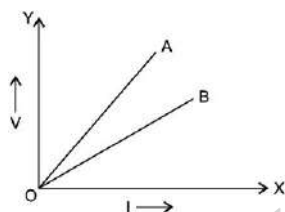
112. The given figures show V-I graphs experimentally obtained for different resistors. Select the graphs for resistors that do not obey Ohm's law.





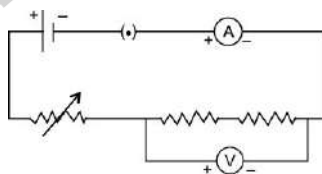
Ans. The figure (b) and (d) do not obey Ohm's law because the V-I graphs are not straight lines.

113. The given figure represents V-I graph for a series combination and for a parallel combination of two resistors. Which of the two, A or B, represents the series combination. Give a reason for your answer.



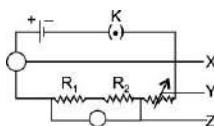
Ans. Since, the straight line A is steeper than B, so the straight line A represents a greater resistance. The equivalent resistance in a series combination is greater than in parallel combination. Hence, A represents series combination.

114. What is the mistake in the circuit given below ?



Ans. The terminals of ammeter are wrongly connected.

115. Identify the X, Y and Z in the circuit given below :



Ans. X = Ammeter, Y = Rheostat, Z = Voltmeter.

Numericals

116. The resistance of a wire of length 150 cm and of uniform

area of cross-section 0.015 cm^2 , is found to be 3.0Ω . Calculate the specific resistance of the wire.

Ans. Here, $l = 150 \text{ cm}$; $A = 0.015 \text{ cm}^2$; $R = 3.0 \Omega$.

Specific resistance, $\rho = \frac{RA}{l}$

$$= \frac{3.0 \times 0.015}{150}$$

$$= 0.0003 \Omega \text{ cm}.$$

117. A wire has a resistance of 5Ω . Calculate the resistance of a wire of same material, whose length is three times and area of cross-section is four times the first wire.

Ans. Case I : $R = 5 \Omega$

Let the area of cross-section be 'A' and length be 'l'.

We know that, $R = \rho \cdot \frac{l}{A}$

Where ρ is the specific resistance of the wire.

$$\therefore 5 = \rho \frac{l}{A} \dots (i)$$

Case II : $R_1 = ?$

Here, length = $3l$, area of cross-section = $4A$

$$\therefore R_1 = \rho \frac{3l}{4A} \dots (ii)$$

Dividing equation (ii) by (i), we get

$$\frac{R_1}{5} = \frac{\rho \cdot 3l}{4A} \times \frac{A}{\rho \cdot l}$$

$$\therefore R_1 = 5 \times \frac{3}{4} = 3.75 \Omega.$$

118. A torch bulb when cold has a resistance of 2.5Ω . It draws a current 450 mA , when connected to a 6 V battery and glows brightly. Calculate the resistance of the bulb when glowing and explain the reason for the difference in resistance.

Ans. While glowing, $I = 450 \text{ mA} = 0.45 \text{ A}$, $V = 6 \text{ volt}$

Using Ohm's law, Resistance of bulb, $R = \frac{V}{I} = \frac{6}{0.45} = 13.33 \Omega$

The reason for the difference in resistance of bulb when cold ($R = 2.5 \Omega$) and while glowing ($R = 13.33 \Omega$), is that the resistance of filament of bulb increases with the increase in temperature.

119. A uniform wire with a resistance of 32Ω is divided into four equal parts and they are joined in parallel. Calculate the equivalent resistance of the parallel combination.

Ans. Resistance of each part,

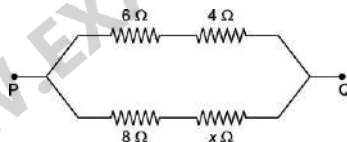
$$R_1 = \frac{32}{4} \Omega = 8 \Omega$$

When connected in parallel, the equivalent resistance is

$$\frac{1}{R} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{4}{8} = \frac{1}{2}$$

or $R = 2 \Omega$.

120. Calculate the value of x if the equivalent resistance between the points P and Q as shown in figure is 5Ω .



Ans. Equivalent resistance of 6Ω and 4Ω in series,

$$R_1 = (4 + 6) \Omega = 10 \Omega$$

Equivalent resistance of 8Ω and $x \Omega$ in series,

$$R_2 = (8 + x) \Omega.$$

Now, R_1 and R_2 are in parallel.

Therefore, the equivalent resistance of R_1 and R_2 connected in parallel can be calculated as

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\text{or } \frac{1}{5} = \frac{1}{10} + \frac{1}{8+x} [\because R = 5 \Omega]$$

$$\text{or } \frac{1}{5} - \frac{1}{10} = \frac{1}{8+x}$$

$$\text{or } \frac{2-1}{10} = \frac{1}{8+x}$$

$$\text{or } \frac{1}{10} = \frac{1}{8+x}$$

$$\text{or } 8 + x = 10$$

$$\Rightarrow x = 10 - 8 = 2 \Omega$$

\therefore Value of $x = 2 \Omega$.

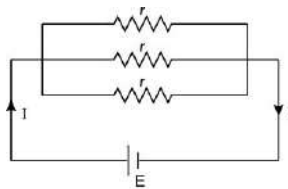
121. You have three resistors of r ohm each and a battery of E volts. How would you connect these resistors with the battery to obtain maximum current? Draw a circuit diagram to illustrate your answer and also calculate the current drawn from the battery.

[Board Question]

Ans. Three resistors are connected in parallel. Let its equivalent resistance be $R \Omega$.

$$\therefore \frac{1}{R} = \frac{1}{r} + \frac{1}{r} + \frac{1}{r}$$

$$\frac{1}{R} = \frac{1+1+1}{r} = \frac{3}{r}$$



$$\Rightarrow R = \frac{r}{3}$$

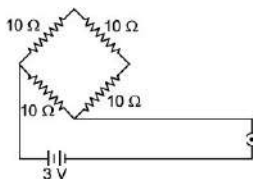
By Ohm's law, $E = IR$

$$\Rightarrow \text{Current } (I) = \frac{E \times 3}{r} = \frac{3E}{r}$$

These resistances should be connected in parallel with the battery to obtain the maximum current.

122. Find the current drawn from the battery by the network of four resistors shown in the figure.

[Board Question]

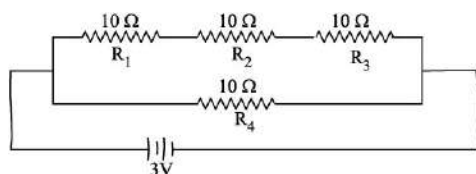


Ans. The given circuit can be redrawn as shown below :

Resultant resistance of R_1 , R_2 and R_3 :

$$R' = R_1 + R_2 + R_3$$

$$= 10 + 10 + 10 = 30 \, \Omega$$



Resultant resistance of the circuit :

$$\frac{1}{R} = \frac{1}{R'} + \frac{1}{R_4}$$

$$= \frac{1}{30} + \frac{1}{10} = \frac{1+3}{30} = \frac{4}{30}$$

$$R = \frac{30}{4} = \frac{15}{2} = 7.5 \, \Omega$$

Here, $V = 3$ volt, $I = ?$

By Ohm's law, $V = IR$

$$\Rightarrow I = \frac{V}{R} = \frac{3}{7.5} = \frac{30}{75} = 0.4 \, A$$

123. An electric lamp of $100 \, \Omega$, a toaster of resistance $50 \, \Omega$, and a water filter of resistance $500 \, \Omega$ are connected in parallel to a $220 \, V$ source. What is the resistance of an electric iron connected to the same source that takes as much current as all three appliances and what is the current through it?

[NCERT]

Ans. The combined resistance R of the three electrical devices R₁, R₂ and R₃ connected in parallel is :

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Here, R₁ = 100 Ω, R₂ = 50 Ω and R₃ = 500 Ω

$$\therefore \frac{1}{R} = \frac{1}{100} + \frac{1}{50} + \frac{1}{500}$$

$$= \frac{5+10+1}{500}$$

$$= \frac{16}{500}$$

$$\text{or } R = \frac{500}{16}$$

$$= 31.25 \, \Omega$$

Thus, the resistance of electric iron is 31.25Ω.

Now, Potential difference, V = 220 V

Current, I = ?

Resistance, R = 31.25 Ω

Using Ohm's law : $\frac{V}{I} = R$

$$\text{or } \frac{220}{I} = 31.25$$

$$\text{or } I = \frac{220}{31.25}$$

$$= 7.04 \, \text{A}$$

Hence, the current passing through the electric iron is 7.04 A.

124. How can three resistors of resistances 2 Ω, 3 Ω and 6 Ω be connected to give a total resistance of (a) 4 Ω and (b) 1 Ω?

[NCERT]

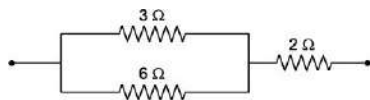
Ans. (a) The three resistors of resistances 2 Ω, 3 Ω and 6 Ω have to be combined as shown in the figure to obtain 4 Ω resistance.

Equivalent resistance of 3 Ω and 6 Ω connected in parallel is,

$$\frac{1}{R_p} = \frac{1}{3} + \frac{1}{6}$$

$$= \frac{2+1}{6} = \frac{3}{6}$$

$$\text{or } R_p = \frac{6}{3} = 2 \, \Omega$$



Now, R_p and $2 \, \Omega$ are joined in series and the equivalent resistance is,

$$R = R_p + 2$$

$$= (2 + 2) \, \Omega$$

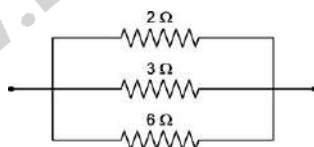
$$= 4 \, \Omega$$

(b) In order to obtain $1 \, \Omega$ resistance, the resistors $2 \, \Omega$, $3 \, \Omega$ and $6 \, \Omega$ have to be combined as shown in figure.

$2 \, \Omega$, $3 \, \Omega$ and $6 \, \Omega$ resistances are connected in parallel,

$$\therefore \frac{1}{R} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$$

$$= \frac{3+2+1}{6}$$



$$= \frac{6}{6}$$

$$\text{or } R = 1 \, \Omega$$

125. How many $176 \, \Omega$ resistors in parallel are required to carry $5 \, \text{A}$ on a $220 \, \text{V}$ line?

[NCERT]

Ans. Here, Potential difference, $V = 220 \, \text{V}$, Current, $I = 5 \, \text{A}$

$$\therefore \text{Resistance, } R = \frac{V}{I}$$

$$= \frac{220}{5} = 44 \, \Omega$$

Let the number of $176\ \Omega$ resistors to be connected in parallel to give an equivalent resistance of $44\ \Omega$ be x .

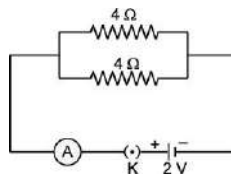
Equivalent resistance of ' x ' $176\ \Omega$ resistance connected in parallel is $\frac{176}{x}\ \Omega$

But, $\frac{176}{x} = 44$

$\therefore x = \frac{176}{44} = 4$

Thus, 4 resistors of $176\ \Omega$ each should be connected in parallel.

126. In the circuit diagram shown below, calculate : (i) total resistance and (ii) current shown by the ammeter A.



Ans. (i) The two resistors of resistance $4\ \Omega$ each are connected in parallel.

$\therefore \frac{1}{R} = \frac{1}{4} + \frac{1}{4}$

$= \frac{1+1}{4}$

$= \frac{2}{4} = \frac{1}{2}$

$\therefore R = 2\ \Omega$

Now, Potential difference,

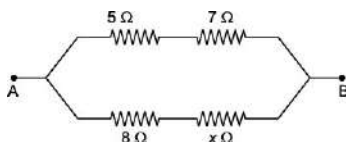
$V = 2\ \text{V}$

Total resistance, $R = 2\ \Omega$

(ii) Using Ohm's law, Current,

$I = \frac{V}{R} = \frac{2}{2}\ \text{A} = 1\ \text{A}.$

127. In the circuit given below, calculate the value of x , if the equivalent resistance between the points A and B is $6\ \Omega$.



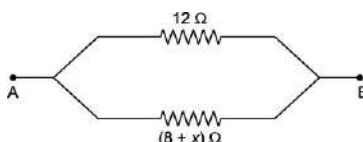
Ans. The network of resistors can be simplified as

(\because $5\ \Omega$ and $7\ \Omega$ are in series and also $8\ \Omega$ and $x\ \Omega$ are in series).

Here, equivalent resistance (R) = $6\ \Omega$, $R_1 = 12\ \Omega$, $R_2 = (8 + x)\ \Omega$

The resistors R_1 and R_2 are connected in parallel.

$$\therefore \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$



$$\text{or } \frac{1}{6} = \frac{1}{12} + \frac{1}{8+x}$$

$$\text{or } \frac{1}{6} - \frac{1}{12} = \frac{1}{8+x}$$

$$\text{or } \frac{2-1}{12} = \frac{1}{8+x}$$

$$\text{or } \frac{1}{12} = \frac{1}{8+x}$$

$$\text{or } 8 + x = 12$$

$$\therefore x = 12 - 8 = 4\ \Omega.$$

128. Draw a schematic diagram of a circuit consisting of a battery of three cells of $2\ \text{V}$ each, a $5\ \Omega$ resistor, an $8\ \Omega$ resistor, and a $12\ \Omega$ resistor and a plug key, all connected in series. Now, connect the ammeter to measure the current through the resistors and a voltmeter to measure the potential difference across the $12\ \Omega$ resistors. What would be the readings in the ammeter and the voltmeter?

Ans. The total resistance of the circuit is given by

$$R = 5 + 8 + 12$$

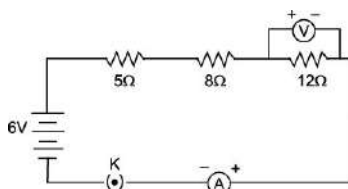
$$= 25\ \Omega$$

We know, $R = \frac{V}{I}$

Hence, $25 = \frac{6}{I}$

$$I = \frac{6}{25}$$

$$= 0.24 \text{ A}$$



Since, resistances are connected in series, thus electric current remains the same through all resistors.

Here we have,

Electric current, $I = 0.24 \text{ A}$

Resistance, $R = 12 \Omega$

Thus, potential difference (V) through the resistor of 12Ω is given by

$$V = I \times R$$

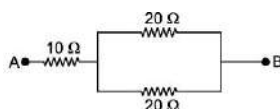
$$= 0.24 \times 12$$

$$= 2.88 \text{ V}$$

\therefore Reading of ammeter = 0.24 A

Reading of voltmeter through resistor of $12 \Omega = 2.88 \text{ V}$.

129. Calculate the equivalent resistance of the following network :



Ans. Let R_p is the equivalent resistance of resistors connected in parallel.

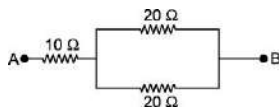
\therefore Equivalent resistance of the circuit

$$\frac{1}{R_p} = \frac{1}{20} + \frac{1}{20}$$

$$\frac{1}{R_p} = \frac{1+1}{20}$$

$$= \frac{2}{20} = \frac{1}{10}$$

$$R_p = 10 \, \Omega$$



Now, equivalent circuit becomes.

\therefore 10 Ω and 10 Ω are connected in series.



\therefore Equivalent resistance of the circuit $R = 10 \, \Omega + 10 \, \Omega$

$$= 20 \, \Omega$$

130. Resistance of a conductor of length 80 cm is 4.0 Ω . Calculate the resistance of a similar conductor of length 400 cm.

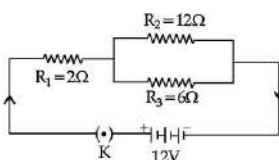
Sol. Here, $l_1 = 80 \, \text{cm}$, $R_1 = 4.0 \, \Omega$, $l_2 = 400 \, \text{cm}$, $R_2 = ?$

$$\therefore \frac{R_1}{R_2} = \frac{l_1}{l_2}$$

$$\text{or } R_2 = R_1 \cdot \frac{l_2}{l_1}$$

$$= 4.0 \times \frac{400}{80} = 20.0 \, \Omega.$$

131. The circuit diagram given below shows the combination of three resistors, $R_1 = 2 \, \Omega$, $R_2 = 12 \, \Omega$ and $R_3 = 6 \, \Omega$:



Calculate :

(i) Total resistance of the circuit.

(ii) Total current flowing in the circuit.

(iii) The potential difference across R_1 .

(iv) The potential difference across R_2 or R_3 .

(v) Current flowing through R_2 .

Ans. (i) R_2 and R_3 are in parallel.

\therefore Equivalent resistance of R_2 and R_3 ,

$$R_P = \frac{R_2 \times R_3}{R_2 + R_3}$$

$$= \frac{12 \times 6}{12 + 6} \Omega$$

$$= \frac{72}{18} \Omega$$

$$= 4 \Omega.$$

\therefore Total resistance of the circuit, $R = R_1 + R_P$

Now, R_1 and R_P are connected in series

$$= (2 + 4) \Omega$$

$$= 6 \Omega$$

(ii) Potential difference, $V = 12 \text{ V}$

Total resistance, $R = 6 \Omega$

Using Ohm's law,

Total current flowing in circuit,

$$I = \frac{V}{R}$$

$$= \frac{12}{6} \text{ A} = 2 \text{ A}$$

(iii) Potential difference across R_1 ,

$$V_1 = IR_1$$

$$= 2 \times 2 = 4 \text{ V}$$

(iv) Potential difference across R_2 or R_3 ,

$$V_2 = IR_P$$

$$= 2 \times 4 = 8 \text{ V}$$

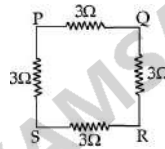
(v) Let the current flowing through R_2 be I' .

$$\therefore V_2 = I'R_2$$

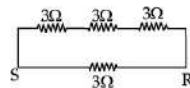
$$\text{or } I' = \frac{V_2}{R_2} = \frac{8}{12} \text{ A}$$

$$= 0.67 \text{ A.}$$

132. In a network of resistors as shown in figure, calculate the equivalent resistance between the points (i) S and R and (ii) P and R.



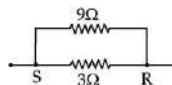
Sol. (i) Between S and R : Between the points S and R the above network of resistors can be represented as :



Equivalent resistance of three 3Ω resistors connected in series,

$$R_1 = (3 + 3 + 3) = 9 \Omega$$

Now, R_1 and 3Ω are connected in parallel.



\therefore Equivalent resistance R can be calculated as

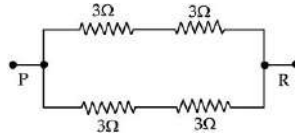
$$\frac{1}{R} = \frac{1}{9} + \frac{1}{3}$$

$$= \frac{1+3}{9}$$

$$= \frac{4}{9}$$

$$\text{or } R = 9/4 \, \Omega = 2.25 \, \Omega$$

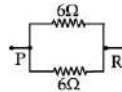
(ii) Between P and R : Between the points P and R the network of resistors can be represented as :



Equivalent resistance of two $3 \, \Omega$ resistors connected in series is $(3 + 3) = 6 \, \Omega$

Now, two $6 \, \Omega$ resistors are connected in parallel.

\therefore Equivalent resistance is given by



$$\frac{1}{R} = \frac{1}{6} + \frac{1}{6}$$

$$\frac{1}{R} = \frac{1+1}{6} = \frac{2}{6} = \frac{1}{3}$$

$$= 3 \, \Omega.$$

133. A copper wire has diameter 0.5 mm and resistivity of $1.6 \times 10^{-8} \, \Omega \, \text{m}$. What will be the length of this wire to make its resistance $10 \, \Omega$? How much does the resistance change if the diameter is doubled ?

Sol. Here, diameter of wire = 0.5 mm, Resistivity (ρ) = $1.6 \times 10^{-8} \, \Omega \, \text{m}$, Resistance (R) = $10 \, \Omega$. Let the length of wire l and the resistance when diameter is doubled be R_1 .

$$\therefore \text{Radius} = \frac{0.5}{2} \text{ mm} = 0.25 \text{ mm}$$

$$= \frac{0.25}{1000} = 0.00025 \text{ m}$$

$$\text{We know that, } R = \rho \frac{l}{A}$$

$$\therefore l = \frac{RA}{\rho} = \frac{R\pi r^2}{\rho}$$

$$\Rightarrow l = \frac{10 \times 3.14 \times (0.00025)^2}{1.6 \times 10^{-8}}$$

$$l = \frac{10 \times 3.14 \times 0.00025 \times 0.00025}{1.6 \times 10^{-8}}$$

$$\Rightarrow l = \frac{10 \times 3.14 \times 0.000000625 \times 10^8}{1.6}$$

$$l = \frac{10 \times 10^8 \times 0.00000196250}{1.6}$$

$$= \frac{196.26}{1.6}$$

$$= 122.65 \text{ m} = 122.7 \text{ m}$$

When diameter wire is doubled then,

$$\text{Now diameter} = 0.5 \times 2 = 1 \text{ mm}$$

$$\therefore \text{Radius} = \frac{1}{2} \text{ mm} = 0.5 \text{ mm}$$

$$= \frac{0.5}{1000} \text{ m} = 0.0005 \text{ m}$$

$$\therefore R_1 = \rho \frac{l}{A} = \rho \frac{l}{\pi r^2}$$

$$= 1.6 \times 10^{-8} \times \frac{122.7}{3.14 \times 0.0005 \times 0.0005}$$

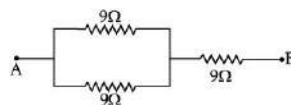
$$= \frac{1.6 \times 10^{-8} \times 122.7}{3.14 \times 0.0000025}$$

$$= \frac{1.6 \times 122.7}{3.14 \times 0.0000025 \times 10^8}$$

$$= \frac{196.32}{78.5} = 2.5 \Omega$$

134. Show how would you join resistors each resistance 9 W so that the equivalent resistance of the combination of combination is (i) 13.5 W (ii) 6 Ω?

Sol. (i) To get an equivalent resistance of 13.5 Ω, the resistance should be connected as shown in the figure given below:



$$\text{So, } \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$= \frac{1}{9} + \frac{1}{9}$$

$$= \frac{1+1}{9} = \frac{2}{9}$$

$$\frac{1}{R_p} = \frac{2}{9}$$

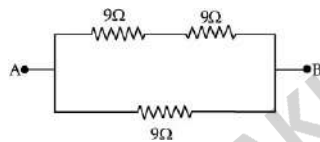
$$R_p = \frac{9}{2} = 4.5 \, \Omega$$

$$\text{Now, } R_S = R_3 + 4.5 \, \Omega$$

$$= 9 \, \Omega + 4.5 \, \Omega$$

$$= 13.5 \, \Omega$$

(ii) To get equivalent resistance of $6 \, \Omega$, the resistance should be connected as shown in the given below



$$R_S = R_1 + R_2$$

$$= 9 + 9$$

$$= 18 \, \Omega$$

Now both the resistance are in parallel with each other so,

$$R_p = \frac{1}{\frac{1}{18} + \frac{1}{9}}$$

$$= \frac{1+2}{18} = \frac{3}{18}$$

$$= \frac{1}{6}$$

$$\text{So, } R_p = 6 \, \Omega$$

135. An electric bulb of resistance $44 \, \Omega$ draws a current of $5.0 \, \text{A}$. Calculate the line voltage.

Ans. Here, $I = 5.0 \, \text{A}$, $R = 44 \, \Omega$, $V = ?$

Using Ohm's law, $V = IR$

$$= 5.0 \times 44 = 220 \text{ V}$$

136. An electric iron of resistance 20Ω takes a current of 5 A. Calculate the heat developed in 30 s.

[NCERT]

Ans. Here, Current (I) = 5 A, Resistance (R) = 20Ω ,
Time (t) = 30 s

$$\therefore \text{Heat produced (H)} = I^2 R t$$

$$= (5)^2 \times 20 \times 30$$

$$= 15000 \text{ J}$$

Thus, heat developed is $1.5 \times 10^4 \text{ J}$.

137. Which uses more energy, a 250 W T.V. set in 1 hour or a 1200 W toaster in 10 minutes?

[NCERT]

Ans. For T.V. Set : Power, $P = 250 \text{ W}$

Time, $t = 1 \text{ h}$

Electrical energy consumed = $P \times t$

$$= \frac{250 \times 1}{1000} \text{ kWh}$$

$$= 0.25 \text{ kWh}$$

For toaster : Power, $P = 1200 \text{ W}$

Time, $t = 10 \text{ minutes}$

$$= \frac{10}{60} \text{ h} = \frac{1}{6} \text{ h}$$

Electrical energy consumed = $P \times t$

$$= \frac{1200 \times 1}{1000 \times 6} \text{ kWh}$$

$$= 0.20 \text{ kWh}$$

The T.V. set uses more energy (0.25 kWh) whereas the toaster uses

less energy (0.20 kWh).

138. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor.

[NCERT]

Ans. Here, Potential difference, $V = 12 \text{ V}$

Current, $I = 2.5 \text{ mA} = \frac{2.5}{1000} \text{ A} = 0.0025 \text{ A}$

Using Ohm's law

Resistance, $R = \frac{V}{I} = \frac{12}{0.0025} = 4800 \Omega$

139. The values of current I flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below :

I (ampere)	0.5	1.0	2.0	3.0	4.0
V (volt)	1.6	3.4	6.7	10.2	13.2

Plot a graph between V and I and calculate the resistance of that resistor.

Ans. The graph between V and I is given below :

Let us consider two points A and B on the slope.

Draw two lines, one from point B along X-axis and another from point A along Y-axis, which meet at point C.

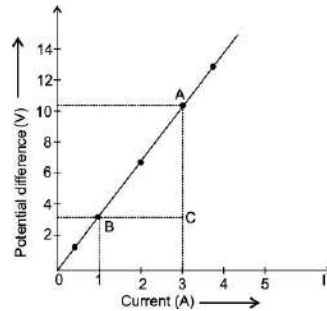
The slope of the graph will give the value of resistance, thus

$$\text{Slope} = R = \frac{AC}{BC}$$

$$\text{Now, } BC = 3 - 1 = 2 \text{ A}$$

$$AC = 10.2 - 3.4 = 6.8 \text{ V}$$

$$\text{Slope} = \frac{6.8}{2} = 3.4 \Omega$$



Thus, resistance $(R) = 3.4 \, \Omega$.

140. An electric iron is rated '1 kW – 220 V'. Calculate the following :

- (i) The resistance of its heating element.**
- (ii) The amount of current that will flow through the element.**
- (iii) The amount of heat that will be produced in 2 minutes.**
- (iv) The power consumed if the line voltage falls to 200 V.**

Ans. Here, $V = 220$ volt, $P = 1 \text{ kW} = 1000 \text{ W}$, $t = 2 \text{ minute} = 2 \times 60 = 120 \text{ s}$

(i) Resistance of the heating element,

$$R = \frac{V^2}{P} = \frac{(220)^2}{1000} = 48.4 \, \Omega.$$

(ii) Current through the element,

$$I = \frac{P}{V} = \frac{1000}{220} = 4.54 \text{ A}$$

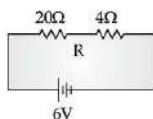
(iii) Heat produced in 2 minutes $= P \times t$

$$= 1000 \times 120 = 1.2 \times 10^5 \text{ J}$$

(iv) If line voltage falls to 200 V, the power consumed is,

$$P = \frac{V^2}{R} = \frac{(200)^2}{48.4} = 826.44 \text{ W}.$$

141. An electric lamp of resistance $20 \, \Omega$ and a conductor of resistance $4 \, \Omega$ are connected to a 6 V battery as shown in the circuit. Calculate :



- (i) the total resistance of the circuit,
- (ii) the current through the circuit,
- (iii) the potential difference across the (a) electric lamp and (b) conductor,
- (iv) power of the lamp.

Ans. (i) Given, $R_1 = 20\ \Omega$, $R_2 = 4\ \Omega$

Since, in Series $R = R_1 + R_2$

\therefore Total resistance of circuit : $R = 20 + 4$

$= 24\ \Omega$

(ii) Current through circuit $V = 6\ \text{V}$, $R = 24\ \Omega$

According to Ohm's law $V = IR$

So, $I = \frac{V}{R}$

$$I = \frac{6}{24}$$

$$= \frac{1}{4} = 0.25\ \text{ampere}$$

(iii) (a) Potential difference across electric lamp :

$$I = \frac{1}{4}\text{A}, R_1 = 20\ \Omega$$

$$V_1 = IR_1$$

$$V_1 = \frac{1}{4} \times 20$$

$$= 5\ \text{V}$$

(b) Potential difference across conductor

$$V_2 = IR_2$$

$$= \frac{1}{4} \times 4$$

$$V_2 = 1 \text{ V}$$

(iv) Power of lamp : $P = I^2 R$

$$= \left(\frac{1}{4}\right)^2 \times 20$$

$$= \frac{1}{4} \times \frac{1}{4} \times 20$$

$$= \frac{5}{4} \text{ W}$$

or $P = 1.25 \text{ W}$.

142. Two bulbs rated (60 W – 220 V) and (60 W – 110 V) respectively. Calculate the ratio of their resistance.

Sol. First bulb:

Power rating $P_1 = 60 \text{ W}$

Voltage rating $V_1 = 220 \text{ V}$

$$\therefore \text{Resistance, } R_1 = \frac{V_1^2}{P_1}$$

$$= \frac{220 \times 220}{60} \Omega$$

$$= 806.66 \Omega$$

Second bulb:

Power rating $P_2 = 60 \text{ W}$

Voltage rating, $V_2 = 110 \text{ V}$

$$\therefore \text{Resistance, } R_2 = \frac{V_2^2}{P_2}$$

$$= \frac{110 \times 110}{60} \Omega$$

$$\frac{R_1}{R_2} = \frac{\frac{220 \times 220}{60}}{\frac{110 \times 110}{60}}$$

$$= \frac{220 \times 220}{60} \times \frac{60}{110 \times 110}$$

$$= \frac{4}{1}$$

$$R_1 : R_2 = 4 : 1$$

143. An electric kettle is rated at (1000 W – 220 V).

(i) What is the resistance of its element when in use?

(ii) What is the safe value of current that can pass through its element?

Sol. Here, Power rating, $P = 1000 \text{ W}$

Voltage rating, $V = 220 \text{ V}$

(i) Using the relation $P = \frac{V^2}{R}$

Resistance of element when in use,

$$R = \frac{V^2}{P} = \frac{220 \times 220}{1000}$$

$$= 48.4 \, \Omega$$

(ii) Using the relation $P = VI$

$$\text{Safe current, } I = \frac{P}{V} = \frac{1000}{220}$$

$$= 4.55 \text{ A}$$

144. Two lamps, one rated 100 W at 220 V, and the other 60 W at 220 V, are connected in parallel to electric mains supply. What current is drawn from the line if the supply voltage is 220 V?

[NCERT]

Sol. Given: Power of one lamp, $P_1 = 100 \text{ W}$

Power of second lamp, $P_2 = 60 \text{ W}$

Since, both the lamps are connected in parallel, thus, potential difference will be equal.

Thus, Potential difference = 220 V

We know, that Power (P) = VI

Thus, the total current through the circuit

$$I = \frac{P_1}{V} + \frac{P_2}{V}$$

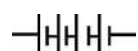
$$I = \frac{100}{220} + \frac{60}{220}$$

$$= \frac{100 + 60}{220}$$

$$= \frac{160}{220} = 0.727 \text{ A}$$

Analysis and Evaluation Based Questions

145. If a student wants to connect four cells of 1.5 V each to form a battery of 6 V, then how would he draw the symbol of the battery?

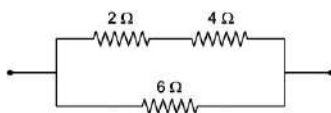
Ans. 

146. The atoms of copper contain electrons and the atoms of rubber also contain electrons, then, why does copper conduct electricity but rubber does not conduct electricity?

Ans. Copper contains a large number of free electrons, hence is a good conductor of electric current whereas rubber has negligible number of free electrons and is an insulator.

147. You are given three resistors of resistance 2 Ω , 4 Ω and 6 Ω . Show by a diagram, how you can get a 3 Ω resistance with the help of these resistors.

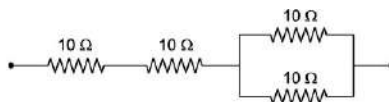
Ans. Connect 2 Ω and 4 Ω in series then this combination is connected with the parallel 6 Ω resistance. By this arrangement we can get resistance 3 Ω as equivalent resistance.



148. How many 10 Ω resistors are required to get a 25 Ω resistor?

Ans. Four 10 Ω resistors are required and they are connected as

shown.



149. You are given fifty $5\ \Omega$ resistors. What is (i) smallest and (ii) largest resistance can be obtained by using these?

Ans. (i) To get the smallest resistance, all the $5\ \Omega$ resistors must be connected in parallel.

$$\text{Smallest resistance} = \frac{5}{50} = 0.1\ \Omega$$

(ii) To get the largest resistance, the $5\ \Omega$ resistors must be connected in series.

$$\text{Largest resistance} = 5 \times 50 = 250\ \Omega.$$

150. Why are fairy decorative lights always connected in parallel?

Ans. When the fairy lights are connected in series the resistance offered will be greater and brightness of the bulbs will be affected. But in parallel connection all the bulbs will glow with same intensity and if any bulb gets fused the other bulbs will continue to glow.

151. What will happen when :

(i) Voltmeter is connected in series?

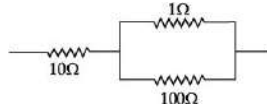
(ii) Ammeter is connected in parallel?

Ans. (i) Negligible current will pass through the circuit because the voltmeter has a very high resistance.

(ii) Ammeter will get damaged due to flow of large amount of current through it, because it has low resistance.

152. Arrange $1\ \Omega$, $10\ \Omega$ and $100\ \Omega$ such that the equivalent resistance is greater than $10\ \Omega$ but less than $11\ \Omega$.

Sol. The resistor have to combined as shown in the diagram



The equivalent resistance of 1 Ω and 100 Ω connected in parallel is:

$$\begin{aligned}\frac{1}{R_1} &= \frac{1}{1} + \frac{1}{100} \\ &= \frac{100+1}{100} \\ &= \frac{101}{100}\end{aligned}$$

$$\text{or } R_1 = \frac{100}{101} \Omega$$

$$= 0.99 \Omega$$

Now, 10 Ω and R_1 are in series,

Therefore, equivalent resistance R is

$$R = (10 + 0.99) \Omega$$

$$= 10.99 \Omega$$

The above value of resistance is greater than 10 Ω but less than 11 Ω.

153. What is (i) the highest, (ii) the lowest resistance that can be secured by combination of other resistors of 1 Ω, 10 Ω, 100 Ω and 1000 Ω?

Sol. (i) To obtain the highest resistance, the resistors must be connected in series.

$$\therefore \text{Highest resistance, } R_S = (1 + 10 + 100 + 1000) \Omega$$

$$= 1111 \Omega$$

(ii) To obtain the lowest resistance, the resistors must be connected in parallel. the lowest resistance is given by

$$\begin{aligned}\frac{1}{R_P} &= \frac{1}{1} + \frac{1}{10} + \frac{1}{100} + \frac{1}{1000} \\ &= \frac{1000+100+10+1}{1000}\end{aligned}$$

$$= \frac{1111}{1000}$$

$$\therefore \text{Lowest resistance } R_p = \frac{1000}{1111} \Omega$$

$$= 0.9 \Omega.$$

154. If two resistors in series have 'p' number of common points. What will be the value of 'p'?

Ans. One.

155. There are three 2 V cells connected in series. How many joules of energy does 1 C gain on passing through all the three cells?

Ans. Here, the potential difference,

$$V = 2 + 2 + 2 = 6 \text{ V and}$$

$$\text{charge, } Q = 1 \text{ C}$$

We know that,

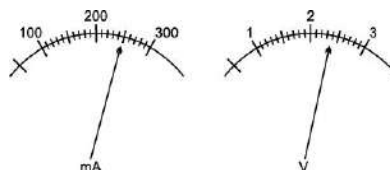
$$\text{Work done, } W = VQ$$

Substituting the values, we get

$$W = 6 \times 1 = 6 \text{ J.}$$

156. The current flowing through a resistor connected in a circuit and the potential difference developed across its ends are as shown in the diagram by milliammeter and voltmeter readings respectively:

[Board Question]



(i) What are the least counts of these meters?

(ii) What is the resistance of the resistor?

Ans. (i) 10 mA and 0.1 V

(ii) $V = 2.4$ volt, $I = 250$ mA = 0.25 A

From Ohm's law. $R = \frac{V}{I} = \frac{2.4}{0.25} = 9.6 \Omega$

157. Why is the tungsten metal more coiled in the bulb and not installed in straight parallel wire form?

Ans. The coiled wire of tungsten increases the surface area of the wire in very less space so as to emit more light and helps in glowing with more intensity.

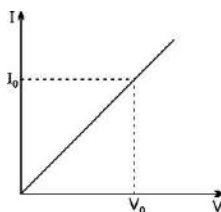
158. While studying the dependence of potential difference (V) across a resistor on the current (I) passing through it, in order to determine the resistance of the resistor, a student took 5 readings for different values of current and plotted a graph between V and I. He got a straight line graph passing through the origin. What does the straight line signify? Write the method of determining resistance of the resistor using this graph.

[Board Question]

Ans. The straight line in the graph signifies that potential difference and current are directly proportional to each other.

The method of determining resistance of resistor using the graph is by Ohm's law,

$V = IR$ and by calculating the slope from the points mentioned on the graph.



$$\therefore R = \frac{1}{\text{Slope of I-V graph}}$$

159. What would you suggest to a student if while performing an experiment he finds that the pointer/needle of the ammeter

and voltmeter do not coincide with the zero marks on the scales when circuit is open? No extra ammeter/voltmeter is available in the laboratory.

Ans. This is called the zero error of the scale of ammeter or voltmeter. If there is a zero error then this error is subtracted from the value that depicts when the circuit is closed otherwise accurate reading will not be recorded.

160. Why we must keep the circuit closed for a relatively shorter time and open for a relatively longer time to ensure minimal changes in the values of resistance?

Ans. Due to heating effect of current, we must keep the circuit closed for a relatively shorter time and open for a relatively longer time to ensure minimal changes in the values of resistance.

Creating Based Questions

161. The following apparatus is available in a laboratory which is summarised in tabular form:

S. No.	Battery	Adjustable from of to 4.5 V
1.	Resistors	3 Ω and 6 Ω
2.	Ammeters	A ₁ of range 0 to 3 A least count 0.1 A A ₂ of range 0 to 1 A least count 0.05 A.
3.	Voltmeters	V ₁ of range 0 to 10 V least count 0.5 V

		V_2 of range of 0 to 5 V least count 0.1 V
--	--	---

(i) For what purpose an ammeter is used ?

(ii) If we require the maximum resistance from a number of given resistors we connect :

- (a) all in series
- (b) all in parallel
- (c) less resistors in series and more in parallel

(iii) The best combination of voltmeter and ammeter for finding the equivalent resistance of the resistors in series would be :

- (a) ammeter A_1 and voltmeter V_1
- (b) ammeter A_1 and voltmeter V_2
- (c) ammeter A_2 and voltmeter V_1
- (d) ammeter A_2 and voltmeter V_2

(iv) For the experiment to find the equivalent resistance of the parallel combination of the two given resistors, the best choice would be :

- (a) ammeter A_1 and voltmeter V_1
- (b) ammeter A_1 and voltmeter V_2
- (c) ammeter A_2 and voltmeter V_1
- (d) ammeter A_2 and voltmeter V_2

Ans. (i) To measure current in the circuit.

(ii) (a) All in series

(iii) (d) Ammeter A_2 and voltmeter V_2

(iv) (c) Ammeter A_2 and voltmeter V_1

162. Shyam designed a burglar alarm circuit in which the resistors are connected in series. The circuit breaks and the current does not flow through the circuit. What is the alternate method he should opt to prevent the circuit break when the resistors are connected in series ?

Ans. There is only a single path which connects from the electric source to the output devices. The electrical appliance damage can be prevented by connecting the **fuse in series** with the mains as well as the electrical appliance. To maintain the current level efficiently series of resistors can be used.

163. Brisilia designed a prototype in which she used a very sensitive electrical device. But she does not know how to protect the sensitive electrical device from high current. Suggest her with one idea to protect the sensitive device from high current.

Ans. The suggestion to protect the sensitive electrical device from high current is by using a **parallel low resistor known as shunt resistor**. The resistance value of shunt resistor is very low. It is made up of the material having low temperature co-efficient of resistance. It measures the electric current, alternating current or direct current.

164. Rita designed a circuit in which resistors are connected in series. Yet she is not satisfied with the series resistors because if there is a fault in some component of the circuit, the whole circuit stops working. What would be your suggestion in alternative to the resistance in series ?

Ans. To overcome the problem faced by Rita, I would suggest to connect the resistors in parallel because if the **resistors are**

connected parallel, the whole circuit does not stop working. If the fault is with one component of the circuit, the current continues to flow through the other components of the circuit which makes the device work further.

165. Electrical resistivities of some substance at 20°C are given below.

S. No.	Metal	Resistivity (in $\Omega \cdot m$)
1.	Silver	1.60×10^{-8}
2.	Copper	1.62×10^{-8}
3.	Tungsten	5.20×10^{-8}
4.	Iron	10.0×10^{-8}
5.	Mercury	94.0×10^{-8}
6.	Nichrome	100.0×10^{-8}

Answer the following relations in relation to them.

- (i) Among silver and copper, which one is a better conductor ?
- (ii) Which material would you advise to be used in electrical heating devices ?
- (iii) Define resistivity.
- (iv) What is the effect of temperature on resistivity of a substance ?

Ans. (i) Silver

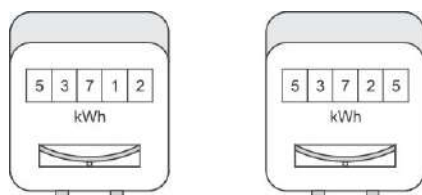
(ii) Nichrome

(iii) Resistivity of a conductor is defined as the resistance of the

conductor of unit length and unit area of cross-section.

(iv) Resistivity of a material changes if its temperature changes.

166. Rhea noted the readings of her home's electricity meter on Monday at 9 a.m. and again on Tuesday at 9 a.m. (as shown in figure given below).



- (i) What was the meter reading on Monday ?
- (ii) What was the meter reading on Tuesday ?
- (iii) How many units of electrical energy have been used ?
- (iv) How much time (in hours) have these units been used ?
- (v) Calculate the cost of electrical energy used during this time, if the rate is ₹ 8 per unit.

Ans. (i) Meter reading on Monday = 53712

(ii) Meter reading on Tuesday = 53725

(iii) Number of units of electrical energy used = $53725 - 53712$
= 13 units

(iv) Time = 24 hours

(v) Electrical energy consumed = ₹ 8×13
= ₹ 104

Miscellaneous Questions

167. What is the limitation of Ohm's law ?

Ans. Ohm's law is obeyed only when the temperature of conductor remains constant.

168. Use the data in table below to answer the following :

	Material	Resistivity ($\Omega \text{ m}$)
Conductors	Silver	1.60×10^{-8}
	Copper	1.62×10^{-8}
	Aluminium	2.63×10^{-8}
	Tungsten	5.20×10^{-8}
	Nickel	6.84×10^{-8}
	Iron	10.0×10^{-8}
	Chromium	12.9×10^{-8}
	Mercury	94.0×10^{-8}
	Manganese	1.84×10^{-8}
Alloys	Constantan (alloy of Cu and Ni)	49×10^{-8}
	Manganin (alloy of Cu, Mn and Ni)	44×10^{-6}
	Nichrome (alloy of Ni, Cr, Mn and Fe)	100×10^{-6}
Insulators	Glass	$10^{10} - 10^{14}$
	Hard rubber	$10^{13} - 10^{16}$

	Ebonite	$10^{15} - 10^{17}$
	Diamond	$10^{12} - 10^{13}$
	Paper (dry)	10^{12}

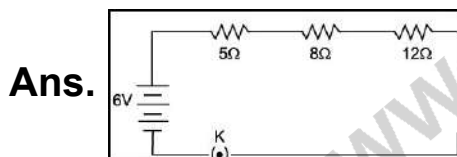
(i) Which of these, two iron or mercury is a better conductor ?

(ii) Which of these materials is the best conductor?

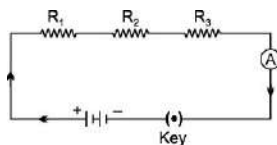
Ans. (i) It can be seen from the above table that the resistivity of mercury is more than that of iron. This implies that iron is a better conductor than mercury.

(ii) It can be observed from the above table that the resistivity of silver is the lowest among the listed materials. Hence, it is the best conductor.

169. Draw a schematic diagram of a circuit consisting of a battery of three cells of 2 V each, a 5 Ω resistor, an 8 Ω resistor, and a 12 Ω resistor, and a plug key, all connected in series.



170. How will you infer with the help of an experiment that the same current flows through every part of a circuit containing three resistors in series connected to a battery ?



Ans. Let three resistors R_1 , R_2 and R_3 are connected in series which are also connected with a battery, an ammeter and a key as shown in figure.

When key is closed, the current starts flowing through the circuit.

Take the reading of ammeter. Now change the position of ammeter to anywhere in between the resistors and take its reading. We will observe that in both the cases reading of ammeter will be same showing same current flows through every part of the circuit above.

171. Answer the following questions:

[Board Question]

(i) Write Joule's law of heating.

(ii) Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 200 V.

Ans. (i) According to Joule's law of heating, the heat produced in a wire is directly proportional to :

1. square of current (I^2),
2. resistance of wire (R),
3. time (t) for which current is passed.

Thus, the heat produced in the wire by current in time ' t ' is

$$H \propto I^2 R t$$

$$\text{or } H = K I^2 R t$$

$$\text{But } K = 1, H = I^2 R t$$

(ii) We know that, $P = VI$

$$\Rightarrow I = \frac{P}{V} \quad \textbf{First lamp : } P_1 = 100 \text{ W, } V = 220 \text{ volt}$$

$$I_1 = \frac{P_1}{V} = \frac{100}{220} = 0.45 \text{ A}$$

Second lamp : $P_2 = 60 \text{ W, } V = 220 \text{ volt}$

$$I_2 = \frac{P_2}{V} = \frac{60}{220} = 0.27 \text{ A}$$

So, Total current = $I_1 + I_2$

$$= 0.45 + 0.27$$

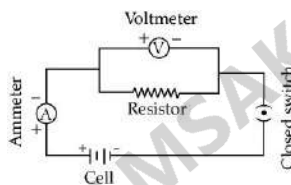
$$= 0.72 \text{ A}$$

172. Does Ohm's law hold good for electrolytic solutions and semiconductors?

Ans. No.

173. Define the electric circuit. Draw a labelled, schematic diagram of an electric circuit comprising of a cell, a resistor, an ammeter, a voltmeter and a closed switch.

Sol. A continuous conduction path consisting of wires and other resistance (like bulb, fan, etc) and a switch between the two terminals of a cell or a battery along which an electric current flows, is called a circuit.

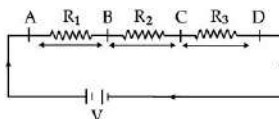


174. For the series combination of three resistors establish the relation:

$$R = R_1 + R_2 + R_3$$

where the symbols have usual meaning. Calculate the equivalent resistance of the combination of three resistor of 6Ω , 9Ω and 18Ω joined in parallel.

Sol. Same current (I) flows through different resistance, when these are joined in series, as shown in the figure.



Let R be the combined resistance, then

$$V = IR$$

$$V_1 = IR_1, V_2 = IR_2, V_3 = IR_3$$

$$\therefore IR = IR_1 + IR_2 + IR_3$$

$$\therefore IR = IR_1 + IR_2 + IR_3$$

$$\Rightarrow IR = I(R_1 + R_2 + R_3)$$

$$\therefore R = R_1 + R_2 + R_3$$

$$\text{Now, } R_1 = 6 \, \Omega, R_2 = 9 \, \Omega,$$

$$R_3 = 18 \, \Omega$$

In parallel combination

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\Rightarrow \frac{1}{R} = \frac{1}{6} + \frac{1}{9} + \frac{1}{18} = \frac{3+2+1}{18}$$

$$= \frac{6}{18} = \frac{1}{3}$$

$$\Rightarrow \frac{1}{R} = \frac{1}{3}$$

$$\Rightarrow R = 3 \, \Omega.$$

175. Let the resistance of an electrical component remains constant while the potential difference across the two ends of the component decreases to half of its former value. What change will occur in the current through it?

Sol. Since Resistance (R) = $\frac{\text{Potential difference (V)}}{\text{Electric current (I)}}$

Therefore, if potential between to ends of the component will be halved, and resistance remains constant then electric current would also be halved.

176. What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series?

Ans. Advantages of connecting electrical appliances in parallel

instead of connecting in series:

1. Voltage remains same in all the appliances.
2. The total effective resistance is less.
3. Switching ON/OFF of one device does not affect others.

177. State the energy conversion taking place in the following electric appliances :

- (i) Electric heater,
- (ii) Electric -motor,
- (iii) Loud-speaker,
- (iv) Electrolysis.

Ans. (i) Electrical energy gets converted into heat energy in an electric heater.

(ii) Electrical energy changes into mechanical energy in an electric motor.

(iii) Electrical energy gets converted into sound energy in a loudspeaker.

(iv) Electrical energy changes into chemical energy during electrolysis.

Self-Assessment

178. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor.

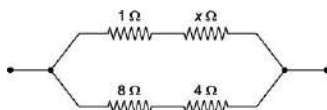
[NCERT]

Ans. 4800 Ω

179. A nichrome wire has a resistance of $10\ \Omega$. Find the resistance of another nichrome wire, whose length is three times and area of cross-section is four times the first wire.

Ans. $7.5\ \Omega$

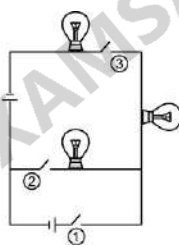
180. The equivalent resistance of the combination of resistors given in figure is $4\ \Omega$. Calculate the value of x .



Ans. $5\ \Omega$

181. Explain the difference between resistance and resistivity of a conductor.

182. The given figure shows three lamps and three switches 1, 2 and 3 connected with two cells.



(i) Name the switch/switches to be closed so as to light all the three lamps.

(ii) How are the lamps connected : in series or in parallel?


Ans. (i) 2 and 3, (ii) in series.


183. Identify the components used in circuit diagram represented by the following symbols :

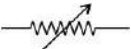
(i)

(ii)

(iii)

(iv) 

(v) 

(vi) 

Ans. (i) resistance or rheostat

(ii) Electric cell

(iii) A closed plug key

(iv) Battery

(v) Fixed resistance

(vi) Variable resistance

184. Why does the resistance of filament of an electric bulb change when it starts to glow ?

185. Why should a voltmeter never be connected in series ?

186. Does Ohm's law always hold good? Give examples.

187. What is an electric circuit?

188. What is an electric cell?

189. Define resistance? What are the factors on which it depends?

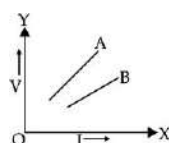
190. Name (i) S.I. unit, (ii) Commercial unit of electrical energy and state the relationship between the two.

191. Define 1 ohm electrical resistance.

192. Name the physical quantity associated with the following units:

(i) ampere, (ii) ohm, (iii) kilowatt-hour, (iv) volt.

193. The given figure shows V-I graph for two conductors A and B.



(i) Which conductor obeys Ohm's law ?

(ii) Which conductor (A or B) has more resistance? Explain your answer.

Ans. (i) Both conductors A and B obey ohm's law.

(ii) The slope of V-I graph represents resistance of a conductor. The straight line for conductor A is steeper (or has a greater slope). Hence, conductor A has more resistance.

194. Do all conductors obey Ohm's law ? State two points of difference between conductors obeying Ohm's law and the ones not obeying Ohm's law.

195. What is the difference between an electric cell and a battery ?

196. How many $220\ \Omega$ resistors (in parallel) are required to carry 5 A on a 220 V line ?

Ans. 5.

197. Several electric bulbs designed to be used on a 220 V electric supply line, are rated 10 W. How many lamps can be connected in parallel with each other across the two wires of 220 V line if the maximum allowable current is 5 A ?

[NCERT]

Ans. 110.

198. Which uses more energy :

(i) a 250 W T.V. set in 1 hour

(ii) a 1200 W toaster in 10 minutes ?

[NCERT]

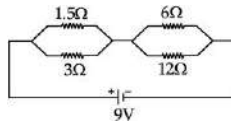
Ans. (i) 9×10^5 J,

(ii) 7.2×10^5 J (T.V. set uses more energy)

199. Study the circuit diagram given in figure carefully and calculate :

(i) Current in main circuit.

(ii) Current in each of the resistors in the parallel circuit.



Ans. (i) 1.80 A, (ii) 1.2 A and 0.6 A, 1.2 A and 0.6 A.

200. A wire of resistance $1.5\ \Omega$ is stretched to double its length. What will be its new resistance ?

Ans. $6\ \Omega$.

201. A wire of resistance $36\ \Omega$ and length 60 cm is tripled on itself. What is the new resistance ?

Ans. $4\ \Omega$.

202. How many electrons are flowing per second past a point in a circuit in which there is a current of 1 A ?

Ans. 6.25×10^{18} .

203. The graph between V and I for a conductor is a straight line passing through the origin.

(i) Name the law illustrated by such a graph ?

(ii) What should remain constant in a statement of this law ?

Ans. (i) Ohm's law, (ii) Temperature.

204. Why are alloys such as constantan and manganin used for making standard resistors ?

205. Why are connected wires made of thick copper or aluminium wires ?

206. How is an ammeter connected in an electric circuit and what does it measure ?

207. Name any six components of an electric circuit and draw their symbols.

208. Calculate the least count of voltmeter in which there are 10 divisions between 1.0 V and 1.5 V marks.

Ans. Least count = $\frac{0.5}{10} = 0.05$.

209. Draw a circuit diagram for the experimental verification of Ohm's law and state the function of each component used.

210. An ammeter has 10 divisions between 0 and 0.5 A marks on its scale. The least count of ammeter is :

- (a) 0.01 A
- (b) 0.5 A
- (c) 0.05 A
- (d) 0.1 A

Ans. (c) 0.05 A

211. For which of the following substances, resistance decreases with increases in temperature?

- (a) Mercury
- (b) Silver
- (c) Copper
- (d) Carbon

Ans. (d) Carbon

212. Commercial unit of electrical energy is :

- (a) joule
- (b) ampere

(c) volt

(d) kilowatt-hour

Ans. (d) kilowatt-hour

213. For a parallel combination of three resistors establish the relation :

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

214. Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal ?

215. When a current I flows through a resistance R for time t , the electrical energy spent is given by :

(a) I^2R/t

(b) IRt

(c) I^2Rt

(d) IR^2t

Ans. (c) I^2Rt

216. The electric meter in a house records :

(a) current

(b) energy

(c) power

(d) voltage

Ans. (b) energy

217. What is an electric cell ?

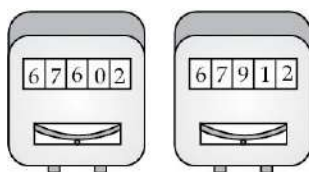
218. An electric heater is rated '1500 W, 250 V'. The heater is connected to 250 V mains. Calculate :

- (i) The current drawn.
- (ii) The energy consumed in 50 hours.
- (iii) The cost of energy consumed at ₹ 6 per kWh.

Ans. (i) 6A, (ii) 75 kWh, (iii) Rs. 450.

219. Define 1 watt electrical power.

220. A boy noted the readings of his home's electricity meter on 1st June and again on 1st July (as shown in figure given below) :



- (i) What was the meter reading on 1st June ?
- (ii) What was the meter reading on 1st July ?
- (iii) How many units of electrical energy have been used ?
- (iv) Calculate the cost of electrical energy used, if the rate is Rs. 5 per unit.

Ans. (i) 67602

(ii) 67912

(iii) 310

(iv) ₹ 1550.

221. In an activity performed by a girl to estimate the monthly bill of her house, she reported that 3 bulbs of 100 W each, 2 fans of 50 W each and 1 T.V. set of 60 W are used daily for an average of 8 hours, 10 hours and 5 hours respectively.

- (i) Calculate the electrical energy (in kWh) consumed in 1 month.
- (ii) If the cost of electrical energy is R 6 per unit, what is the monthly bill ?

Ans. (i) 111 kWh

(ii) ₹ 666.

222. Is Joule heating always desirable ?

Ans. No.

223. Name a material whose resistivity becomes zero at a particular temperature.

Ans. Mercury.

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Magnetic Effects of Electric Current

Chapter 13

Summary

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Magnet

- A substance which attracts small pieces of iron, steel, nickel etc., and points in North-South direction when suspended freely.
- Magnets come in various shapes and sizes depending on their use.
- One of the most common magnets is bar magnet which is a long, rectangular bar of uniform cross-section.

Magnetic Effect of Electric Current

An electric current flowing in a wire produces a magnetic field around it".

Magnetic Field

- The space surrounding a magnet in which magnetic force is exerted.
- It has both magnitude and direction.
- The direction of magnetic field at a point is the direction of the resultant force acting on a hypothetical north pole placed at that point.

Magnetic Field Lines

- A closed continuous curved path around a magnet such that the tangent at any point on the curve gives the direction of magnetic field at that point.
- **Properties:**
 - » Outside the magnet, they are directed from the north pole towards the south pole whereas inside the magnet they are directed from the south pole towards the north pole.
 - » They never intersect each other.
 - » They are crowded near the poles of magnet where magnetic field is strong and are less crowded (near the centre) where the magnetic field is weak.

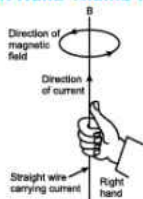
MAGNETIC FIELD DUE TO A CURRENT-CARRYING CONDUCTOR

Magnetic field due to Straight Current-carrying Conductor

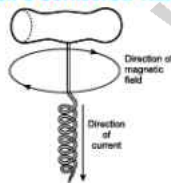
- The magnetic field lines around a straight conductor carrying current are concentric circles whose centres lie on the wire.
- In this case, the magnitude of magnetic field is :
 - » Directly proportional to the current passing in the wire,
 - » Inversely proportional to the distance of that point from the wire.

Direction

- **Right Hand Thumb Rule :**



- **Maxwell's Corkscrew Rule :**

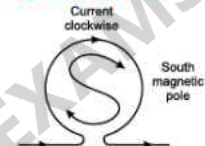


Magnetic field due to a Circular Loop

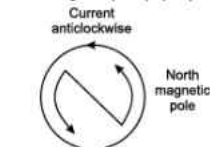
- The magnetic field lines are represented by concentric circles that appear as straight lines near the centre of loop.
- In this case, the magnitude of magnetic field is :
 - » Directly proportional to the current passing through the circular loop,
 - » Inversely proportional to the radius of circular loop.

Direction

- **Clock Face Rule**



(a) The direction of current in this face of circular wire is clockwise, so this face of circular wire carrying current will act as a South magnetic pole (S-pole)



(b) The direction of current in this face of circular wire is anticlockwise, so this face of circular wire carrying current will act as a North magnetic pole (N-pole)

Magnetic field due to a Solenoid

- The solenoid is a long coil containing a large number of close turns of insulated copper wire.
- The magnetic field produced by a current carrying solenoid is similar to the magnetic field produced by a bar magnet.
- In this case, the strength of magnetic field depends on :
 - » number of turns in solenoid.
 - » strength of current in the solenoid.
 - » the nature of 'core material'.

Electromagnet

- A temporary magnet of soft iron which retains magnetism only when current passes through it.
- Used in electric bell, telephone, electric motor etc.
- Factors affecting the strength of an electromagnet :
 - » Number of turns.
 - » Current flowing in the coil.
 - » Length of air gap between its poles.

Force on Current-carrying conductor placed in a magnetic field

- When a current-carrying conductor is placed in a magnetic field, a mechanical force is exerted on the conductor which makes it move.
- The direction of force is :
 - perpendicular to the direction of current,
 - perpendicular to the direction of magnetic field.

Direction of Force

• **Fleming's left hand Rule :**

Electric Motor

- A motor is a device which converts electrical energy into mechanical energy.
- It works on the principle that when a rectangular coil is placed in a magnetic field and current is passed through it, a force acts on the coil which rotates it continuously.
- It is mainly used in electric fans, washing machines, refrigerators, electric cars, etc.

Electromagnetic Induction

The production of induced current in a coil placed in a region where the magnetic field changes with time.

Direction of Induced Current

• **Fleming's right hand rule :**

Application

- Electric generator : It converts mechanical energy into electrical energy. It works on the basis of electromagnetic induction.
- An A.C. generator produces alternating current, which reverses its direction after equal intervals of time. In this case, we use slip rings due to which the direction of current changes.
- D.C. generator produces direct current i.e., the direction of current remains the same. In this case, we use split rings called commutator, which give current only in one direction.

• **Colour Coding of wires in a cable :**

Wire	Colour	
	Old Convention	New Convention
Live (L)	Red	Brown
Neutral (N)	Black	Light Blue
Earth (E)	Green	Green or Yellow

- The colour coding of wires help us to connect the switch, fuse, socket etc. through proper wire in house wiring.
- The live wire is at a higher potential of 220V whereas the neutral wire is at the ground potential of 0V.
- Overloading is the process of over heating of a wire due to excess current drawn by all the appliances than the permitted limit for that wire.
- Short-circuiting is the process of over heating which may even cause fire when the live wire and the neutral wire come in contact due to defective or damaged wiring.
- An electric fuse is a safety device which is used to limit the current in an electric circuit. It safeguards the circuits and the appliances connected in that circuit from being damaged.
- An alloy of lead and tin is used as the material of the fuse wire because it has a low melting point ($\approx 250^\circ\text{C}$) and its specific resistance is more than that of copper and aluminium.
- The thickness of a fuse wire depends on its current rating. Higher the current rating, thicker is the fuse wire.
- A fuse is always connected in series with the live wire before the appliance.
- The fuse provided with an electric appliance to protect it against electric faults must be of current rating slightly higher than the maximum current that can be drawn by the appliance before being over heated.
- A switch is an on-off device for current in a circuit. It is connected in the live wire.
- To avoid the risk of electric shocks, the metal body of an electrical appliance is earthed. It is necessary to remove paint from the body part where earth connection is to be made.
- In a three pin plug, the top pin is for earthing, the pin on the left is for live and the pin on the right is for neutral.
- In a three pin socket, the upper hole is for earth connection, while the hole on the right side is for connection to the live wire and the hole on the left side is for connection to the neutral wire.
- All electrical appliances such as bulbs, fans, sockets, etc. are connected in parallel across the live wire and the neutral wire.

Multiple Choice Questions

1. A toaster of 4 kW is running in an existing circuit 110 volt that has a stream from ranking of 4 A. Find the stream of electrons drawn by the toaster.

(a) 36.36 A

(b) 23.34 A

(c) 14.6 A

(d) 9.06 A

Ans. (a) 36.36 A

Explanation :

The stream of electrons drawn by the toaster is 36.36 A

Given, $P = 4 \text{ kW}$, $V = 110 \text{ V}$

We know that,

Power = VI

$= 110 \times I$

$4,000 = 110 \times I$

... $I = 36.36 \text{ A}$

2. The most important safety method used for protecting home appliance from short circuiting on overloading is:

[NCERT Exemplar]

(a) earthing

(b) use of fuse

(c) use of stabilizers

(d) use of fuse electric meter

Ans. (b) use of fuse

Explanation :

Use of fuse is most important safety method protecting home appliances from overloading all short circuiting.

3. A finite straight wire carries a current of 3 A, where it is a 2 m long and weighs around 240 g. If it is suspended in the mid-air

by a uniform magnetic field then calculate the field B.
[Acceleration due to gravity = 9.8 m/s^2]

(a) 0.39 T

(b) 0.42 T

(c) 0.61 T

(d) 0.37 T

Ans. (a) 0.39 T

Explanation :

Given, Mass of the wire = 240 g = 0.24 kg

Length of the wire = 2 m

Current $I = 3 \text{ A}$

The force acting on the current carrying wire in uniform magnetic field

$$F = B i l \sin \theta$$

$$F = B i l \quad (\theta = 90^\circ)$$

$$\text{Weight of the wire, } w = mg = 0.24 \times 9.8 \text{ N}$$

In the position of suspension

$$B i l = mg$$

$$B = \frac{mg}{i l}$$

$$B = \frac{(0.24 \times 9.8)}{(3 \times 2)}$$

$$B = \frac{(2.352)}{(6)}$$

The magnetic field (B) is 0.39 T

4. If it takes 520 turns to make a solenoid that is 40 cm long with a radius of 1.2 m that carries a current of 6 A, then determine

the magnetic field inside the solenoid.

(a) $7.2 \times 10^{-3} \text{ T}$

(b) $9.8 \times 10^{-3} \text{ T}$

(c) $8.4 \times 10^{-4} \text{ T}$

(d) $10.2 \times 10^{-4} \text{ T}$

Ans. (b) $9.8 \times 10^{-3} \text{ T}$

Explanation :

Given, $I = 6 \text{ A}$, $L = 40 \text{ cm} = 0.4 \text{ m}$, $r = 1.2 \text{ m}$,
 $N = 520$

We know that,

$$B = \frac{\mu_0 NI}{L}$$

On substituting the values in above formula

$$= \frac{(4\pi \times 10^{-7} \times 520 \times 6)}{0.4}$$

$$= \frac{(4 \times 3.14 \times 10^{-7} \times 520 \times 6)}{0.4}$$

$$= 97968 \times 10^{-7}$$

$$= 9.8 \times 10^{-3} \text{ T}$$

The magnetic field inside the solenoid is $9.8 \times 10^{-3} \text{ T}$

5. A 3 pin mains plug is fitted to the cable for a 1 kW electric kettle to be used on a 250 V a.c. supply which of the following statements is not correct?

(a) The fuse should be fitted in the live wire.

(b) A 13 A fuse is the most appropriate value to use.

(c) The neutral wire is coloured black.

(d) The green wire should be connected to the earth pin.

Ans. (b) A 13 A fuse is the most appropriate value to use

Explanation :

$$P = 1 \text{ kW} = 1000 \text{ W}, V = 250 \text{ V}$$

$$\dots \text{Current, } I = \frac{P}{V}$$

$$= \frac{1000}{250}$$

$$= 4 \text{ A}$$

Because current drawn is 4 A, a fuse of 13 A cannot be considered the most appropriate.

6. Calculate the magnetic field produced by the solenoid of length 50 cm with no. of turns in the coil 210 when the current passing through it 8 A. (Given permeability, $\mu_0 = 4\pi \times 10^{-7} \text{ Wb/Am}$)

(a) $4.22 \times 10^{-7} \text{ T}$

(b) $42.24 \times 10^{-7} \text{ T}$

(c) $422.2 \times 10^{-7} \text{ T}$

(d) $422.2 \times 10^{-5} \text{ T}$

Ans. (d) $422.2 \times 10^{-5} \text{ T}$

Explanation :

$$B = \mu_0 n i$$

$$\text{where, } n = \frac{N}{L}$$

$$= \frac{4\pi \times 10^{-7} \times 210 \times 8}{0.50}$$

$$= 422.2 \times 10^{-5} \text{ T}$$

7. The strength of an electromagnet after the limit cannot be increased by increasing the current through the solenoid. What is the reason behind this phenomenon?

- (a) Electrons start to corrode the solenoid.
- (b) Voltage through the solenoid gradually starts to decrease.
- (c) Resistance of the solenoid increases.
- (d) Current flowing through the solenoid is saturated.

Ans. (d) Current flowing through the solenoid is saturated.

Explanation :

The strength of an electromagnet after the limit cannot be increased by increasing the current through the solenoid because current flowing through the solenoid is saturated.

8. Two wires are placed in parallel; repulsion force and current in these two wires are " i_1 " and " i_2 " respectively. What will be a force if the current is doubled in each wire ?

- (a) $2F$
- (b) $\frac{F}{2}$
- (c) $\frac{2F}{4}$
- (d) $4F$

Ans. (d) $4F$

Explanation :

If the current is doubled in each wire the force will be $4F$. This can be explained as follows:

We know that the force of repulsion per unit length between two wires carrying current in opposite direction is:

$$\frac{F}{l} = \frac{\mu_0 i_1 i_2}{2\pi d}$$

Thus when both i_1 and i_2 are doubled, the force between them becomes four times.

9. H_1 and H_2 are heats produced by two copper wires have the same length and different diameters when they are connected in series and parallel respectively. From the above, we infer what of the following ?

(a) $H_1 > H_2$

(b) $H_1 < H_2$

(c) $H_1 = H_2$

(d) $H_1 \neq H_2$

Ans. (b) $H_1 < H_2$

Explanation :

When wire are connected in series,

$$R_s = R_1 + R_2$$

in parallel, $R_p = \frac{R_1 R_2}{R_1 + R_2}$

$$\therefore R_s > R_p$$

$$\therefore H_1 < H_2 \left[\because H \propto \frac{1}{R} \right]$$

Then $H_1 < H_2$ which implies option (b) is correct.

10. The strength of magnetic field inside a long current carrying straight solenoid is:

[NCERT Exemplar]

(a) more at the ends than at the centre.

- (b) minimum in the middle.
- (c) uniform at all points.
- (d) found to increase from one end to the other.

Ans. (c) uniform at all points.

Explanation :

Inside the solenoid magnetic field lines are straight. This indicates strong magnetic field. Hence, magnetic field is uniform at all points inside the solenoid.

11. Pick out the incorrect statement about magnetic lines of force.

- (a) Magnetic lines of forces start from the North Pole and end on the South Pole.
- (b) No two magnetic lines of force can intersect each other.
- (c) Magnetic lines of force are far away from each other at the poles.
- (d) Magnetic lines of force are closed continuous curves.

Ans. (c) Magnetic lines of force are far away from each other at the poles.

Explanation :

Magnetic lines of forces are closed continuous curves. They are nearer to each other at the point where magnetic field is strongest and far from each other where magnetic field is weak. At poles magnetic line of forces are nearest to each other because magnetic field is strongest at the pole.

No two magnetic lines of forces intersect with each other at the point of intersection, the compass needle would point towards two directions, which is not possible.

They are continuous, forming closed loops without beginning or end

which start from north pole and end at south pole. Hence, statement (c), *i.e.*, Magnetic lines of force are far away from each other at the poles is the incorrect statement.

12. Strength of the magnetic field at a point in the space surrounding the magnet is measured by:

- (a) thickness of the magnet.
- (b) number of lines crossing a given point.
- (c) resistance of it.
- (d) length of the magnet.

Ans. (b) number of lines crossing a given point.

Explanation :

The strength of the magnetic field at a point in the space surrounding the magnet is measured by number of lines crossing a given point.

13. The magnetic field strength of a solenoid can be increased by inserting:

- (a) a wooden piece into it.
- (b) an iron piece into it.
- (c) a glass piece into it.
- (d) paper roll into it.

Ans. (b) an iron piece into it.

Explanation :

When a piece of soft iron is inserted inside a solenoid then the strength of the magnetic field increases because the iron gets magnetized due to magnetic induction and this combination of the solenoid and the soft iron core so formed is called an electromagnet.

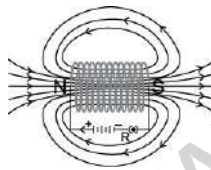
14. The magnetic field inside the solenoid is:

- (a) non-uniform
- (b) variable
- (c) same at all points
- (d) zero

Ans. (c) same at all points

Explanation :

The magnetic field inside the solenoid is same at all points. This is because the magnetic field lines inside the solenoid are in the form of parallel straight lines which indicates that the magnetic field is uniform at all points inside the solenoid.



Field lines of the magnetic field through and around a current carrying solenoid.

15. The magnetic field lines inside a solenoid are in the form of:

- (a) Curved line
- (b) Circular lines
- (c) Zig - zag lines
- (d) Parallel straight lines

Ans. (d) Parallel straight lines

Explanation :

The field lines inside the solenoid are in the form of parallel straight lines. This indicates that magnetic field is same at all point inside the solenoid.

16. Which of the following correctly describes the magnetic

field near a long straight wire ?

- (a) The field consists of straight lines perpendicular to the wire.
- (b) The field consists of straight lines parallel to the wire.
- (c) The field consists of radial lines originating from the wire.
- (d) The field consists of concentric circles centred on the wire.

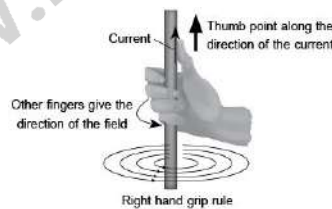
Ans. (d) The field consists of concentric circles centred on the wire.

Explanation :

The magnetic field near a long straight wire are concentric circles and their centres lie on the wire. This can be confirmed by Right-hand Thumb Rule.

According to this rule, if we put the thumb of our right hand in the direction of the current flow through the conductor or straight wire and encircle the wire with your fingers, then the direction of those fingers will correspond to the direction of the magnetic field.

Thus, the magnetic field lines will be in concentric circles around the conductor.



17. Inside the magnet, the field lines move:

- (a) from South to North
- (b) from North to South
- (c) away from North pole
- (d) away from South poles

Ans. (a) from South to North

Explanation :

Magnetic field is a vector quantity that has both direction and magnitude. The direction of the magnetic field is taken to be the direction in which a North pole of the compass needle moves inside it. The field lines emerge from North pole and merge in the South pole but inside the magnet the direction of field lines is opposite.

18. An electron moves with a speed v along positive direction of the x -axis. If a magnetic field B acts along the positive y -direction, then the force on the electron will act along:

- (a) x -axis
- (b) y -axis
- (c) – ve z -direction
- (d) +ve y -direction

Ans. (c) – ve z -direction

Explanation :

As electron is moving in positive x -direction then, according to the Maxwell's right hand thumb rule, the current is moving in negative x -direction and the magnetic field acts along positive y -direction. By applying Fleming's left-hand rule, the thumb will be in negative z -direction which is the direction of force.

19. The force exerted on a current carrying wire placed in a magnetic field is zero when the angle between wire and the direction of magnetic field is:

- (a) 45°
- (b) 60°
- (c) 90°
- (d) 180°

Ans. (d) 180°

Explanation :

The force exerted on a current carrying wire placed in a magnetic field is zero when the angle between wire and the direction of magnetic field is 180° .

A force is experienced by the current carrying wire in the presence of an external magnetic field. This can be expressed as:

$$F = BIL \sin \theta$$

Where,

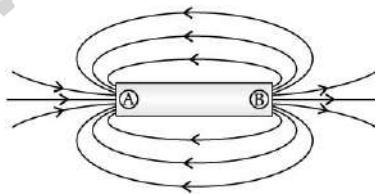
L is the length of the wire.

I is the current, and

θ is the angle between the current and the magnetic field.

We know that $\sin 180^\circ$ is 0. Therefore, the force exerted on a current-carrying wire that is placed in a magnetic field is zero when the angle between the wire and the direction of magnetic field is 180° .

20. In the figure shown below, the point A and B are respectively:



- (a) North pole, South pole
- (b) South pole, North pole
- (c) North pole, North pole
- (d) South pole, South pole

Ans. (b) South pole, North pole

Explanation :

As magnetic lines of forces start from North pole and terminates at S-pole.

21. The north pole of a long bar magnet was pushed slowly into a short solenoid connected to a galvanometer. The magnet was held stationary for a few seconds with the North pole in the middle of the solenoid and then withdrawn rapidly. The maximum deflection of the galvanometer was observed when the magnet was:

- (a) Moving towards the solenoid
- (b) Moving into the solenoid
- (c) At rest inside the solenoid
- (d) Moving out of the solenoid

Ans. (d) Moving out of the solenoid

Explanation :

As due to electromagnetic induction.

22. A rectangular coil of copper wires is rotated in a magnetic field. The direction of the induced current changes once in each:

- (a) two revolutions
- (b) one revolution
- (c) half revolution
- (d) one-fourth revolution

Ans. (c) half revolution

Explanation :

A rectangular coil of copper wires is rotated in a magnetic field. The direction of the induced current changes once in each half revolution. This is because when a rectangular coil is rotated in a magnetic field

the direction of the induced current varies once every half revolution. As a result, the current in the coil continues to flow in the same direction.

23. The magnetic field of the current was discovered by:

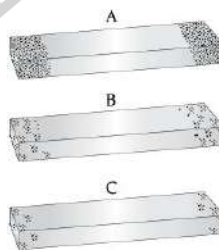
- (a) Maxwell
- (b) Fleming
- (c) Oersted
- (d) Faraday

Ans. (c) Oersted

Explanation :

Hans Christian oersted discovered that a compass needle got deflected when electric current passed through a metallic wire placed nearby.

24. Three magnets A, B and C were dipped one by one in a heap of iron filing. It shows the amount of the iron filing sticking to them:



The Strength of these magnets will be:

- (a) $A > B > C$
- (b) $A < B < C$
- (c) $A = B = C$
- (d) $A < B > C$

Ans. (a) $A > B > C$

Explanation :

As most of the iron fillings got stuck to magnet A. So, it is the most powerful magnet, or it has maximum strength.

25. If we place the magnetic compass near the north pole of the magnet, which pole of the needle will point towards it?



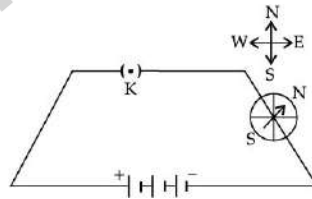
- (a) North pole
- (b) South pole
- (c) Keep deflecting
- (d) None of these

Ans. (b) South pole

Explanation :

As like poles repel each other and unlike poles attract each other. Therefore when North pole of bar magnet is brought near the compass, it gets deflected in south direction.

26. In the circuit shown below, what is direction of the current?

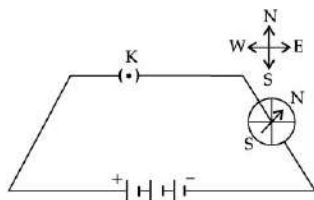


- (a) No current flowing
- (b) Anti-clock wise
- (c) Clock wise
- (d) Data insufficient

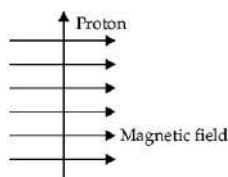
Ans. (c) Clock wise

Explanation :

If the current flows from North to South the compass needle will move towards the East.



27. A proton enters a magnetic field at right angle to it, as shown below. The direction of force acting on the proton will be:



- (a) To the right
- (b) To the left
- (c) Out of the page
- (d) Into the page

Ans. (d) Into the page

Explanation :

The proton enters a magnetic field at right-angle to it. Therefore, it will experience a force and the direction of force is calculated using Fleming's Left-Hand Rule.

28. A bar magnet is immersed in a heap of iron fillings and pulled out. The amount of iron filling clinging to the:

- (a) North pole is almost equal to the South pole
- (b) North pole is much more than the South Pole
- (c) North pole is almost less equal than the South pole
- (d) Magnet will be same all along its length

Ans. (a) North pole is almost equal to the South pole

Explanation :

As the maximum intensity of magnet is on the poles of the magnet.

29. Rashita and her friends were decorating the class bulletin board. She accidentally dropped the box of stainless steel pins by mistake. She tried to collect the pins using a magnet. She could not succeed. Why?

- (a) They are not using the magnet in right direction
- (b) Steel pins are very heavy and cannot be lifted magnet
- (c) Steel pins are very long
- (d) Steel is not magnetic in nature

Ans. (d) Steel is not magnetic in nature

Explanation :

As steel is not magnetic in nature, so it is not attracted by the magnet.

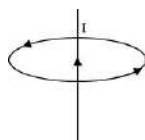
30. If the current is passing through a straight conductor. then, the magnetic field lines around it forms a particular shape. That shape is:

- (a) Straight lines
- (b) Concentric circles
- (c) Concentric ellipse
- (d) Concentric parabolas

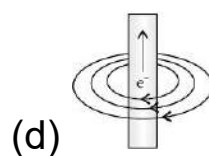
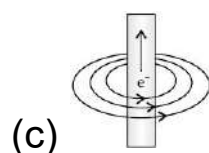
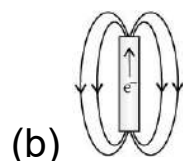
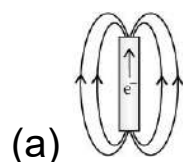
Ans. (b) Concentric circles

Explanation :

When current passes through a straight conductor, then the magnetic field lines forms concentric circle around it.



31. The figure given below shows the magnetic field produced by a currents carrying wire. Which of the diagram shows it correctly?



Ans. (d)

Explanation :

As when current flows through and current-carrying wire, then direction of magnetic field is calculated by right hand thumb rule.

32. Consider the following statements and choose the correct are:

(a) A magnet is an object which attracts pieces of iron, Nickel and cobalt

(b) Magnetic effect of electric current means that an electric current

flowing in a wire produces a magnetic field around it

(c) The end of a freely suspended magnet which points towards the north direction is called the north pole of the magnet

(d) All of the above

Ans. (d) All of the above

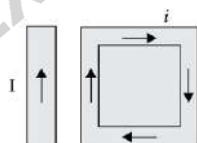
Explanation :

(a) A magnet is an object which attracts pieces of iron, Nickel and cobalt.

(b) Magnetic effect of electric current means that an electric current flowing in a wire produces a magnetic field around it .

(c) The end of a freely suspended magnet which points towards the north direction is called the north pole of the magnet.

33. A rectangular loop carrying a current I is situated near a long straight wire such that the wire is parallel to one of the sides of the loop and is in plane of the loop. If steady current I is created in wire as shown in figure below, then the loop:



(a) Rotate about an axis parallel to the wire

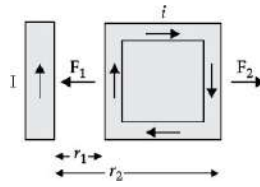
(b) Move towards the wire

(c) Move away from the wire or towards right

(d) Remains stationary

Ans. (b) Move towards the wire

Explanation :



$$\text{Force } F = \frac{\mu_0 2i_1 i_2}{4\pi r}$$

$$F \propto \frac{1}{r}$$

$$\text{As } r_1 < r_2$$

$$\therefore F_1 > F_2$$

$$\therefore F_{\text{net}} = F_1 - F_2$$

(Directed towards the wire)

34. Which one of the following substances is the magnetic substances?

- (a) Mercury
- (b) Iron
- (c) Gold
- (d) Silver

Ans. (b) Iron

Explanation :

Among the given substances, the iron is the only magnetic substances.

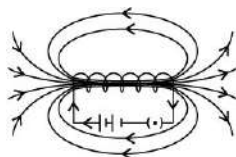
35. The magnetic lines of force, inside a current carrying solenoid are:

- (a) Along the axis and are parallel to each other
- (b) Perpendicular to axis and equidistant from each other
- (c) Circular and they do not intersect each other

(d) Circular at the ends but they are parallel to the axis inside the solenoid

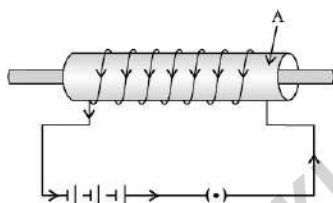
Ans. (a) Along the axis and are parallel to each other

Explanation :



The figure shows the magnetic lines of forces the solenoid.

36. In the diagram shown below, what is the component A:



(a) Solenoid

(b) Glass rod

(c) Magnetic material

(d) None of these

Ans. (c) Magnetic Material

Explanation :

Here, A is a magnetic material on which solenoid is wrapped. As by passing current through it the magnetic material will become an electromagnet.

37. Which of the following determine the direction of magnetic field due to a current carrying conductor?

(a) Faraday's laws of electromagnetic induction

(b) Fleming's left hand rule

(c) Lenz's law

(d) Maxwell's cork screw-rule

Ans. (d) Maxwell's Cork Screw-Rule

Explanation :

According to Maxwell's Cork Screw-Rule, if we consider ourselves driving a cork screw in the direction of current, then the direction of the rotation of cork Screw is the direction of the Magnetic field.

38. Which of the following is not an example of the right hand thumb rule ?

- (a) D.C. motor
- (b) Solenoid
- (c) A.C. generator
- (d) Cartesian coordinate system

Ans. (c) A.C. generator

Explanation :

Right hand thumb rule is used to find the direction of magnetic field in a coil of wire and the electric current in a straight conductor. A.C. generator is not an example of right hand thumb rule because it works on the principle of electromagnetic induction.

39. Commercial motors do not use:

[NCERT Exemplar]

- (a) an electromagnet to rotate the armature
- (b) effectively large number of turns of conducting wire in the current carrying coil
- (c) a permanent magnet to rotate the armature
- (d) a soft iron core on which the coil is wound

Ans. (c) a permanent magnet to rotate the armature

Explanation :

Commercial motors do not use permanent magnets because they are weak and do not produce strong magnetic field in the region.

40. The process of inducing a current in a coil of wire by placing it in a region of changing magnetic field is:

- (a) Electrical effect
- (b) Heating effect of current
- (c) Magnetic effect of current
- (d) Electromagnetic induction

Ans. (d) Electromagnetic induction

Explanation :

The process of inducing a current in a coil of wire by placing it in a region of changing magnetic field is electromagnetic induction.

41. The core of electromagnet is made of:

- (a) soft iron
- (b) steel
- (c) magnesium
- (d) copper

Ans. (a) soft iron

Explanation :

The core of electromagnet is made of soft iron due to following reasons:

- (i) It can be easily magnetised and demagnetised.
- (ii) It has low carbon content.
- (iii) It has large susceptibility and small retentivity.

- (iv) It does not retain its magnetism when the current is switched off.
- (v) It is less corrosive.

42. Fleming's Right-hand rule gives:

- (a) Magnitude of the induced current.
- (b) Magnitude of the magnetic field.
- (c) Direction of the induced current.
- (d) Both, direction and magnitude of the induced current.

Ans. (c) Direction of the induced current.

Explanation :

Fleming's Right hand rule gives the direction of the induced current.

Stretch the thumb, forefinger and middle finger of right hand so that they are perpendicular to each other. If forefinger indicates the direction of the magnetic field, thumb shows the direction of motion of conductor, then the middle finger will show the direction of induced current. We can not find out the magnitude of either the induced current or magnetic field by this law.

43. Which of the following property of a proton can change while it moves freely in a magnetic field?

- (a) Mass
- (b) Speed
- (c) Velocity
- (d) Charge

Ans. (c) Velocity

Explanation :

Velocity of a proton can change while it moves freely in a magnetic field because each moving charged particle in a magnetic field

experiences a force. The direction of force experienced by a positively charged proton can be studied by Fleming's Left-hand Rule.

The force acting on the proton would change both velocity and momentum when it moves freely in magnetic field. If a charged particle's velocity is completely parallel to the magnetic field, the magnetic field will not exert any force on the particle, and thus the velocity will remain constant. Whereas, if the force is acting perpendicular to the direction of moving charge, work done will be zero. It means kinetic energy does not change. Hence, we can conclude that the force can change the direction of velocity of the proton but not its speed. Thus, momentum and velocity changes.

44. A positively-charged particle (alpha-particle) projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is:

- (a) towards south
- (b) towards east
- (c) downward
- (d) upward

Ans. (d) upward

Explanation :

A positively-charged particle (alpha-particle) projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is upward. This can be explained by Fleming's Left-hand Rule which states that if we stretch our thumb, forefinger and middle figure of our left hand perpendicular to each other in such a way that forefinger points the direction of magnetic field and middle figure points the direction of current then thumb will represent the direction of motion or the force acting on the conductor. Hence, upward is the correct answer.

45. The phenomenon of electromagnetic induction is:

- (a) the process of charging a body.
- (b) the process of generating magnetic field due to a current passing through a coil.
- (c) producing induced current in a coil due to relative motion between a magnet and the coil.
- (d) the process of rotating a coil of an electric motor.

Ans. (c) producing induced current in a coil due to relative motion between a magnet and the coil.

Explanation :

The phenomenon of electromagnetic induction is producing induced current in a coil due to relative motion between a magnet and the coil. When a coil is brought near the magnet, and a relative motion is generated between the two by either moving the magnet or the coil, the magnetic flux links through the coil changes. This change in the magnetic flux produces an emf or voltage and hence, subsequent electric current in the coil.

46. The direction of force acting on a current carrying conductor placed in a magnetic field can be obtained by:

[NCERT]

- (a) Fleming's left hand rule.
- (b) Fleming's right hand rule.
- (c) Clock face rule.
- (d) Ampere's swimming rule.

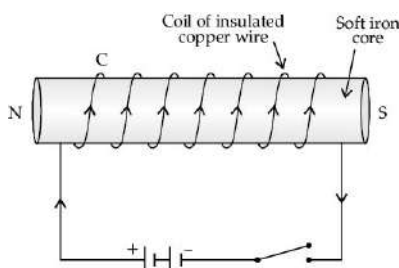
Ans. (a) Fleming's left hand rule.

Explanation :

The direction of force acting on a current carrying conductor placed

in a magnetic field can be obtained by Fleming's left hand rule. According to this rule, when a current-carrying conductor is placed in an external magnetic field, the conductor experiences a force perpendicular to both the field and to the direction of the current flow.

47. The process shown in the diagram below is:



- (a) Electromagnetism
- (b) Electric generator
- (c) Electric Motor
- (d) Electric fuse

Ans. (a) Electromagnetism

Explanation :

An electromagnet produces a magnetic field so long as current flows in its coil.

48. Which of the given options represents the correct pair?

(a)	Right-hand thumb rule	Direction of force
(b)	Galvanometer	Adjust current in circuit
(c)	Earth wire	Red colour
(d)	MRI	Magnetic Resonance Imaging

Ans. (d) MRI → Magnetic Resonance Imaging

Explanation :

MRI is a technique used to obtain the image of different body parts by using magnetic field.

49. The strength of magnetic field inside a long current-carrying straight solenoid is :

- (a) More at the ends than at the center
- (b) Minimum in the middle
- (c) Same at all points
- (d) Found to increase from one end to the another

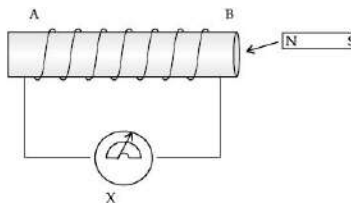
Ans. (c) Same at all points

Explanation :

The magnetic field inside a solenoid is proportional to both the applied current and the number of turns per unit length. There is no dependence on the diameter of the solenoid, and the field strength does not depend on the position inside the solenoid, *i.e.*, the field inside is constant.

The magnetic field is nearly uniform field in the center, *i.e.*, inside of a long solenoid and the field outside is weak and divergent.

50. In the given electric circuit, the device X is:



- (a) Ammeter
- (b) Resistance
- (c) Galvanometer

(d) Voltmeter

Ans. (c) Galvanometer

Explanation :

Galvanometer is an instrument that is used to detect the presence of the current in the circuit. And when magnet is moved near the coil, the current is induced in the coil.

51. The figure below shows the Fleming's left hand rule. Identify the correct label with the function?



(a) Thumb force

(b) Fore finger field

(c) Middle finger-current

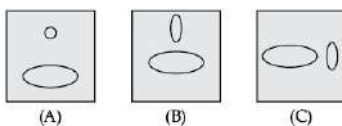
(d) All of these

Ans. (d) All of these

Explanation :

According to Fleming's left hand rule stretch the thumb, fore finger and middle finger of your left hand side that they are mutually perpendicular. If the first finger points in the direction of magnetic field and second finger in the direction of current, then thumb will point in the direction of force.

52. Mutual induction is a process in which current is induced in the neighbouring coil if current flows in a coil. In the figure shown below:



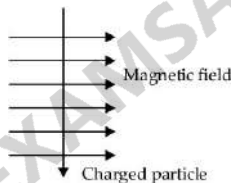
- (a) Maximum in situation (A)
- (b) Maximum in situation (B)
- (c) Maximum in situation (C)
- (d) Same in all situation

Ans. (a) Maximum in situation (A)

Explanation :

As both the coils are in the same plane. And induced current is found to be highest when the direction of the coil is at right angle to the magnetic field.

53. A charged particle enters at right angle into a uniform field as shown. What should be the nature of charge on the particle if it begins to move in a direction pointing vertically out of the page due to its interaction with the magnetic field?



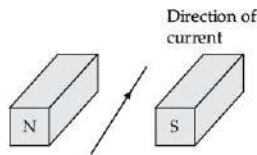
- (a) Positive
- (b) Negative
- (c) Natural
- (d) Can't decide

Ans. (a) Positive

Explanation :

Using Fleming's left hand rule, the nature of charged particle is positive.

54. A current flows in a wire, running between the S and N poles of a magnet lying horizontally as shown in the figure below:



The force on the wire due the magnet is directed.

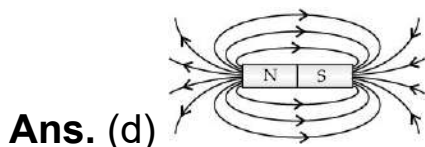
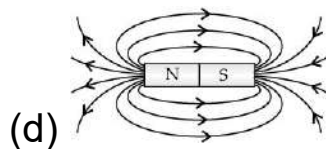
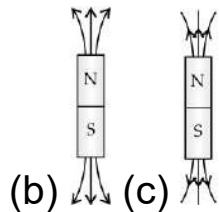
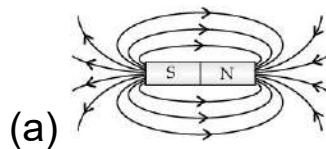
- (a) From N to S
- (b) From S to N
- (c) Vertically downwards
- (d) Vertically upwards

Ans. (c) Vertically downwards

Explanation :

Force on conductor is calculated using Fleming's left hand rule.

55. A student learns that magnetic field strength around a bar magnet is different at every point which diagram shows the correct magnetic field lines around a bar magnet?



Explanation :

As magnetic lines of forces are continuous curves and originate from N-pole and ends at the S-pole

56. Which of the following is not true?

- (a) Induction proceeds attractions
- (b) We cannot isolate a single pole
- (c) We can magnetise an iron ring
- (d) A permanent magnet retains its magnetism even when heated on a flame

Ans. (d) A permanent magnet loses its magnetism when heated on the flame

Explanation :

A permanent magnet does not lose its magnetism even when heated on a flame.

57. Which of the following combination is not correct?

- (a) Electric Motor—Fleming's right hand rule
- (b) Electric generator—Electromagnetic induction
- (c) Earth wire—Green colour
- (d) Compass Needle—Small Magnet

Ans. (a) Electric Motor—Fleming's right hand rule

Explanation :

A electric motor works on the principle of Fleming's left hand rule.

58. By removing the inducing magnets, the induced magnetism is:

- (a) Finished after sometime
- (b) Finished just after
- (c) Non-finished for a long time

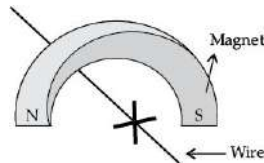
(d) Not Charged

Ans. (b) Finished just after

Explanation :

As induced magnetism takes place, as long as the induced magnet is present.

59. A copper wire is held between the poles of a magnet:



The current in the wire can be reversed. The pole of the magnet can also be changed over. In how many of the four directions shown can the force act on the wire?

(a) 1

(b) 2

(c) 3

(d) 4

Ans. (b) 2

Explanation :

By Fleming's left hand rule, we know that the force on the wire is perpendicular to the current in the wire and the magnetic field.

That is, there are only two possibilities for the direction of force *i.e.*, upward or downward.

60. Commercial electric motors do not use:

(a) An, electromagnetic to rotate the armature

(b) Effectively large number of conducting wire in the current carrying coil

(c) A permanent magnet to rotate the armature

(d) A soft iron core on which the coil is wound

Ans. (c) A permanent magnet to rotate the armature

Explanation :

Using, electromagnet, the magnetic field strength further increase by, increasing the current. Hence, it will enhance the power of electric motor.

61. The device used for producing electric current is called a :

[NCERT]

(a) Generator

(b) Galvanometer

(c) Ammeter

(d) Motor

Ans. (a) Generator

Explanation :

A.C. generator is used to convert mechanical energy to electrical energy.

62. The essential difference between an A.C. generator and a D.C. generator is that:

[NCERT]

(a) A.C. generator has an electromagnet while a D.C. generator has permanent magnet.

(b) D.C. generator will generate a higher voltage.

(c) A.C. generator will generate a higher voltage.

(d) A.C. generator has slip rings while the D.C. generator has a commutator.

Ans. (d) A.C. generator has slip rings while the D.C. generator has a commutator.

Explanation :

Most essential difference between A.C. generator and D.C. generator is using slip ring in A.C. generator and commutator in D.C. generator.

63. At the time of short circuit, the current in the circuit:

[NCERT]

- (a) Reduces substantially
- (b) Does not change
- (c) Increases heavily
- (d) Vary continuously

Ans. (c) Increases heavily

Explanation :

A short circuit occurs when circuit current rises rapidly and the electric circuit draw an heavy amount of current from the supply.

Assertion and Reasoning Based Questions

Directions: In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.
- (c) Assertion is true, but reason is false.
- (d) Assertion is false, but reason is true.

64. Assertion: Iron filings are kept near a magnet it gets arranged in

a particular fashion.

Reason: Magnetic field is a scalar quantity.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Magnetic field is not a scalar quantity rather it is a vector quantity which has both magnitude and direction. So, when iron filings are placed around a magnet, they get arranged in a fashion similar to that of magnetic lines. Thus, assertion is correct, but reason is false.

65. Assertion: A current carrying rod is suspended between U-shaped magnet, the rod deflects.

Reason: A force is exerted on the rod due to magnetic field.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

A force is always exerted due to magnetic field in the same way electric current flowing through any conductor produces magnetic field. And in this case, Fleming's left-hand rule is used to predict directions of the magnetic field, current and displacement. Thus, assertion and reason both are correct and reason is the correct explanation of assertion.

66. Assertion: The energy of charged particle moving in a uniform magnetic field does not change.

Reason: Work done by magnetic field on the charge is zero.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

The force on a charged particle moving in a uniform magnetic field always acts in direction perpendicular to the direction of motion of

the charge. As work done by magnetic field on the charge is zero, so the energy of the charged particle does not change. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

67. Assertion: A current carrying conductor experiences a force in a magnetic field.

Reason: The net charge on a current carrying conductor is zero.

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

When a current carrying conductor having no net charge is placed in a magnetic field, the free electrons of the conductor move towards the positive end of the conductor with same drift velocity, hence a magnetic force acts on them. The positive ions of the conductor being stationary, do not experience any magnetic field. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

68. Assertion: Magnetic field lines do not intersect each other.

Reason: It is impossible to have two direction of the magnetic field at a point.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Magnetic field lines do not intersect, because it happen so then at that point two direction of magnetic field lines exist, which is not possible. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

69. Assertion: The principle of electromagnetic induction was discovered by Micheal Faraday

Reason: The principle is used only in DC generators

Ans. (c) Assertion is true, but reason is false.

Explanation :

Not only DC generators but AC generators also work on the principle of electromagnetic induction. Thus, assertion is true, but reason is false.

70. Assertion: Electric Motor converts electric energy into mechanical energy.

Reason: Electric Motor is based on the principle of Fleming's right hand rule. Thus assertion is true, but reason is False.

Ans. (c) Assertion is true, but reason is false.

Explanation :

Electric motor is based on the principle of Fleming's left hand rule. Thus assertion is true, but reason is false.

71. Assertion: A compass is kept near a wire carrying current gets deflected.

Reason: Electric current is capable of producing a magnetic effect.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Here while carrying out an experiment if a compass needle is placed near a wire carrying current then due to the effect of magnetism which is produced due to electric current produced in the wire the needle gets deflected. It shows that the magnetism and electricity are interlinked. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

72. Assertion: Deflection of the iron filings changes when current in the conductor varies.

Reason: Magnitude of the magnetic field does not change with the magnitude of current.

Ans. (c) Assertion is true, but reason is false.

Explanation :

As the current changes in the conductor, magnitude of the magnetic field produced also varies which is the reason for a change in the deflection of the iron filings. Thus assertion is true, but reason is false.

73. Assertion: A pump operated by electric motor starts pumping liquid.

Reason: Motor converts mechanical energy to electrical energy.

Ans. (c) Assertion is true, but reason is false.

Explanation :

An electric motor converts electrical energy to mechanical energy which is used for pumping liquids through the pumps. It produces a rotating force when electricity is given to it. Thus, assertion is true, but reason is false.

74. Assertion: Galvanometer is used to measure polarity.

Reason: Galvanometer is an instrument which is used to detect current in any circuit.

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

In testing purposes galvanometer is used to measure polarity. There is a torque acting on a current carrying coil suspended in a magnetic field which produces deflection. Deflection is directly proportional to current flowing through the galvanometer coil. Thus, both assertion and reason are correct but reason is not the correct explanation of

the assertion.

75. Assertion: Current can be induced in a coil by changing the magnetic field around it.

Reason: A Galvanometer connected to a coil can deflect either to the left or right of the zero mark.

Ans. (b) Both assertion and reason are correct, but reason is not the correct explanation of assertion.

Explanation :

Current is induced in a coil due to a changing magnetic field and this process is known as electromagnetic induction.

Galvanometer is a device that detects the presence of current by deflecting the needle to one side of the zero mark but this does not explain the current induced in the coil. Thus both assertion and reason are correct and reason is not the correct explanation of the assertion.

76. Assertion: Electric generator uses mechanical energy and converts it into electrical energy.

Reason: Electric generator works on the principle of electromagnetic induction.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of the assertion.

Explanation :

The axle of the generator is mechanically rotated to rotate the coil inside the magnetic field. The rotating coil is kept between two poles of a permanent magnet. Due to the electromagnetic induction electricity is produced through the coils. Thus, both assertion and reason are correct and reason is the correct explanation of assertion.

77. Assertion: A fault occurred in the domestic lines, but all the

equipment's are safe.

Reason: Potential difference is only 220 V in our country in domestic lines.

Ans. (b) Both assertion and reason are correct but reason is not the correct explanation of the assertion.

Explanation :

As when a fault occurs in the domestic lines there is a protective device called fuse which breaks the circuit and protects all the equipments by melting the low melting point wire wrapped to it in order to interrupt supply. Thus, both assertion and reason are correct but reason is not the correct explanation of the assertion.

78. Assertion: Losses in the transmission lines are very less these days.

Reason: Low voltage is used for the purpose of transmission.

Ans. (c) Assertion is true, but reason is false.

Explanation :

When we use high voltages for transmission system then line losses reduces to an extent. As high voltages are used, so current will be less in those cases which in turn reduces I^2R losses occurring in the transmission lines. So, efficiency of the transmission lines increases. Thus, assertion is true but reason is false.

Case Based Questions

79. Read the passage given below and answer the following questions from (i) to (v).

When a small compass is placed near a magnet, it will experience a force due to the magnetic field of the magnet. It is evidently observed due to a deflection in the north pole pointer of the compass. The path traced by the north pole pointer under the influence of a magnetic

field is called the magnetic field line. The magnetic field lines are produced from the north pole of the magnet end at the south pole of the magnet. When the compass is moved around the field line, it always sets itself tangential along the curves.

(i) The magnetic field lines:

(a) intersect at right angle to one another.

(b) intersect at an angle of 45 degree.

(c) cross at an angle of 60 degree.

(d) never intersect with each other.

Ans. (d) never intersect with each other.

(ii) Magnetic field lines can be used to determine:

(a) the shape of the magnetic field.

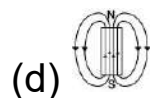
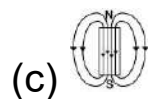
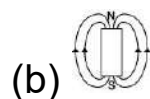
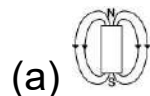
(b) only the direction of the magnetic field.

(c) only the relative strength of the magnetic field.

(d) both the direction and the relative strength of the magnetic field.

Ans. (d) both the direction and the relative strength of the magnetic field.

(iii) The magnetic field lines due to a bar magnet are correctly shown in:



Ans. (d)



(iv) Which of the following is incorrect regarding magnetic field lines?

- (a) The field lines are directed N to S inside the magnet.
- (b) The Crowdedness of the field lines shows the strength of the magnet.
- (c) The field is tangent to the magnetic field line.
- (d) Magnetic field lines are closed and continuous curves.

Ans. (a) The field lines are directed N to S inside the magnet.

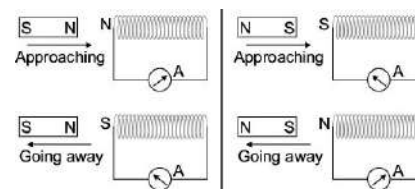
(v) A strong bar magnet placed vertically above a surface. The magnetic field lines will be:

- (a) Only in a horizontal plane around the magnet.
- (b) Only in a vertical plane around the magnet.
- (c) Both in horizontal and vertical plane around the magnet.
- (d) In all the planes around the magnet.

Ans. (d) In all the planes around the magnet

80. Read the passage given below and answer the following questions from (i) to (v).

A current-carrying wire produces a magnetic field around it. The phenomena in which an electromotive force and current are induced by changing magnetic field through it is called induced current. It can be concluded that the induced current flows in a conductor as long as the magnetic force changes within the conductor. For the motion of the coil with respect to the magnet or vice versa, the direction of the current flowing in the conductor is determined by the direction of the relative motion of the conductor with respect to the magnetic field. The induced emf or current is directly proportional to the rate of change in the magnetic field.



(i) What is the condition of electromagnetic induction?

- (a) There must be relative motion between galvanometer and coil of wire.
- (b) There must be a relative motion between galvanometer and magnet.
- (c) There must be a relative motion between galvanometer and electric motor.
- (d) There must be a relative motion between the coil of wire and a magnet.

Ans. (d) There must be a relative motion between the coil of wire and a magnet.

(ii) An induced emf is produced when a magnet is plugged into a coil. The magnitude of induced emf does not depend upon:

- (a) The number of turns in the coil.
- (b) The speed with which the magnet is moved.
- (c) The resistivity of the material of the coil.
- (d) The strength of the magnet.

Ans. (c) The resistivity of the material of the coil

(iii) A bar magnet is pushed steadily into a long solenoid connected to a meter.

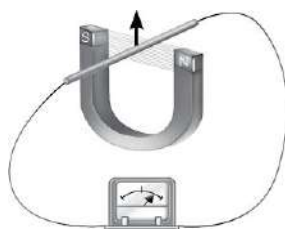
Which of the following would affect the magnitude of the deflection of the meter?

- (a) How fast the magnet is pushed into the coil.

- (b) Direction in which the coil is wound.
- (c) End of the solenoid where the magnet enters.
- (d) Pole of the magnet which enters the coil first.

Ans. (a) How fast the magnet is pushed into the coil

(iv) A conducting rod moves across two magnets as shown in the figure and the needle in the galvanometer deflects momentarily. This physical phenomenon is called:



- (a) Induced magnetism
- (b) Electromagnetism
- (c) Static induction
- (d) Electromagnetic induction

Ans. (d) Electromagnetic induction

(v) Magnetic lines of force inside current-carrying solenoid are:

- (a) perpendicular to axis.
- (b) along the axis and are parallel to each other.
- (c) parallel inside the solenoid and circular at the ends.
- (d) circular.

Ans. (b) along the axis and are parallel to each other

81. Read the passage given below and answer the following questions from (i) to (v).

Hans christian Oersted, one of the leading scientists of the 19th century, play a crucial role in understanding electromagnetism. In

1820, he accidentally discovered that a compass needle got deflected when an electric current passed through a metallic wire placed nearby. Through this observation Oersted showed that electricity and magnetism were related phenomenon. This research later created technologies such as radio, television and fibre optics. The unit of magnetic field was named as Oersted in his honour. Electromagnetism is the study of electromagnetic force. It is a type of interface that happens between electrically charged particles. The electromagnetic force generally exhibits electromagnetic fields like magnetic fields, electric fields and light, and is one of the four essential interactions commonly known as forces in nature. The other 3 important interactions are the strong interaction, gravitation and the weak.

(i) Oersted experiment is used to explain which effect of current ?

- (a) Electric effect
- (b) Magnetic effect
- (c) Both (a) and (b)
- (d) None of these

Ans. (b) Magnetic effect

Explanation :

He make to understand that current carrying wire has magnetic field around it.

(ii) Which instrument helps to detect the presence of magnetic field at a point?

- (a) Strong magnet
- (b) Solenoid
- (c) Compass needle
- (d) Current carrying line

Ans. (c) Compass needle

Explanation :

Compass needle is a small bar magnet, whose ends are approximately towards the north and south direction.

(iii) In the diagram below, the direction of magnetic field is:



- (a) Clockwise
- (b) Anti clockwise
- (c) Not any fixed direction
- (d) None of these

Ans. (b) Anti clockwise

Explanation :

It is evaluated by using Right Hand Thumb Rule.

(iv) On reversing the direction of the current in a wire, the magnetic field produced by it:

- (a) Gets reversed in direction
- (b) Increase in strength
- (c) Decreases in strength
- (d) Remains unchanged in strength and direction

Ans. (a) Gets reversed in direction

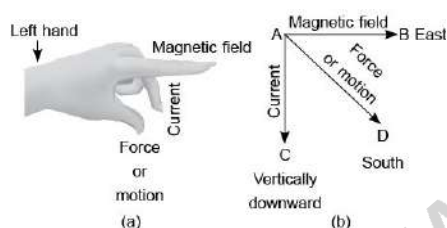
Explanation :

When direction of current change, then direction of magnetic field produced changes accordingly.

82. Read the passage given below and answer the following

questions from (i) to (v).

A magnet must exert an equal and opposite force on a current-carrying conductor. We know that current is due to the charge in motion. Thus, it is evident that a charge moving in a magnetic field experiences a force. If the direction of motion is perpendicular to the direction of the magnetic field, the magnitude of force experienced depends upon the charge, velocity, and strength of the magnetic field. Fleming's left-hand rule gives the direction of the magnetic force.



(i) If a charged particle is moving along a magnetic field line, the magnetic force on the particle is:

- (a) along with its velocity.
- (b) opposite to its velocity.
- (c) perpendicular to its velocity.
- (d) zero.

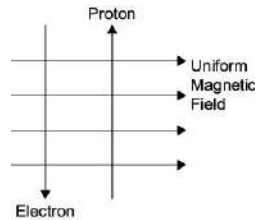
Ans. (d) zero

(ii) An electron is travelling horizontally towards the east. A magnetic field in the vertically downward direction will exert a force in:

- (a) East
- (b) West
- (c) North
- (d) South

Ans. (d) South

(iii) A uniform magnetic field exists from left to right on a surface. An electron and proton moving in the directions as shown in the figure will experience:



- (a) Forces both pointing into the plane of the surface.
- (b) Forces both pointing out of the plane of the surface.
- (c) The electron will experience into the plane and proton out of the plane.
- (d) The electron will experience opposite to and proton along the direction of the uniform magnetic field.

Ans. (a) Forces both pointing into the plane of the surface

(iv) Magnetic field exerts no force on:

- (a) a stationary electric charge.
- (b) a magnet.
- (c) an electric charge moving perpendicular to its direction.
- (d) an unmagnetized iron bar.

Ans. (a) a stationary electric charge

(v) In Fleming's left-hand rule, the thumb's direction shows the:

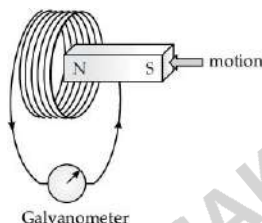
- (a) current
- (b) field
- (c) motion
- (d) charge

Ans. (c) motion

83. Read the passage given below and answer the following questions from (i) to (v).

The space surrounding a magnet in which magnetic force is exerted, is called a magnetic field. The direction of magnetic field lines at a place can be determined by using a compass needle. A compass needle placed near a magnet gets deflected due to the magnetic force exerted by the magnet.

The north end of the needle of the compass indicates the direction of magnetic field at the point where it is placed. When the magnet shown in the diagram below is moving towards the coil, the galvanometer gives a reading to the right.



(i) The direction of induced current is given by:

- (a) Right hand thumb rule
- (b) Fleming's right hand rule
- (c) Fleming's left hand rule
- (d) Maxwell's rule

Ans. (b) Fleming's right hand rule

(ii) What is the condition of electromagnetic induction?

- (a) There must be a relative motion between the coil of wire and galvanometer.
- (b) There must be a relative motion between the galvanometer and a magnet.
- (c) There must be a relative motion between galvanometer and generator.

(d) There must be a relative motion between the coil of wire and a magnet.

Ans. (d) There must be a relative motion between the coil of wire and a magnet.

(iii) A student writes a few statements after studying the principles of electromagnetism and working of electric motor:

(I) Fleming's left hand rule is used to make electromagnet.

(II) Fleming's left hand rule is used in electric motor.

(III) Fleming's right hand rule is used in electric motor.

(IV) Right hand thumb rule is used in electric motor.

Choose the correct statement(s) from the following:

(a) Only (I)

(b) Only (II)

(c) (I) and (III)

(d) (II), (III) and (IV)

Ans. (b) Only (II)

(iv) When the magnet is moved away from the coil, it is observed that:

(a) the galvanometer needle deflects to the left

(b) the galvanometer needle deflects to the right

(c) the galvanometer needle first deflects to the left and then to the right

(d) the galvanometer needle first deflects to the right and then to the left.

Ans. (a) the galvanometer needle deflects to the left.

(v) The induced current is highest when:

(a) direction of magnetic field is parallel to the direction of motion of coil.

(b) direction of magnetic field is opposite to the direction of motion of coil.

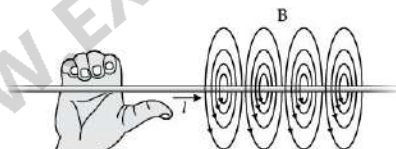
(c) direction of magnetic field is perpendicular to the direction of motion of coil.

(d) direction of magnetic field is in straight line to the direction of motion of coil.

Ans. (c) direction of magnetic field is perpendicular to the direction of motion of coil.

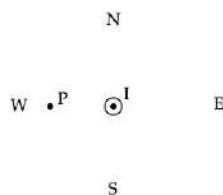
84. Read the passage given below and answer the following questions from (i) to (v).

The magnetic field lines of an infinite wire are circular and centered at the wire and they are identical in every plane perpendicular to the wire as shown in the figure.



Since the field decreases with distance from the wire, the spacing of the field lines must increase correspondingly with distance. The direction of this magnetic field may be found with a second form of the right-hand rule. If you hold the wire with your right hand so that your thumb points along the current, then your fingers wrap around the wire in the same sense as $B \rightarrow$.

(i) A vertical wire carries an electric current out of the page. What is the direction of the magnetic field at point P located to the west from the wire?



- (a) North
- (b) South
- (c) East
- (d) Down

Ans. (b) South

(ii) A student writes the following statements on the characteristics of magnetic field lines:

- (I) The magnetic field lines are imaginary lines.
- (II) The magnetic field lines has only magnitude.
- (III) The magnetic field lines are closed curves.
- (IV) The magnetic field lines emerge from the south pole of a magnet.

Choose the correct statement(s) from the following:

- (a) Only (I)
- (b) Both (I) and (II)
- (c) Both (I) and (III)
- (d) Both (II) and (IV)

Ans. (c) Both (I) and (III)

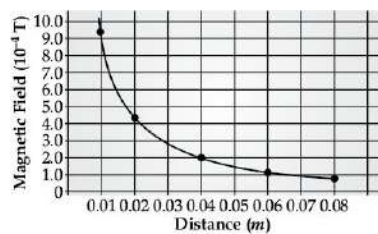
(iii) A current carrying conductor is held in exactly vertical direction. In order to produce a clockwise magnetic field around the conductor, the current should be passed in the conductor:

- (a) from top to bottom

- (b) from left to right
- (c) from bottom to top
- (d) from right to left

Ans. (a) from top to bottom

(iv) A student plotted the variation of magnetic field around a straight current carrying wire and the distance from the wire where the magnetic field is measured. Study the graph below and answer the question that follows:



The magnetic field around a current carrying straight wire:

- (a) increases linearly with increase in distance.
- (b) decreases with increase in distance.
- (c) remains constant.
- (d) magnetic field at a point does not depend on distance.

Ans. (b) decreases with increase in distance

(v) A positive charge is moving towards a person. The direction of magnetic field lines will be in:

- (a) clockwise direction
- (b) anticlockwise direction
- (c) vertically upward direction
- (d) vertically downward direction

Ans. (b) anticlockwise direction

85. Define magnetism.

Ans. The property by virtue of which a magnet attracts certain metals such as iron, cobalt, nickel etc., is termed as magnetism.

86. What do you mean by 'magnetic field' of a magnet?

Ans. The space or region around a magnet in which the force of attraction or repulsion due to the magnet can be detected is called the magnetic field.

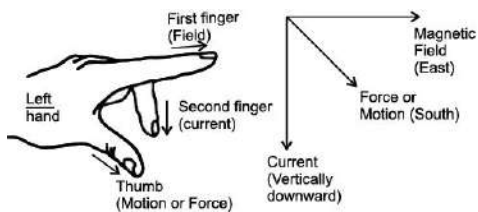
87. State Ampere's swimming rule.

Ans. If a swimmer swims in the direction of current, facing the magnetic needle, then the north pole of the magnetic needle deflects towards his left hand *i.e.*, west and the south pole towards his right hand *i.e.*, east.

88. State Fleming's Left Hand Rule.

[NCERT]

Ans. According to this rule, stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular to each other. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

**89. What is an electric motor?**

Ans. An electric motor is a device which converts the electrical energy into mechanical energy.

90. What is the principle of an electric motor?

[NCERT]

Ans. Electric motor works on the principle that 'when a rectangular coil is placed in a magnetic field and current is passed through it, a force acts on the coil which rotates it continuously. Thus, when the coil rotates, the shaft attached to it also rotates converting the electrical energy supplied to the motor to the mechanical energy of rotation.

91. What is a galvanometer?

Ans. A galvanometer is an instrument which can detect the presence of electric current in a circuit.

92. Define electromagnetic induction.

Ans. The production of electricity from magnetism is called electromagnetic induction.

93. What is a permanent magnet? Give one use of it.

Ans. A permanent magnet is a magnet made from steel such that once magnetized, it does not lose its magnetism easily.

94. Define a compass.

Ans. A compass is a device used to show magnetic field direction at a point. It consists of a tiny pivoted magnet usually in the form of a pointer which can turn freely in the horizontal plane.

Very Short Answer Type Questions

95. How is the strength of the magnetic field at a point near a wire related to the strength of the electric current flowing in the wire ?

Ans. Strength of magnetic field is directly proportional to the strength of current flowing in the wire.

96. State the conclusion that can be drawn from the observation that a current-carrying wire deflects a magnetic needle placed

near it.

Ans. A magnetic field is produced around a current-carrying conductor.

97. Why does a current-carrying conductor experience a force when it is placed in a magnetic field ?

Ans. A current-carrying conductor produces a magnetic field around it. This magnetic field interacts with the externally applied magnetic field and as a result the conductor experiences a force.

98. What is the function of a galvanometer in a circuit ?

Ans. Galvanometer is a device that detects the presence of current in a circuit. It is also used for measuring the amount of current in the circuit.

99. Why does a current carrying freely suspended solenoid rest along a particular direction ? State the direction in which it rests.

Ans. A current carrying solenoid behaves like a bar magnet. It rests in geographic north-south direction.

100. At what place of the magnet are the magnetic field lines closer ?

[Board Question]

Ans. Near the poles of the magnet.

101. How is the strength of the magnetic field at a point near a wire related to the strength of the electric current flowing in the wire ?

[Board Question]

Ans. Strength of magnetic field is directly proportional to the strength of current flowing in the wire.

102. State the observation made by Oersted on the basis of his

experiment with current-carrying conductors ?

[Board Question]

Ans. Every current-carrying conductor has a magnetic field around it.

103. What is the shape of a current-carrying conductor whose magnetic field pattern resembles that of a bar magnet ?

[Board Question]

Ans. A solenoid

104. Name the two factors that completely define a magnetic field at a point.

[Board Question]

Ans. The strength and the direction of magnetic field at the given point.

105. A stationary charge is placed in a magnetic field. Will it experience a force ? Give reason to justify your answer.

Ans. No, a magnetic field exerts a force only on a moving charge.

106. Where will be the value of magnetic field maximum due to current-carrying circular conductor?

[Board Question]

Ans. At the centre of current-carrying circular loop.

107. State the conclusion that can be drawn from the observation that a current-carrying wire deflects a magnetic needle placed near it.

[Board Question]

Ans. A magnetic field is produced around a current-carrying conductor.

108. Why does a current-carrying conductor experience a force when it is placed in a magnetic field?

[Board Question]

Ans. A current-carrying conductor produces a magnetic field around it. This magnetic field interacts with the externally applied magnetic field and as a result the conductor experiences a force.

109. Why steel is not used for making electromagnets ?

Ans. The steel does not lose all its magnetism when the current is stopped and becomes a permanent magnet. That's why it is not used for making electromagnets.

110. What happens to the magnetic field lines due to a current-carrying conductor when the current is reversed ?

[Board Question]

Ans. The direction of magnetic field (and magnetic field lines) gets reversed on changing the direction of flow of current in a straight conductor.

111. Name five main parts of a D.C. motor.

Ans. An electric motor is a device which converts the electrical energy into mechanical energy.

The five main parts of a D.C. motor are:

1. Strong field magnet,
2. Armature coil,
3. Split ring or commutator,
4. Carbon brushes, and
5. Battery.

112. What is the role of a split ring in an electric motor?

[NCERT]

Ans. In an electric motor, after every half rotation the direction of coil gets reversed due to change in orientation of the magnetic field. To ensure a continuous rotation; a split ring is attached to the coil so that the polarity of the coil changes after every half rotation. This changes the direction of current and thus the armature keeps on rotating continuously.

113. What type of current is used in household supply?

[Board Question]

Ans. An alternating current (A.C.).

114. In one complete cycle of A.C., how many times the direction of current changes?

Ans. Two times, *i.e.*, direction of current changes after each half cycle of A.C.

Reasoning Based Questions

115. Why does a compass needle get deflected when brought near a bar magnet?

[NCERT]

Ans. When a compass needle is brought near a bar magnet, the compass needle experiences a deflection due to the interaction of magnetic fields of the compass needle and the bar magnet.

116. Why don't two magnetic lines of force intersect each other?

Ans. The tangent drawn at any point on the magnetic field line gives the direction of magnetic field at that point. Hence, if two magnetic field lines would intersect each other, it would result in two tangents at one point which in turn would result in two directions at one point which is impossible. That is why two magnetic field lines never intersect each other.

117. Why does a magnetic needle show a deflection when brought close to a current carrying conductor?

Ans. A current carrying conductor produces a magnetic field around it and the magnetic needle in this magnetic field experiences a torque due to which it deflects to align itself in the direction of magnetic field.

118. Why steel is not used for making electromagnets?

Ans. The steel does not lose all its magnetism when the current is stopped and becomes a permanent magnet. That's why it is not used for making electromagnets

119. Why is soft iron generally used as the core of the electromagnet?

Ans. Soft iron is generally used for making electromagnets because it can easily gain magnetic properties when current is passed around the core and quickly loses when current is stopped.

120. Explain why, an electromagnet is called a temporary magnet?

Ans. An electromagnet is called a temporary magnet because as we keep on passing electric current it will work as magnet, if we stop passing electric current, it will no longer work as magnet.

121. When does an electric short circuit occur?

[NCERT]

Ans. When live and neutral wires touch each other, the resistance suddenly decreases and current increases. This leads to excessive heating of wire which manifests in the form of sparks. This is called short circuit.

122. What is the function of an earth wire? Why is it necessary to earth metallic appliances?

Ans. The earth wire transfers any leakage of electric current to the earth. The leaked current can otherwise reach the metallic body of an appliance and can lead to electric shock. Earth wire prevents from electric shock by safely transferring the leaked current to the earth.

123. Why is the fuse wire fitted in a porcelain casing?

Ans. Fuse wire is fitted in a porcelain casing because porcelain is an insulator of electricity.

124. An electric switch should not be touched with wet hands while putting it on or off. Give a reason for your answer.

Ans. An electric switch should not be touched with wet hands while putting it on or off because if water reaches the live wire, it forms a conducting layer between the hand and the live wire of the switch due to which a strong current passes through the hand and the user gets an electric shock.

125. Why are fuses fitted in the fuse box of a domestic electricity supply?

Ans. Fuses are fitted in the fuse box of a domestic electricity supply to protect the whole wiring of the house when excessive current flows in the circuit.

126. Explain why, it is more dangerous to touch the live wire of a mains supply rather than the neutral wire.

Ans. It is more dangerous to touch the live wire rather than the neutral wire because live wire has a high potential of 220 V, whereas neutral wire has zero potential.

127. Answer the following questions:

(i) What do you mean by 'magnetic field' of a magnet?

(ii) What are magnetic field lines? List two characteristic properties of these lines.

Ans. (i) The space or region around a magnet in which the force of attraction or repulsion due to the magnet can be detected is called the magnetic field.

(ii) The lines drawn in a magnetic field along which north magnetic pole moves, are called magnetic field lines.

The characteristic properties of magnetic field lines are :

1. The magnetic lines originate from North pole and ends at South pole.

2. The magnetic lines do not intersect each other.

128. Answer the following questions:

(i) State Ampere's swimming rule.

(ii) Name and state the rule to determine the direction of magnetic field produced by a straight wire carrying current.

Ans. (i) If a swimmer swims in the direction of current, facing the magnetic needle, then the North pole of the magnetic needle deflects towards his left hand *i.e.*, West and the South pole towards his right hand *i.e.*, East.

(ii) Maxwell's right hand thumb rule is used to determine the direction. According to this rule, when you hold a current carrying conductor in your right hand in such a way that your thumb points in the direction of the current then the direction in which your fingers encircle the conductor will give the direction of magnetic field around it.

129. Answer the following questions:

(i) Name and state the rule to determine the polarity of the two

faces of a current carrying circular loop.

(ii) State Fleming's Left Hand Rule.

[NCERT]

Ans. (i) Clock face rule is used to determine the polarity of the two faces of a current carrying circular loop.

According to this rule, "If the current around the face of circular wire flows in the clockwise direction, then that face of the circular wire will be South pole (S-Pole) and if the current around the face of circular wire flows in the anticlockwise direction, then that face of the circular wire will be North pole (N-Pole)."

(ii) According to this rule, stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular to each other. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

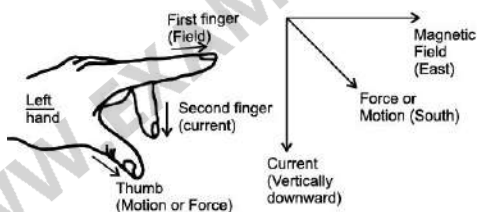


Fig. Fleming's left hand rule

130. Answer the following questions:

(i) What is the principle of an electric motor?

[NCERT]

(ii) What is the role of a split ring in an electric motor?

[NCERT]

(iii) Define magnetism.

Ans. (i) Electric motor works on the principle that 'when a rectangular coil is placed in a magnetic field and current is passed

through it, a force acts on the coil which rotates it continuously. Thus, when the coil rotates, the shaft attached to it also rotates converting the electrical energy supplied to the motor to the mechanical energy of rotation.

(ii) In an electric motor, after every half rotation the direction of coil gets reversed due to change in orientation of the magnetic field. To ensure a continuous rotation; a split ring is attached to the coil so that the polarity of the coil changes after every half rotation. This changes the direction of current and thus the armature keeps on rotating continuously.

(iii) The property by virtue of which a magnet attracts certain metals such as iron, cobalt, nickel etc., is termed as magnetism.

131. State the rule to determine the direction of a :

(i) Magnetic field produced around a straight current carrying conductor.

(ii) Force experienced by a current-carrying straight conductor placed in a magnetic field which is perpendicular to it.

(iii) Current induced in a coil due to its rotation in a magnetic field.

Ans. (i) Right hand thumb rule or Maxwell's Corkscrew rule.

(ii) Fleming's left hand rule.

(iii) Fleming's right hand rule.

132. Answer the following questions:

(i) What do you mean by Overloading?

(ii) Define an electromagnet.

(iii) What is a galvanometer?

Ans. (i) Overloading is the process of overheating of a wire due to excess current drawn by all the appliances than the permitted limit

for that wire.

(ii) An electromagnet is a magnet consisting of a long coil of insulated copper wire wrapped around a soft iron core that is magnetized only when electric current is passed through the coil.

(iii) A galvanometer is an instrument which can detect the presence of electric current in a circuit.

133. Answer the following questions:

(i) Define electromagnetic induction.

(ii) What is a permanent magnet? Give one use of it.

(iii) Define a compass.

Ans. (i) The production of electricity from magnetism is called electromagnetic induction.

(ii) A permanent magnet is a magnet made from steel such that once magnetized, it does not lose its magnetism easily.

(iii) A compass is a device used to show magnetic field direction at a point. It consists of a tiny pivoted magnet usually in the form of a pointer which can turn freely in the horizontal plane.

134. State Fleming's right hand rule.

Ans. It states that, "Stretch your right hand in such a way that the first finger, the central finger and the thumb are mutually perpendicular to each other. If the first finger points along the direction of magnetic field and the thumb points along the direction of motion of the conductor, then the direction of induced current is given by the direction of the central finger."

This rule is also called dynamo rule.

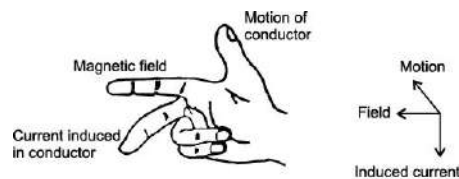


Fig. Fleming's right hand rule.

135. Answer the following questions:

(i) What do you mean by:

(a) Direct Current (D.C.),

(b) Alternating Current (A.C.)?

(ii) What is:

(a) an electric fuse,

(b) an electric switch?

Ans. (i) (a) An electric current whose magnitude is either constant or variable, but the direction of flow in a conductor remains the same, is called direct current.

(b) An electric current whose magnitude changes with time and direction reverses periodically, is called an alternating current.

(ii) (a) An electric fuse is a safety device which is used to limit the current in an electric circuit. The use of a fuse safeguards the circuit and the appliances connected from being damaged.

(b) An electric switch is an on-off device for current in a circuit or in an appliance.

Differentiate Between

136. State five differences between an electromagnet and a permanent magnet.

Ans.

S. No.	Electromagnet	Permanent Magnet
--------	---------------	------------------

1.	It is made up of soft iron.	It is made up of steel.
2.	The magnetic field strength can be changed.	The magnetic field strength can not be changed.
3.	The magnetic field can be very strong.	The magnetic field is not so strong.
4.	The polarity of an electromagnet can be reversed.	The polarity of a permanent magnet cannot be reversed.
5.	It can be easily demagnetized by switching off the current.	It cannot be easily demagnetized.

137. Give the difference between AC and DC Generators.

Ans.

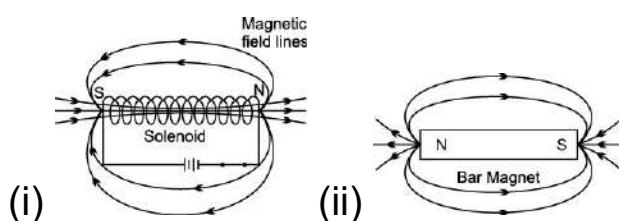
S. No.	AC Generators	DC Generators
1.	AC generator is a mechanical device which converts mechanical energy into AC electrical power.	DC generator is a mechanical device which converts mechanical energy into DC electrical power.
2.	In an AC generator, the electrical reverses direction periodically.	In a DC generator, the electrical current flows only in one direction.
3.	AC generator does not have commutators.	DC generators have commutators to make the current flow in one direction only.
4.	AC generators have slip-rings.	DC generators have split-ring

Diagram Based Questions

138. What is a solenoid ? Draw the pattern of magnetic field lines of (i) a current carrying solenoid and (ii) a bar magnet. List two distinguishing features between the two fields.

[Board Question]

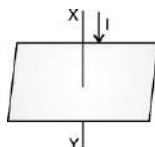
Ans. Solenoid is a long cylindrical coil of wire consisting of a large number of turns bound together very tightly.



Distinguishing features are as follows :

1. Magnetic field outside the solenoid is negligible as compared to the bar magnet.
2. Magnetic field of solenoid can be varied as per our requirement just by changing current or core of solenoid but in bar magnet it is fixed.

139. In the diagram XY is a straight conductor carrying current in the direction marked by the arrow. The conductor is held vertically by passing it through a horizontal cardboard sheet. Draw three magnetic lines of force on the board and mark the direction of magnetic field in your diagram. State two factors on which magnitude of magnetic field at a point, depends.

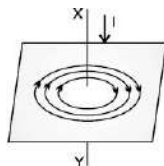


Ans. The magnetic lines of force due to current in the straight conductor XY are shown in figure given alongside. The arrows on

the magnetic lines of force show the direction of magnetic field.

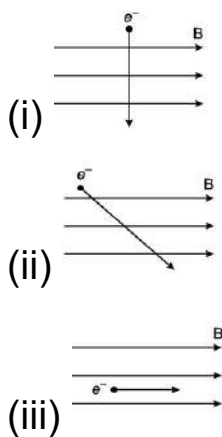
The magnitude of magnetic field at a point depends on :

1. The strength of current in the conductor, and
2. The distance of point from the conductor.



140. Given below are three diagrams showing entry of an electron in a magnetic field. Identify the case in which the force on electron will be maximum and minimum respectively. Give reason for your answer. Find the direction of maximum force acting on electron.

[Board Question]

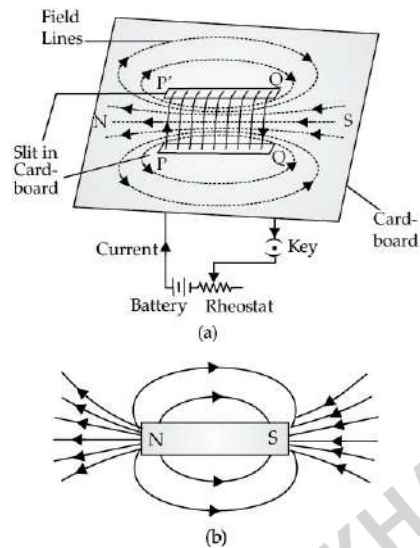


Ans. Force on electron is maximum in fig. (i) because here direction of motion of electron is at right angles to that of magnetic field 'B'. The force is minimum (or zero) in fig. (iii) because here electron is moving along the direction of magnetic field B.

The direction of maximum force acting on electron is perpendicular to the plane of paper and directed into it.

141. Sketch the lines of force of the magnetic field of a solenoid. How does its field compare with that of a bar magnet ?

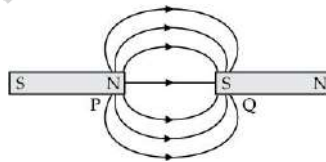
Ans. The magnetic field of a solenoid is very similar to that of a bar magnet. this is shown in figure (a) and (b) respectively, which shows the lines of force of the magnetic field of a current carrying solenoid and a bar magnet.



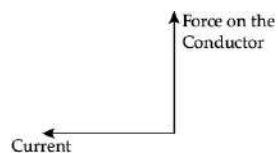
142. Two magnets are lying side by side as shown below. Draw magnetic field lines between poles P and Q.



Ans. Magnetic field lines are shown below:



143. State the direction of magnetic field in the following diagram.

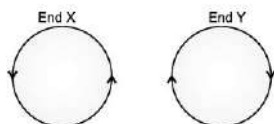


Ans. As per Fleming's left hand rule, the magnetic field is directed out of the paper.

144. The directions of current flowing in the coil of an

electromagnet at its two ends X and Y are as shown in given figure.

- (i) What is the polarity of end X ?
- (ii) What is the polarity of end Y ?
- (iii) Name the rule which you have used to determine the polarities.

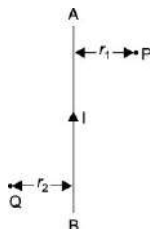


Ans. (i) Since current at end X is anticlockwise, the polarity at that end is North pole.

(ii) Current at end Y is clockwise, hence polarity at that end is South pole.

(iii) Clock-face rule is used to determine the polarities of the two faces of a current carrying circular loop.

145. AB is a current carrying conductor in the plane of the paper as shown in figure. What are the directions of magnetic fields produced by it at points P and Q ? Given $r_1 > r_2$, where will the strength of the magnetic field be larger?



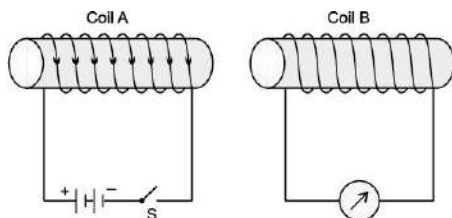
Ans. Since the direction of the current in the current carrying conductor AB is upwards, the direction of the magnetic field would be anti-clockwise as deduced by applying right hand thumb rule. Consequently, the magnetic field at point P would be towards the plane and, at point Q, the direction of the magnetic field would be away from the plane.

Since the strength of the magnetic field is inversely proportional to

the distance (r), the field at P would be weaker as compared to Q [$\because r_1 > r_2$].

146. Two coils A and B are placed close to each other. If the current in coil A is changed, will some current be induced in the coil B ? Given reason.

[NCERT]

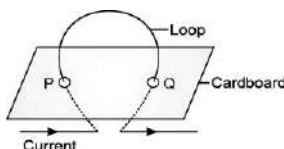


Ans. When we switch on current in coil A, it becomes an electromagnet and produces a magnetic field around coil B.

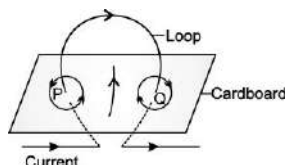
So, an induced current flows in coil B for a moment. When the current in coil A becomes steady, its magnetic field also becomes steady and the current in coil B stops.

When we switch off the current in coil A, then the magnetic field in coil B stops quickly and in this case an induced current flows in coil B in the opposite direction.

147. The diagram shows a current carrying coil passing through a cardboard sheet. Draw three magnetic lines of force on the board. State two factors on which magnitude of magnetic field at the centre depends.



Ans. Figure shows the magnetic lines of force due to current carrying coil.

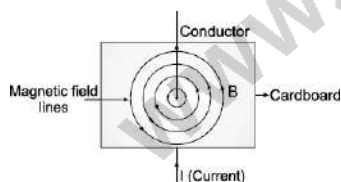


The magnitude of magnetic field at the centre of coil depends on : (a) the strength of current in the coil, and (b) the number of turns in the coil.

148. Answer the following question:

(i) A straight wire conductor passes vertically through a piece of cardboard sprinkled with iron filings. Copy the diagram and show the setting of iron filings when a current is passed through the wire in the upward direction and the cardboard is tapped gently. Draw arrows to represent the direction of the magnetic field lines.

(ii) Name the law which helped you to find the direction of the magnetic field lines.

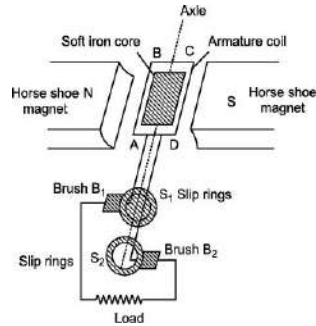


Ans. (i)

(ii) Right hand thumb rule.

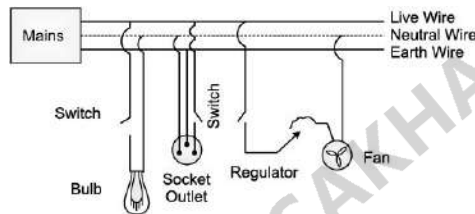
149. Draw a labelled diagram of an A.C. generator.

Ans. The diagram of an A.C. generator is shown in the figure given below :



150. Draw a labelled diagram with necessary switch, regulator etc. to connect a bulb, a plug socket outlet and a fan with the mains. In what arrangement have you connected these to the mains ?

Ans. The labelled diagram of the circuit is given below :



Numericals

151. Which of the following fuse ratings would be suitable for an electric motor of power 3 kW, if it is operated at 220 V supply?

(5 A, 10 A, 12 A, 15 A)

Sol. Here, $P = 3 \text{ kW} = 3000 \text{ W}$, $V = 220 \text{ V}$

Current drawn by motor,

$$I = \frac{P}{V}$$

$$= \frac{3000}{220} \text{ A}$$

$$= 13.6 \text{ A}$$

Hence, current rating of fuse to be used with this motor is 15 A.

152. A house has a main fuse of 5 A rating, 3 bulbs each of 100

W and 8 tube lights each of 40 W are used simultaneously. Calculate :

- (a) the current drawn from the mains of 220 V and
- (b) the number of additional bulbs each of the 60 W which can also be lighted?

Sol. (a) Total power of appliances used simultaneously

$$= (3 \times 100) + (8 \times 40)$$

$$= 300 + 320$$

$$= 620 \text{ W}$$

Voltage of mains,

$$V = 220 \text{ V}$$

Current drawn from mains,

$$I = \frac{P}{V} = \frac{620}{220} = 2.82 \text{ A}$$

$$(b) \text{ Excess current available} = 5 \text{ A} - 2.82 \text{ A} = 2.18 \text{ A}$$

Current drawn by each of 60 W bulb at 220 V,

$$I = \frac{P}{V} = \frac{60}{220} = 0.27 \text{ A}$$

Number of additional bulbs of 60 W which can be lighted,

$$n = \frac{\text{Excess current available}}{\text{Current drawn by each bulb}}$$

$$= \frac{2.18}{0.27} = 8.07$$

Therefore, eight more 60 W bulbs can be lighted.

153. A house has a main fuse of 5 A rating. What is the maximum number of 40 W tube lights which can be used at a 220 V supply?

Sol. Power of 1 tube light,

$$P = 40 \text{ W}$$

Voltage supply,

$$V = 220 \text{ V}$$

Therefore, current drawn by each tube light,

$$I = \frac{P}{V} = \frac{40}{220} = 0.18 \text{ A}$$

Therefore, maximum number of tube lights which can be used,

$$n = \frac{\text{Current rating of fuse}}{\text{Current drawn by each tube light}}$$
$$= \frac{5}{0.18} = 27.7$$

Hence, a maximum number of tube light which can be used = 27

154. An electric oven of 2 kW power rating is operated in a domestic electric circuit (220 V) that has a current rating of 5 A. What result do you expect? Explain.

Sol. Here, Power, $P = 2 \text{ kW}$

$$= 2 \times 1000 \text{ W} = 2000 \text{ W}$$

Supply voltage,

$$V = 220 \text{ V}$$

Therefore, current drawn by electric oven,

$$I = \frac{P}{V} = \frac{2000}{220} \text{ A} = 9 \text{ A}$$

The current drawn by the electric oven is 9 A, but the fuse has a 5 A current rating. Thus, when a 2 kW power rating electric oven is operated in the circuit having 5 A current rating fuse, the fuse will blow off and cut-off the power supply.

155. A fuse is rated 15 A. Can it be used with an electric heater of rating 3 kW, 220 V?

Sol. Here, Power, $P = 3 \text{ kW}$

$$= 3 \times 1000 \text{ W} = 3000 \text{ W}$$

Supply voltage,

$$V = 220 \text{ V}$$

\ Current drawn,

$$I = \frac{P}{V} = \frac{3000}{220}$$

$$= 13.6 \text{ A}$$

Since, current rating of fuse is 15 A, hence the fuse can be used with the electric heater.

156. A house has main fuse rating of 5 A. Three lamps each of 100 W and three CFL's each of 40 W are used simultaneously. Find :

(a) the current drawn from the mains of 220 V, and

(b) the number of additional CFL's each of 40 W which can also be lighted?

Ans. (a) Total power of appliances used simultaneously

$$P = (3 \times 100) + (3 \times 40)$$

$$= 420 \text{ W}$$

Voltage of mains,

$$V = 220 \text{ V}$$

Current drawn from the mains,

$$I = \frac{P}{V} = \frac{420}{220} = 1.91 \text{ A}$$

(b) Excess current available which can be safely used

$$= 5 \text{ A} - 1.91 \text{ A}$$

$$= 3.09 \text{ A}$$

\ Current drawn by each CFL of 40 W at 220 V,

$$I = \frac{P}{V} = \frac{40}{220} = 0.18 \text{ A}$$

\ Number of additional CFLs of 40 W each which can be lighted,

$$n = \frac{\text{Excess current available}}{\text{Current drawn by each tube light}}$$

$$= \frac{3.09}{0.18} = 17.2$$

\ Seventeen additional CFLs can be lighted.

157. A fuse is rated 8 A. Can it be used with an appliance of rating 2 kW, 220 V?

Sol. Power, $P = 2 \text{ kW} = 2 \times 1000 = 2000 \text{ W}$

Voltage supply,

$V = 220 \text{ volt}$

Current drawn by the appliance,

$$I = \frac{P}{V} = \frac{2000}{220} = 9.1 \text{ A}$$

No, the 8 A fuse cannot be used, because it will blow off as soon as the appliance is switched on.

Analysis and Evaluation Based Questions

158. Answer the following question:

(i) What type of magnetic field is produced due to a straight current carrying conductor?

(ii) The magnetic field lines produced by a straight solenoid resemble the magnetic field lines produced by another object. Identify that object.

Ans. (i) Magnetic field lines are concentric circular loops in a plane perpendicular to the straight conductor. The centres of the circular lines lie on the conductor.

(ii) The magnetic field produced due to a straight solenoid is similar

to that produced by a bar magnet.

159. Why does it become more difficult to move a magnet towards a coil when the number of turns in a coil have been increased?

Ans. It becomes more difficult to move a magnet towards a coil when the number of turns in the coil is increased because the induced current in the coil due to electromagnetic induction increases and the induced current opposes the motion of the magnet towards the coil.

160. When is the force experienced by a current-carrying conductor placed in a magnetic field largest?

[NCERT]

Ans. The force experienced by a current-carrying conductor placed in a magnetic field is largest when the current-carrying conductor is placed perpendicular to the direction of magnetic field.

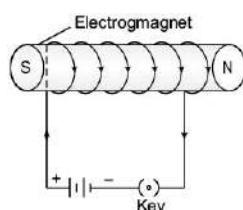
161. State the condition in each case of the magnitude of force on a current carrying conductor placed in a magnetic field to be (i) zero and (ii) maximum.

Ans. (i) The magnitude of force acting on a current carrying conductor placed in a magnetic field will be zero, when the current carrying conductor is in the direction of magnetic field.

(ii) The magnitude of force acting on a current carrying conductor placed in a magnetic field will be maximum, when the current carrying conductor is normal (perpendicular) to the magnetic field.

162. When an iron bar is placed inside a solenoid carrying current, it becomes a magnet as long as current flows through the solenoid. Such a magnet is known as electromagnet. In fact, the magnetic field inside the solenoid magnetises the soft iron bar placed in it, which acts as an electromagnet.

- (i) What type of core is used to make an electromagnet?
- (ii) State two ways by which the strength of an electromagnet can be increased.
- (iii) State one use of electromagnet.
- (iv) Basically electromagnet is a :
- (a) Magnet (b) Solenoid
(c) Wire (d) Coil



Ans. (i) Soft iron core.

(ii) 1. By increasing the number of turns in the winding on the soft iron core.

2. By increasing the strength of the current through the winding.

(iii) Electromagnet are used to lift heavy iron pieces.

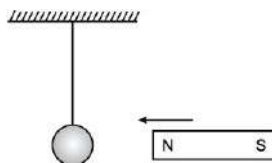
(iv) (b) Solenoid

163. How will you decide whether the magnetic field at a point is due to some current carrying conductor or due to earth?

Ans. Place a compass needle at the given point. If it stays in the North-South direction, then the magnetic field is due to earth. If the needle points along any direction other than North-South direction, then the field is due to some current carrying conductor.

164. A metallic wire loop is suspended freely and a bar magnet is brought near it as shown in the diagram.

What will be the direction of induced current in the wire loop when the magnet is moved towards it?

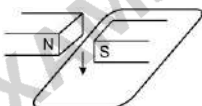


Ans. Anticlockwise from the side of a magnet. As when magnet is brought near it the magnetic flux increases so the induced current will flow in the direction so as to oppose the current. So, current will be anticlockwise.

165. The wire in the figure below is being moved downwards through the magnetic field, so as to produce induced current.

What would be the effect of :

- (i) moving the wire at a higher speed?
- (ii) moving the wire upwards rather than downwards?
- (iii) using a stronger magnet?
- (iv) holding the wire still in the magnetic field?



Ans. (i) The induced current increases at a higher speed.

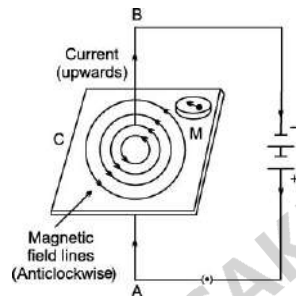
(ii) The induced current is reversed.

(iii) The induced current increases.

(iv) The induced current is zero.

166. Draw the pattern of magnetic field lines produced around a current carrying straight conductor passing perpendicularly through a horizontal cardboard. State and apply right-hand thumb rule to mark the direction of the field lines. How will the strength of the magnetic field change when the point where magnetic field is to be determined is moved away from the straight conductor? Give reason to justify your answer. **[Board Question]**

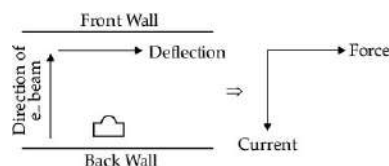
Ans. Maxwell's Right Hand Thumb rule states that if current carrying wire is imagined to be held in the right hand so that thumb points in the direction of current, then the direction in which fingers encircle the wire will give the direction of magnetic field lines around the wire. If we hold the current carrying straight wire so that thumbs in upward direction points the direction of current, the direction of magnetic field lines will be anticlockwise. The strength of magnetic field is inversely proportional to the distance of the point of observation from the wire. So, as we move away from the wire the strength of magnet decreases.



Magnetic field pattern due to a straight current-carrying wire

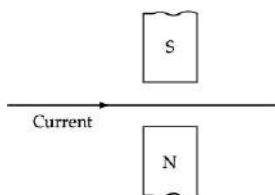
167. Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from back wall towards the front wall, is deflected by a strong magnetic field to your right side. What is the direction of magnetic field ?

Ans. As the electron beam moves from back wall towards the front wall, it implies that the current is travelling from front to back wall. Deflection towards right side indicate the direction of the force. Thus by using Fleming's left hand rule, the direction of the magnetic field would be top of the room towards the floor, *i.e.*, from top to bottom or downwards.



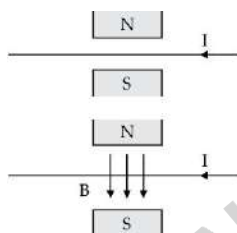
168. Which way does the wire carrying current in the given

figure tend to move ?

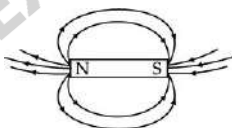


Ans. Applying Fleming's left hand rule, the wire carrying current tends to move upwards (out of the page).

169. A wire is placed between N and S poles of a magnet as shown in figure. If current flows in the wire as shown, in which direction does the wire tend to move?



Ans. The direction of magnetic field is from N-pole to S-pole; on applying Fleming's left-hand rule, the wire tends to move perpendicular to plane of paper upward.



Practical Based Questions

170. A student wound an insulated copper wire around a soft iron rod. He then connected one end to the rheostat and the other free end to the battery via a key. He closed the key and observes the deflection in the magnetic needle placed nearby. Now he altered the current using by reversing the connections of the battery and again noted the change in the deflection of the needle.

(i) Why do the student perform this activity ?

(ii) What did the student observe ?

(iii) Comment on the statement “a material in the middle of a current carrying coil gets magnetised”.

Ans. (i) The student conducted this activity to make an electromagnet.

(ii) The electrical current flowing through a coil will create a uniform magnetic field. This magnetic field causes the needle to turn. Reversing, the connections to the battery, reverses the direction of the current flow and the needle will point in the opposite direction.

(iii) When an iron rod is placed along the axis of a current carrying coil, it gets magnetised under the influence of the magnetic field produced by the coil through induction. But this magnetism lasts as long as the current supply is not withdrawn.

171. Answer the following question:

(i) A coil of insulated wire is connected to a galvanometer. What would be seen if a bar magnet with its south pole towards one face of the coil is :[Board Question]

(a) moved quickly towards it

(b) moved quickly away from it

(c) placed near its one face ?

These activities are then repeated with north pole of the magnet. What will be the observations ?

(ii) Name and define the phenomenon involved in above activities.

(iii) Name the rule which can determine the direction of current in each case.

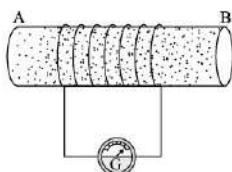
Ans. (i) A coil of insulated wire is connected to a galvanometer and if a bar magnet with its South pole towards one face of the coil is

(a) Moved quickly towards it, the galvanometer is deflected towards

the left.

(b) Moved quickly away from it, the galvanometer is deflected towards the right.

(c) If the magnet is held stationary inside the coil, the deflection of the galvanometer is zero as no change in flux.



If this activity is repeated with North pole of the magnet :

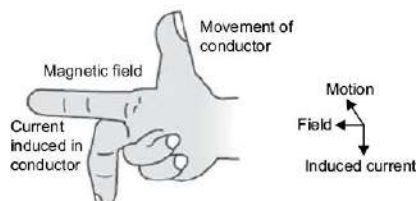
1. If the magnet is pushed into the coil, the galvanometer is deflected towards the right.

2. If the magnet is withdrawn from the coil, the galvanometer is deflected towards the left.

3. If the magnet is held stationary inside the coil, the deflection of the galvanometer is zero.

(ii) The phenomenon involved in this activity is electromagnetic induction. The production of electric current by moving a magnet inside a fixed coil of wire is called electromagnetic induction.

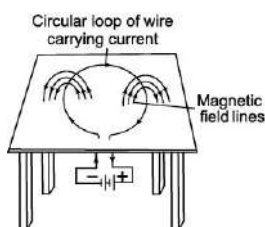
(iii) The direction of induced current is determined by 'Fleming's right hand rule'.



172. Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clock-wise. Apply the right hand rule to find out the direction of the magnetic field inside and outside the loop.

[NCERT]

Ans. Since, the current is flowing clockwise through a circular loop. The direction of magnetic field around the conductor can be found by using the right hand thumb rule. As the figure shows, the magnetic field would be towards the plane of the paper when it is inside the loop. On the other hand, the magnetic field would be away from the paper when it is outside the loop.



173. A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is:

(i) pushed into the coil ?

(ii) held stationary inside the coil ?

(iii) withdrawn from the coil ?

[NCERT]

Ans. (i) When a bar magnet is pushed into the coil, a momentary deflection is observed in the galvanometer.

(ii) When the bar magnet is held stationary inside the coil, there is no deflection in the galvanometer.

(iii) When the bar magnet is withdrawn from the coil, the deflection in the galvanometer is in the opposite direction.



174. Using the following informations form a pathway that defines the working of the electric motor. And also include informations that are not mentioned below to complete it.

Battery, Horse-shoe magnet, vertical position, Commutator,

rectangle coil, Magnetic force, horizontal position.

Ans. Rectangle coil is placed between horse-shoe magnet → **Coil is connected to the battery** through brush and commutator → **The current flow through the coil which is placed between magnetic field** → **Rectangle coil rotates** from the horizontal position → **The current stops flowing when the coil attains vertical position** because the brush and the commutator ring will not be in connection → Though the coil keeps **rotating because of the momentum** from the earlier rotation → Now the coil attains horizontal position → Coil again starts to rotate → With the help of **Fleming's left-hand rule**, the direction of the rotation of the coil is determined.

175. Using the following informations form an instruction to draw magnetic lines. And also include informations that are not mentioned below to complete it.

Magnetic compass, repel, board, Bar magnet, Needle, attract, Merge, Emerge.

Ans. Place a board → Place a bar magnet in the **middle** → Mark the boundary of the bar magnet → Place the magnetic compass near the **North Pole of the bar magnet** → **North side of the needle points away from the north side of the magnet** → Same poles repel each other → different poles attract each other → Now place the **pin in the direction the needle points** → Move the compass to **new position where south pole points the previous position of the north pole** → Repeat the procedure → Magnetic lines emerge at north pole → Magnetic lines merge at south pole → This forms **concentric magnetic lines around bar magnet**.

176. What would be the inference made by Prashant about the magnetic strength when current passed through a circular coil produces a magnetic field?

Ans. Magnetic field lines form in concentric circles around a cylindrical current-carrying conductor, such as a length of wire. The

strength of the magnetic field at the centre of a circular coil carrying current is inversely proportional to the radius of the circular coil *i.e.*, the field strength reduces as the radius of the coil increases.

177. Selena measures the magnetic field produced by an infinitely long wire, a rectangular loop, a solenoid of finite length, a circular loop where all the four carries the same amount of current. After her experiment, she tends to notice that the magnetic field produced by certain cases is similar to the magnetic field produced by the bar magnet. Find out the cases in which both the magnetic fields are equal ?

Ans. Solenoid is the only thing which is tightly-packed and wound in terms of close loops. If current is passed inside a solenoid which is of finite length, the closely packed loops inside it produce a magnetic field which resembles the magnetic field of a bar magnet. Other than this, the circular or rectangular loop doesn't produce much magnetic field as that of a bar magnet.

178. Blair wants to measure magnetic field. Suggest her a better instrument which would measure magnetic field approximately.

Ans. Blair can use Flux meter to measure the magnetic field since it can be used to predict the flux amount produced in the permanent magnet due to its low controlling torque and its heavy electromagnetic damping. It is better than a ballistic galvanometer since it has high torque and its accuracy is less.

179. Using the following informations form an instruction to draw magnetic lines. And also include informations that are not mentioned below to complete it.

Magnetic compass, repel, board, Bar magnet, Needle, attract, Merge, Emerge.

Ans. Place a board $\square \rightarrow$ Place a bar magnet in the middle $\square \rightarrow$ Mark the boundary of the bar magnet $\square \rightarrow$ Place the magnetic compass near the North Pole of the bar magnet $\square \rightarrow$ North side of the needle

points away from the north side of the magnet □→ Same poles repel each other □→ different poles attract each other □→ Now place the pin in the direction the needle points □→ Move the compass to new position where south pole points the previous position of the north pole □→ Repeat the procedure □→ Magnetic lines emerge at north pole □→ Magnetic lines merge at south pole □→ This forms concentric magnetic lines around bar magnet.

180. What would be the inference made by Prashant about the magnetic strength when current passed through a circular coil produces a magnetic field?

Ans. Magnetic field lines form in concentric circles around a cylindrical current-carrying conductor, such as a length of wire. The strength of the magnetic field at the centre of a circular coil carrying current is inversely proportional to the radius of the circular coil *i.e.*, the field strength reduces as the radius of the coil increases.

181. Using the following informations form a pathway to determine the direction of the motor in an electric motor. And also include informations that are not mentioned below to complete it.

Motion of the conductor, Direction of current, three fingers, Magnetic field, Index finger, motion of the conductor.

Ans. Three fingers □→ **In left-hand** □→ Index finger □→ Middle finger □→ Thumb □→ **At right angle** □→ **Middle finger represents** the direction of the current □→ **Index finger represents** the direction of the magnetic field □→ **Thumb represents** the direction of the motion of the conductor □→ Used to define the direction of the motion of the conductor in electric motor □→ Also known as motor rule.

182. Using the following informations form a pathway that defines the working of the electric motor. And also include informations that are not mentioned below to complete it.

Battery, Horse-shoe magnet, vertical position, Commutator, rectangle coil, Magnetic force, horizontal position.

Ans. Rectangle coil is placed between horse-shoe magnet □→ **Coil is connected to the battery** through brush and commutator □→ **The current flows through the coil which is placed between magnetic field** □→ **Rectangle coil rotates** from the horizontal position □→ **The current stops flowing when the coil attains vertical position** because the brush and the commutator ring will not be in connection □→ Though the coil keeps **rotating because of the momentum** from the earlier rotation □→ Now the coil attains horizontal position □→ Coil again starts to rotate □→ With the help of **Fleming's left-hand rule**, the direction of the rotation of the coil is determined.

183. Using the following informations form a pathway to determine the direction of the motor in an electric motor. And also include informations that are not mentioned below to complete it.

Motion of the conductor, Direction of current, Three fingers, Magnetic field, Index finger, motion of the conductor.

Ans. Three fingers → **In left-hand** → Index finger → Middle finger → Thumb → **At right angle** → **Middle finger represents** the direction of the current → **Index finger represents** the direction of the magnetic field → **Thumb represents** the direction of the motion of the conductor → Used to define the direction of the motion of the conductor in electric motor → Also known as **motor rule**.

184. For experimenting purpose, Ram made two electromagnets by wrapping a few turns of wire on one nail and doubled the number of turns of wire for the other nail and let the same amount of electric current passed through it. From his inference, which one tends to have larger magnetic strength ?

Ans. The number of turns of the wire wrapped over the two iron nails

is in the ratio of 2 : 1. Electromagnetic strength has a direct relationship with the number of turns wrapped over it. The strength of electromagnet increases with increase in a number of turns of the wire wrapped over the nail and the current passing through them. Hence, the one with more number of turns tends to have more magnetic strength.

185. Suggest a method by which Simran could determine the direction of the magnetic field in a generator.

Ans. Fleming's right-hand rule is generally used for determining the direction of the current, magnetic field and the motion of the conductor in a generator. Here, one can determine the directions by placing the thumb, forefinger and the middle finger of the right-hand perpendicular to each other. The thumb represents the motion of the conductor, the forefinger and the middle finger represent the direction of the magnetic field and the induced current respectively.

Miscellaneous Questions

186. Draw the pattern of magnetic field lines around a current carrying straight conductor. How does the strength of the magnetic field produce change :

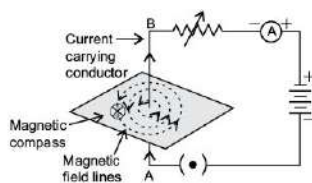
[Board Question]

(i) with the distance from the conductor ?

(ii) with an increase in current in a conductor ?

Ans. (i) The strength of a magnetic field is inversely proportional to the square of the distance from the conductor *i.e.*, strength of an electric field decreases with increase in distance.

(ii) The strength of the magnetic field is directly proportional to the current passing in the wire *i.e.*, strength of the magnetic field increases with the increase in current.



187. The magnetic field in a given region is uniform. Draw a diagram to represent it.

Ans.

188. How will the direction of force be changed, if the current is reversed in the conductor placed in a magnetic field ?

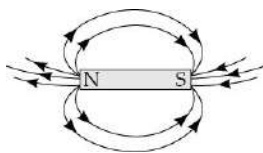
Ans. The direction of the force will be reversed.

189. Write the factors on which the strength of magnetic field produced by a current carrying solenoid depends ?

Ans. The strength of magnetic field produced by a current carrying solenoid depends on :

1. The number of turns in the solenoid : Larger the number of turns in the solenoid, greater will be the magnetism produced.
2. The strength of current in the solenoid : Larger the current passed through solenoid, stronger will be the magnetism produced.
3. The nature of core material used in making solenoid : The use of soft iron rod as core in a solenoid produces the stronger magnetism.

190. Draw magnetic field lines around a bar magnet.



Ans.

191. List the properties of magnetic lines of force.

Ans. Properties of magnetic field lines:

1. Magnetic field lines follow the direction from the North Pole to the South Pole.

2. Magnetic field lines always form closed circular loops.
3. Magnetic field lines do not cross one another.
3. Closer the field lines; stronger is the magnetic field and vice-versa.
4. Magnetic field lines are closer near the poles; which shows greater strength of magnetic field near the poles.

192. Name some devices in which electric motors are used.
[NCERT]

Ans. Electric fan, mixer grinder, tape recorder, CD player, hard disk drive, washing machine, cooler, toy car, vacuum cleaner, etc., are some devices in which electric motor is used.

193. List three sources of magnetic fields.

Ans. Three methods of producing magnetic fields are as follows:

1. By permanent magnet.
2. By electromagnet
3. By current carrying conductors.

194. (i) State Fleming's left hand rule.

[Board Question]

(ii) Write the principle of working of an electric motor.

(iii) Explain the function of following parts of an electric motor:

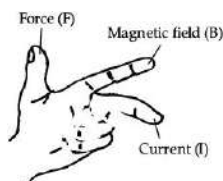
(a) Armature

(b) Brushes

(c) Split ring.

Ans. (i) According to this rule, stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb

will point in the direction of motion or the force acting on the conductor.



(ii) **Principle of electric motor** : When a coil carrying current is placed in a magnetic field, it will experience a force. As a result of this force, the coil begins to rotate.

(iii) (a) **Armature**: It creates a magnetic field and the second role is to generate electromotive force.

(b) **Brushes**: Carbon brushes are used to make contact with the rotating rings of the commutator and through them to supply current to the coil.

(c) **Split ring**: Split rings are used to reverse the direction of current flowing through the coil every time the coil just passes the vertical position during a revolution.

195. Explain different ways to induce current in a coil.

[NCERT]

Ans. The different ways to induce current in a coil are :

1. By moving the coil in a magnetic field.
2. By changing the magnetic field around the coil.

196. Complete the following sentences :

- (i) A current carrying solenoid behaves like a _____.
- (ii) A current or a moving charge produces a _____ around it.

Ans. (i) bar magnet (ii) magnetic field.

197. What are the factors affecting the strength of an electromagnet ?

Ans. Factors affecting the strength of an electromagnet : **The strength of an electromagnet depends on :**

1. The number of turns in the coil : If we increase the number of turns in the coil, the strength of electromagnet increases.
2. The current flowing in the coil : If the current in the coil is increased, the strength of electromagnet increases.
3. The length of air gap between its poles : If we reduce the length of air gap between the pole of an electromagnet, then its strength increases.

198. Complete the following sentences:

- (i) A fuse is connected in _____ with the _____ wire.
- (ii) Higher the current rating _____ is the fuse wire.
- (iii) A current carrying solenoid behaves like a _____
- (iv) A current or a moving charge produces a _____ around it.

Ans. (i) series, live

(ii) thicker

(iii) bar magnet

(iv) magnetic field

Self-Assessment

199. Answer the following questions:

- (i) What are magnetic field lines?
- (ii) List any two properties of magnetic field lines.

200. Consider a straight conductor passing vertically through a card-board having some iron filings sprinkled on it. A current is passed in the conductor in downward direction and the card-board is gently

tapped. Show the setting of iron filings on the card-board and draw arrows to represent the direction of magnetic field lines.

201. A coil of insulated copper wire is connected to a galvanometer. What will happen if the coil is :

- (i) pushed towards a bar magnet.
- (ii) taken away from a bar magnet.
- (iii) held stationary near a bar magnet.

202. How can you demonstrate that a momentary current?

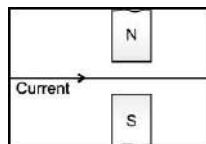
203. The presence of magnetic field at a point can be detected by means of :

- (a) a solenoid
- (b) a compass needle
- (c) a bar magnet
- (d) a current carrying wire

Ans. (b) a compass needle

204. Name and state the rule through which the polarity at the ends of a current carrying solenoid is determined.

205. Which way does the wire carrying current in given figure tend to move ?



Ans. Downward (into the page)

206. The direction of induced current is obtained by :

- (a) Right hand thumb rule
- (b) Fleming's left hand rule

(c) Fleming's right hand rule

(d) Clock face rule.

Ans. (c) Fleming's right hand rule

207. State the rule which gives the direction of a magnetic field produced by a straight current carrying conductor.

208. State the rule which determines the direction of induced current in electromagnetic induction.

209. Why is soft iron generally used as the core of an electromagnet ?

210. If you hold a coil of wire next to a magnet, no current, flows in the coil. What else is needed to induce a current? Explain your answer.

211. Assertion : The force experienced by a current carrying conductor placed in a magnetic field is largest when they both are perpendicular to each other.

Reason : According to Fleming's Right Hand Rule, the magnetic field is largest when both forces are perpendicular to each other.

212. What is the difference between direct current and alternating current?

213. Two fuse wires of the same length are rated 5 A and 10 A. Which of the fuse wires is thicker?

214. An electrical appliance draws a current of 2.5 A from the mains.

(i) What is the appropriate value of the fuse to be fitted in its circuit?

(ii) What will happen if a 15 A fuse is fitted in its circuit?

215. Why is the top pin in a three pin plug, thicker and longer than the other two pins ?

216. While earthing an electric appliance, the paint from the metallic

body of the appliance where the electric contact is made has to be removed. Explain the reason.

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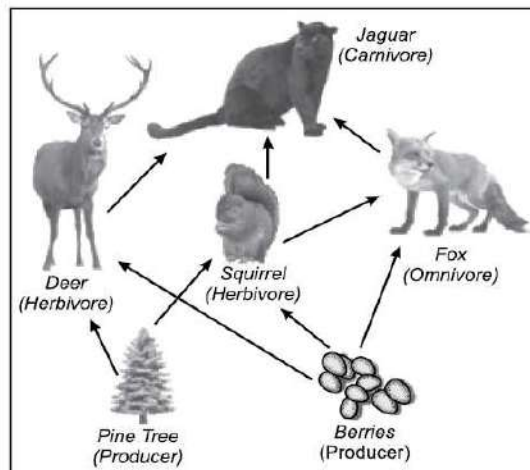
Our Environment

Chapter
15

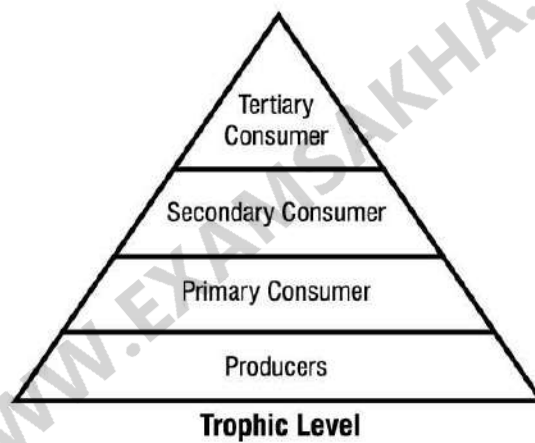
Summary

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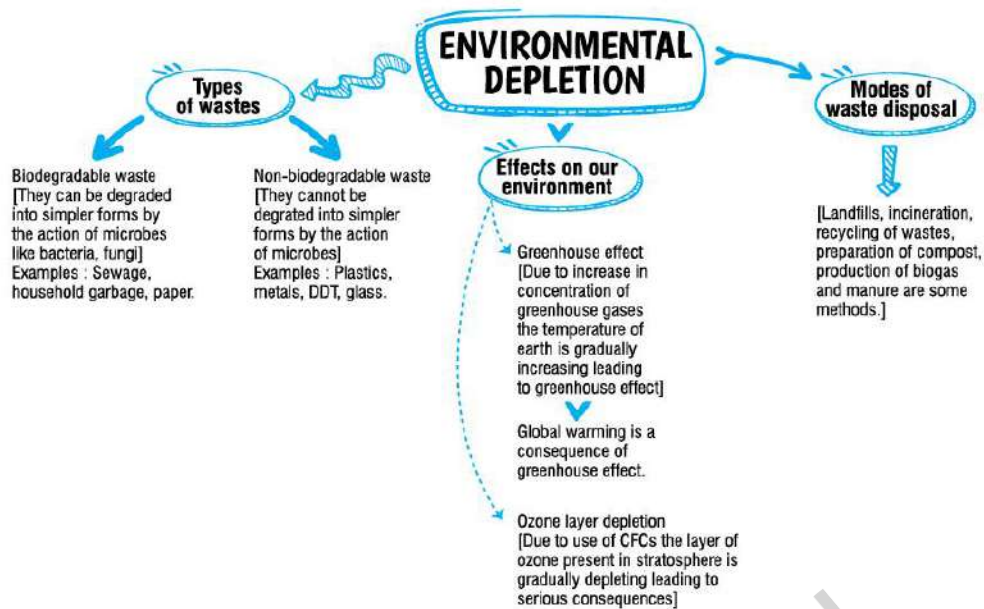
- A food chain shows one path how energy in form of food flows from producers to consumers.
- A food web shows many paths i.e., it is a network of food chains where an organism eats several types of organisms or eaten by many different organisms.



- The distinct sequential steps in the food chain where transfer of energy occurs are referred to as different trophic level, which is represented as under.



- Energy flow in an ecosystem is unidirectional i.e., it flows from autotrophs to herbivores to secondary consumers, tertiary consumers in one direction.
- At each trophic level some amount of energy is lost. Lindeman suggested a Ten percent rule which states that the rate of transfer of energy from one trophic level to the next trophic level is of the order of 10%.
- For example if energy produced by a green plant is 100 calories only 10 calories is available to herbivores then 1 calorie to secondary consumers and very less energy i.e., 0.1 calorie to tertiary consumers. So at each trophic level the energy goes on decreasing hence a food chain or food web consists of 3-4 levels or maximum 5.
- Biomagnification is the process which involves the progressive increase in the concentration of toxic or harmful substances at different trophic levels. So the organisms that are at the top of food chain have accumulated a maximum concentration of harmful chemicals in their body. Example : Accumulation of pesticides like DDT.



- Ozone layer prevents the harmful UV rays of sun from entering to the earth's surface.
- CFCs which is the main cause of depletion of ozone layer and is found mainly in aerosol sprayers, refrigerators, air-conditioners etc.
- The depleting ozone layer has many harmful consequences like it causes cancer, causes genetic variations due to mutation, damages our eyes, decline of photosynthesis rate in plants.
- The first ozone hole was discovered over Antarctica.

Definitions

1. Ecosystem: It is the structural and functional unit of biosphere which comprises of both biotic and abiotic components that interact with each other

to form a stable and self-supporting system.

2. Natural ecosystem: The ecosystems which operate themselves in nature without any interference of human beings are called natural ecosystems.

3. Artificial ecosystem: The ecosystem which is maintained by human beings like croplands, aquarium etc. is called artificial ecosystem.

4. Abiotic components: The non-living physio-chemical factors like soil, humidity, sunlight, rainfall, temperature etc. are the abiotic components.

5. Biotic components: The living organisms like autotrophs, heterotrophs form the biotic components.

6. Food chain: The sequential interlinking of organisms involving transfer of food energy starting with a producer through a series of organisms where one is eaten by the other is called a food chain.

7. Trophic levels: The distinct sequential steps in the food chain where transfer of energy occurs are referred to as trophic levels.

8. Food web: A network of food chains which are interconnected at various trophic levels to form a number of feeding connections among different organisms is called a food web.

9. Biodegradable wastes: The wastes which get degraded in a natural process by the action of microbes into simpler forms are called biodegradable wastes. Example, food waste, human waste, paper waste, manure, sewage etc.

10. Non-biodegradable wastes: The wastes which cannot be degraded by the action of microbes in a natural way and they persist in environment for a longer period of time are called non-biodegradable wastes. Examples, Glass, metal, batteries, plastic bottles, tetra packs.

Multiple Choice Questions

11. The _____ is the functional unit of environment.

- (a) genus
- (b) ecosystem
- (c) class
- (d) biome

Ans. (b) ecosystem

Explanation :

The ecosystem is the structural and functional unit of the environment through which various biotic and abiotic components interact with one another in relation to their surroundings.

12. _____ is not an abiotic factor.

- (a) Humidity
- (b) Animals
- (c) Temperature
- (d) Altitude

Ans. (b) Animals

Explanation :

Both plants and animals are the biotic components of a habitat as they are the species that live there. The abiotic components of the ecosystem are non-living materials like rocks, soil, air, and water.

13. _____ are biotic factors.

- (a) Mountains
- (b) Rocks
- (c) Grass
- (d) All of these

Ans. (c) Grass

Explanation :

Any living component that impacts another organism or shapes the environment is referred to as a biotic component, or biotic factor. Animals, plants, grass, fungus, bacteria, and protists are examples of biotic factors.

14. A _____ is considered a terrestrial ecosystem.

- (a) ocean
- (b) pond

(c) underground caves

(d) forest

Ans. (d) forest

Explanation :

A terrestrial ecosystem is a land-based population of species that includes biotic and abiotic interactions in a specific area. Therefore a forest is considered a terrestrial ecosystem.

15. Which of the following is an abiotic component of the ecosystem?

(a) Lichens on a bare rock

(b) Weathered rock

(c) Planktons in a pond

(d) Sea-weed

Ans. (b) Weathered rock

Explanation :

Weathered rock is an abiotic or non-living component of the ecosystem.

16. Lakes and ponds do not require cleaning but an aquarium does because

(a) an aquarium is an artificial and a complete ecosystem.

(b) lakes and ponds are natural and complete ecosystems.

(c) an aquarium possesses a pool of decomposers.

(d) lakes do not possess any decomposers and thus BOD always remains low.

Ans. (b) lakes and ponds are natural and complete ecosystems.

Explanation :

Lakes and ponds do not require cleaning but an aquarium does because an aquarium is an artificial ecosystem. It is complete and lacks natural decomposers.

17. Four students gave 4 different statements about ecosystem. Who is incorrect?

Student A: "Energy can be recycled in an ecosystem."

Student B: "Matter cannot be recycled in an ecosystem."

Student C: "Energy cannot be recycled but matter can be recycled in an ecosystem."

Student D: "Neither energy nor matter can be recycled in an ecosystem."

(a) Both students A and B

(b) Students A, B and D

(c) Student C

(d) Students A and C

Ans. (b) Students A, B and D

Explanation :

In an ecosystem, the sun is the only source of energy. The energy is not recycled, but the organic matter, which passes from one trophic level to the next, is recycled by the action of decomposers.

18. Fishes living in a crop field with standing water are the part of a/an _____ ecosystem.

(a) natural

(b) artificial

(c) indigenous

(d) none of these

Ans. (b) artificial

Explanation :

Crop fields are man-made ecosystems. If these have standing water as in the case of rice field, they can be used to culture fish. The fish in this water would be the part of an artificial ecosystem.

19. Which of the following is NOT a type of natural ecosystem?

- (a) Sea
- (b) Crop field
- (c) Lakes and ponds
- (d) Estuaries

Ans. (b) Crop field

Explanation :

A crop field is made by humans. Hence, it is not a type of natural ecosystem.

20. Which of the following statements is incorrect ?

- (a) All green plants and blue green algae are producers.
- (b) Green plants get their food from organic compounds.
- (c) Producers prepare their own food from inorganic compounds.
- (d) Plants convert solar energy into chemical energy.

Ans. (b) Green plants get their food from organic compounds.

Explanation :

Green plants and algae are both producers which means that they can make their own food with the help of inorganic substances and sun energy, through the process of photosynthesis.

21. _____ are producers.

- (a) Amoeba
- (b) Mushrooms
- (c) Sunlight
- (d) Green plants

Ans. (d) Green plants

Explanation :

Green plants are producers. They produce their own food, which provides

them with the energy they require to grow, reproduce, and survive. They are the only living beings on earth capable of producing their own supply of food energy, which makes them unique.

22. The % of solar radiation absorbed by all the green plants for the process of photosynthesis is about:

[NCERT Exemplar]

- (a) 1%
- (b) 5%
- (c) 8%
- (d) 10%

Ans. (a) 1%

Explanation :

For the process of photosynthesis, green plants capture roughly 1% of the energy of sunlight that falls on their leaves. This energy is converted into chemical energy, which is then used to make food.

23. All the organisms are not capable of utilising the sun's energy directly for meeting their energy requirements. This gap is filled by:

- (i) all green plants
 - (ii) some species of bacteria
 - (iii) algae
 - (iv) all bacterial species and plant species
- (a) (ii) and (iv)
 - (b) (i) and (iii)
 - (c) (i), (ii) and (iii)
 - (d) Only (i)

Ans. (c) (i), (ii) and (iii)

Explanation :

All green plants, some species of bacteria and green algae are capable of converting sunlight into a useful form by the process of photosynthesis.

24. Which of the following would be affected by the decrease in the producer population?

- (a) All the organisms in the ecosystem.
- (b) The organisms in the next trophic level.
- (c) The organisms at the highest trophic level.
- (d) None of the organisms in the food chain will be affected.

Ans. (a) All the organisms in the ecosystem.

Explanation :

A decrease in the population of producers would directly and indirectly affect all the organisms in that ecosystem.

25. Which of the following statements is correct?

- (a) All plants and bacteria are producers.
- (b) All green plants and certain bacteria are producers.
- (c) Only some species of green plants and all bacteria are producers.
- (d) Only green plants are producers.

Ans. (b) All green plants and certain bacteria are producers.

Explanation :

All green plants and certain bacteria are producers in an ecosystem.

26. In _____ presence of _____, along with sunlight is required to make organic compounds.

- (a) producers; chlorophyll
- (b) decomposers; chlorophyll
- (c) producers; carbon
- (d) consumers; carbon

Ans. (a) producers; chlorophyll

Explanation :

In producers, the presence of chlorophyll, along with sunlight is required to produce glucose.

27. The decomposers in an ecosystem:

[NCERT Exemplar]

- (a) convert inorganic material to simpler forms.
- (b) convert organic material to inorganic forms.
- (c) convert inorganic materials into organic compounds.
- (d) do not break down organic compounds.

Ans. (b) convert organic material to inorganic forms.

Explanation :

Decomposers in an ecosystem transform organic material into inorganic forms, which are then re-used by plants in the soil. Decomposers eat dead bodies, waste products, and organisms.

28. What will happen if deer is missing in the food chain given below ?

[NCERT Exemplar]

Grass → Deer → Tiger

- (a) The population of tiger increases.
- (b) Tiger will start eating grass.
- (c) The population of grass decreases.
- (d) The population of tiger decreases and the population of grass increases.

Ans. (d) The population of tiger decreases and the population of grass increases.

Explanation :

The tiger is a secondary consumer which eats deer. If the deer is missing, there will be no food for the tiger. So, if deers are missing, the population of grass will increase.

29. Food chain does not comprise of which of the following groups of organisms?

- (i) Grass, lion, rabbit, wolf
 - (ii) Plankton, man, fish, grasshopper
 - (iii) Wolf, grass, snake, tiger
 - (iv) Frog, snake, eagle, grass, grasshopper
- (a) (i), (iii)
 - (b) (iii), (iv)
 - (c) (ii), (iii)
 - (d) (i), (iv)

Ans. (c) (ii), (iii)

Explanation :

The flow of energy from one organism to another taking part at various biotic levels forms a food chain. A food chain describes the feeding relationships between the organisms within that ecosystem. Food chain (ii) is an aquatic food chain so grasshopper cannot be a part of it. In food chain (iii), wolf, snake and tiger all are carnivores. There is no herbivore to eat grass or herbivore is missing from the chain.

30. Why do all food chains start with plants?

[CBSE Question Bank]

- (a) Because plants are easily grown.
- (b) Because plants are nutritious.
- (c) Because plants can produce its own energy.
- (d) Because plants do not require energy.

Ans. (c) Because plants can produce its own energy.

Explanation :

A food chain starts with a plant. This is because every food chain needs the presence of organisms that can manufacture their own food. Green plants are

called as producers as they can synthesis their own food in the presence of sunlight and therefore, most of the food chains start with plants.

31. Which of the following limits the number of trophic levels in a food chain ?[NCERT Exemplar]

- (a) Decrease in energy at higher trophic levels
- (b) Deficient food supply
- (c) Polluted air
- (d) Water

Ans. (a) Decrease in energy at higher trophic levels

Explanation :

A considerable amount of energy is used to keep organisms alive at each trophic level. As an organism progresses through the trophic levels, it receives less and less energy. The number of trophic levels is restricted to 3-4 since the energy available for the next level is insufficient to keep the organisms alive after that.

32. Which of the following constitute a food chain ?

- (a) Grass, wheat and mango
- (b) Grass, goat and human
- (c) Goat, cow and elephant
- (d) Grass, fish and goat

Ans. (b) Grass, goat and human

Explanation :

A food chain is a group of creatures that are all dependent on one another for food. Grass is the food chain's primary producer, goats eat grass (herbivores), and humans eat goat (carnivore).

33. If a grasshopper is eaten by a frog, then the energy transfer will be from:

- (a) producer to decomposer

- (b) producer to primary consumer
- (c) primary consumer to secondary consumer
- (d) secondary consumer to primary consumer

Ans. (c) primary consumer to secondary consumer

Explanation :

If a frog eats a grasshopper, energy is transferred from primary consumer to secondary consumer in a food chain. Grasshoppers eat producers, such as grass and plants. So, it is classified as a primary consumer. As a result, frogs, which eat grasshoppers, become the secondary consumer.

34. Organisms of a higher trophic level which feed on several types of organisms belonging to a lower trophic level constitute the : [NCERT Exemplar]

- (a) food web
- (b) ecological pyramid
- (c) ecosystem
- (d) food chain

Ans. (a) food web

Explanation :

A food web is a network of interrelated food chains. In a food chain, a creature can occupy more than one trophic level. It eats a variety of organisms of lower trophic level and may be devoured by organisms of higher trophic level.

35. In the given food chain, suppose the amount of energy at fourth trophic level is 5 kJ, what will be the energy available at the producer level?

Grass → Grasshopper → Frog → Snake → Hawk

- (a) 5 kJ
- (b) 50 kJ
- (c) 500 kJ

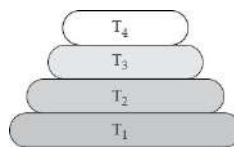
(d) 5000 kJ

Ans. (d) 5000 kJ

Explanation :

According to the 10 per cent law only 10% of the energy available in a trophic level is passed on to the next trophic level. As a result, if the energy available at the fourth trophic level is 5 kJ, then the energy available at the producer level is 5,000 kJ: $5 \rightarrow 50 \rightarrow 500 \rightarrow 5,000$.

36. At which trophic level is maximum energy available in the figure given below for the various trophic levels in a food chain ?



(a) T₄

(b) T₂

(c) T₁

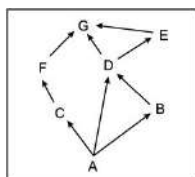
(d) T₃

Ans. (c) T₁

Explanation :

All ecosystems are characterised by a unidirectional flow of energy. At each trophic level, most of the energy available is utilised for respiration and excretion and only ten percent of the available energy is passed on to the next level because only ten percent of the available energy can be passed on to the next trophic level, higher trophic levels have substantially less energy content and the number of trophic levels in a food chain is limited. The lower the trophic level the higher will be energy content. Hence, the greatest amount of energy is expected to be in trophic level T₁.

37. In the food web, which two organisms are competing for food? [\[CBSE Question Bank\]](#)



- (a) A and B
- (b) A and C
- (c) D and F
- (d) B and D

Ans. (d) B and D

Explanation :

When members of various species compete for the same resource in an environment, competition develops. Here, B and D are competing for the same resources or food in this food web.

38. In an area, the frog population decreased due to the spread of some diseases. Frogs are prey for snakes, but no major effect was seen in the population of snakes. Instead, there was a decline in the pesticide sale. What could be the possible reason?

- (a) Frogs stopped eating grains due to their infection.
- (b) There is no relation between the decrease in frog population and pesticide sales.
- (c) Both frog and snake migrated to some other area.
- (d) Snakes now depended on other organisms that must be the pests for the crops grown.

Ans. (d) Snakes now depended on other organisms that must be the pests for the crops grown.

Explanation :

Given scenario is an example of a food web. Infection in frogs could have possibly made snakes shift towards another prey such as rats. Rats destroy the stocked grains. When snakes started eating rats, the sale of pesticides against rats decreased.

39. Supriya listed some important points for energy transfer in a food chain. She made an error. Point out that error.

- (i) Primary consumers transfer 10% of energy to the next trophic level in the food chain.
- (ii) The population at a lower trophic level is greater than the population at a higher trophic level.
- (iii) Producers depend entirely on sunlight to make food.
- (iv) Decomposers work at a double pace to convert complex molecules into simpler forms in case of an epidemic.

- (a) Only (ii)
- (b) Only (iv)
- (c) (i) and (iii)
- (d) All of these

Ans. (b) Only (iv)

Explanation :

The populations at a lower trophic are greater in number than the populations at higher trophic level to fulfil the energy demand of the latter. The population of decomposers might vary but not the pace.

40. Which of the statements given below is correct?

- (a) Omnivores are in the middle of the food chain.
- (b) Omnivores are either in the middle or at the top of the food chain.
- (c) Omnivores are at the top of the food chain.
- (d) Omnivores are capable of modifying the natural food chain.

Ans. (b) Omnivores are either in the middle or at the top of the food chain.

Explanation :

Omnivores can consume plants (producers) as well as animals (consumers).

They can be at the middle just after plants or at the top of the food chain.

41. In an ecosystem, if a species of secondary consumers is affected by a deadly disease, this will affect the ecosystem by _____.

- (a) giving more opportunity of survival to the prey of the secondary consumer
- (b) giving more opportunity of survival to the predators of the secondary consumer
- (c) disturbing the food chain of which the secondary consumer is a part
- (d) decreasing the population of the producers

Ans. (c) disturbing the food chain of which the secondary consumer is a part

Explanation :

Change in the population of the organism at any trophic level can distress the whole food chain in the ecosystem. This can be detrimental to the balance of energy transfer in the ecosystem.

42. Identify A, B and C in the given food chain.

Sunlight → A → B → C → Large fish

- (a) A: Phytoplanktons; B: Zooplanktons; C: Small fish
- (b) A: Zooplanktons; B: Phytoplanktons; C: Small fish
- (c) A: Zooplanktons; B: Small fish; C: Phytoplanktons
- (d) A: Phytoplanktons; B: Small fish; C: Zooplanktons

Ans. (b) A: Phytoplanktons; B: Zooplanktons; C: Small fish

Explanation :

The correct sequence of the food chain is: Sunlight → Producers (Phytoplanktons) → Herbivores (Zooplanktons) → Carnivores (Small fish) → Top Carnivores (Large Fish)

43. The most important trophic level in a terrestrial food chain is:

- (a) the one with the highest energy requirement per individual

- (b) the one with the least energy requirement per individual
- (c) the one with moderate energy requirement per individual
- (d) not dependent on the energy requirement per individual, thus, all are equally important

Ans. (b) not dependent on the energy requirement per individual, thus, all are equally important

Explanation :

In any food chain, all the trophic levels are of equal importance. They maintain ecological balance.

44. Which food chain is NOT a part of the given food web?



- (a) Plants → Frog → Snake → Peacock
- (b) Plants → Frog → Snake → Owl
- (c) Hydrophytes → Crabs → Fish → Hawk → Tiger
- (d) Both (a) and (b)

Ans. (b) Plants → Frog → Snake → Owl

Explanation :

The given image shows a food web in the ecosystem. A food web is formed when the different food chains are interconnected in the ecosystem. Food chain comprising:

Plants → Frog → Snake → Owl

is not the part of this food web.

45. The maximum number of levels in a food chain can be:

- (a) 7 – 8
- (b) 5 – 6
- (c) 3 – 4
- (d) 1 – 3

Ans. (c) 3 – 4

Explanation :

At each trophic level, some amount of energy is lost; hence, food chains can have maximum 3-4 trophic levels. After four levels, there is no significant amount of energy left to pass on.

46. A large number of food chains are interconnected because the organisms at the higher trophic level can depend on different types of organisms at the lower trophic level. The existence of this phenomenon in nature is called:

- (a) food chain
- (b) ecological balance
- (c) ecological pyramid
- (d) food web

Ans. (d) food web

Explanation :

Different food chains interconnect to form food webs.

47. Which of these is NOT a correct sequence of a food chain?

- (a) Phytoplanktons → Zooplanktons → Fish
- (b) Seed grains → Rodents → Eagle
- (c) Grass → Insects → Frog → Snake
- (d) Seaweed → Zooplanktons → Phytoplanktons

Ans. (d) Seaweed → Zooplanktons → Phytoplanktons

Explanation :

Phytoplanktons are the primary producers. They should occupy the first trophic level in the aquatic food chain.

48. Flow of energy in an ecosystem is always:

[NCERT Exemplar]

- (a) uni-directional
- (b) bid-irectional
- (c) multi-directional
- (d) no-specific direction

Ans. (a) uni-directional

Explanation :

The energy flow in an ecosystem is always unidirectional. Energy coming from the sun in most natural ecosystems, is used by producers, and then passed on to subsequent trophic levels in the form of food. Energy never flows in the reverse direction, it always gets transferred from the prey to the predator.

49. In an ecosystem, the 10% of energy available for transfer from one trophic level to the next is in the form of :[NCERT Exemplar]

- (a) heat energy
- (b) light energy
- (c) mechanical energy
- (d) chemical energy

Ans. (d) chemical energy

Explanation :

The sun is the ultimate source of energy in an ecosystem, and green plants capture it and convert it to chemical energy, which is then stored in the form of carbohydrates. This chemical energy, in the form of food, is transmitted down the food chain in the ecosystem from one trophic level to the next following 10 per cent law according to which only 10% of the chemical energy is transferred from one trophic level to subsequent higher trophic level.

50. Which of the following statements holds true for the energy flow in an ecosystem?

- (a) Energy can never be transferred bi-directionally between producers to consumers.
- (b) Energy flows in a unidirectional manner in an ecosystem.
- (c) Only 10% of the energy is transferred from one trophic level to the next trophic level.
- (d) All of the above

Ans. (d) All of the above

Explanation :

The flow of energy is always unidirectional. It flows from the sun to the producers and ultimately to the consumers. According to the 10% law, only 10% of the energy is transferred from one trophic level to the next.

51. The direction of energy flow in an ecosystem is:

- (a) uni-directional but in any direction
- (b) multi-directional
- (c) uni-directional but from lower trophic level towards the higher trophic level
- (d) bi-directional

Ans. (c) uni-directional but from lower trophic level towards the higher trophic level

Explanation :

Energy flows in a unidirectional manner in an ecosystem from the lower trophic level towards the higher trophic level.

52. Cutting of forests for growing crops would:

- (a) reduce the stability of the ecosystem
- (b) enhance the stability of the ecosystem
- (c) not affect the stability of the ecosystem

(d) first increase and then decrease the stability of the ecosystem

Ans. (a) reduce the stability of the ecosystem

Explanation :

Cutting a large number of trees would affect all the other organisms dependent on those plants. Many organisms would even die. Some would migrate to other places. All such events would disturb the ecological balance and thus would decrease the stability of the ecosystem.

53. Which activity would gradually reduce the occurrence of pests, thereby reducing damage to the crops year by year without affecting the environment?

(a) Use of nitrogen based fertilizer

(b) Crop rotation

(c) Use of DDT

(d) Use of manure

Ans. (b) Crop rotation

Explanation :

Crop rotation can gradually reduce the occurrence of pests, thereby reducing damage to crops year by year without affecting the environment.

54. Fish diet can play significant role in biological magnification of pesticides like DDT because:

(a) harmful chemicals get washed into water bodies and enter the aquatic food chains.

(b) fishes can also produce these chemicals in their bodies.

(c) fishes increase in number rapidly.

(d) fishes have special enzymes in their body to digest these pesticides.

Ans. (a) harmful chemicals get washed into water bodies and enter the aquatic food chains.

Explanation :

Biological magnification occurs when the harmful chemicals used in the crop

fields get washed into water bodies and enter the food chains.

55. Biological magnification is defined as:

- (a) the accumulation of harmful chemicals at each trophic level of the food chain.
- (b) the accumulation of organic matter at the first trophic level of the food chain.
- (c) the reduction of energy at each trophic level of the food chain.
- (d) an increase in the population of a species at each trophic level of the food chain.

Ans. (a) the accumulation of harmful chemicals at each trophic level of the food chain.

Explanation :

The accumulation of harmful chemicals at each trophic level is called biological magnification.

56. Which agricultural activities are affecting the environment?

- (a) Overuse of fertilizers and pesticides
- (b) Using groundwater for irrigation
- (c) Extensive cropping in the same area of land
- (d) All of the above

Ans. (d) All of the above

Explanation :

Different agricultural activities are affecting the environment. Fertilizers and pesticides are non-biodegradable. They cause soil and water pollution. Soil loses fertility due to extensive cropping and water table is lowering due to the overuse of groundwater for irrigation.

57. Pesticide can disturb the balance within the ecosystem by:

- (a) indiscriminately killing pests and the predators of these pests
- (b) biomagnification

- (c) eutrophication
- (d) bioaccumulation

Ans. (a) indiscriminately killing pests and the predators of these pests

Explanation :

Pesticides can disturb the balance within the ecosystem by indiscriminately killing pests and the predators of these pests.

58. Which of the following are environment friendly practices ? [NCERT]

- (a) Carrying cloth bags to put purchases in while shopping.
- (b) Switching off unnecessary lights and fans.
- (c) Walking to school instead of getting your mother to drop you on her scooter.
- (d) All of the above

Ans. (d) All of the above

Explanation :

Being eco-friendly refers to a way of life that is better for the environment. It involves taking little measures towards ensuring that the Earth's environment is properly maintained for current and future generations. Carrying cloth bags to put purchases in while shopping, switching off unnecessary lights and fans, walking to school instead of getting your mother to drop you on her scooter are all examples of environment friendly practices.

59. Several factories were pouring their wastes in rivers A and B. Water samples were collected from these two rivers. It was observed that sample collected from river A was acidic while that of river B was basic. The factories located near A and B are :

[Board Question]

- (a) Soaps and detergents factories near A and alcohol distillery near B.
- (b) Soaps and detergents factories near B and alcohol distillery near A.
- (c) Lead storage battery manufacturing factories near A and soaps and

detergents factories near B.

(d) Lead storage battery manufacturing factories near B and soaps and detergents factories near A.

Ans. (c) Lead storage battery manufacturing factories near A and soaps and detergents factories near B.

Explanation :

The lead storage batteries uses sulphuric acid which is acidic in nature while soaps and detergents are basic in nature.

60. Excessive exposure of humans to UV rays results in :[NCERT Exemplar]

(i) damage to immune system

(ii) damage to lungs

(iii) skin cancer

(iv) peptic ulcers

(a) (i), (ii)

(b) (ii), (iv)

(c) (i), (iii)

(d) (iii), (iv)

Ans. (c) (i), (iii)

Explanation :

UV rays are extremely hazardous to humans, animals, and even plants. It can cause skin cancer, cataracts in the eyes, and immune system damage by reducing the body's response to infections.

61. If UNEP had not passed any regulation to control the CFC levels, then what could have been the possible consequences after a few years?

(a) Increase in CFC levels and thus increase in global warming.

(b) Major amount of UV radiations reaching the earth, therefore, multifold increase in problems like cancer.

(c) Increase in natural calamities like Tsunamis and cyclones.

(d) Lowering of the temperature of the earth.

Ans. (b) Major amount of UV radiations reaching the earth, therefore, multifold increase in problems like cancer.

Explanation :

If UNEP has not controlled the CFC levels, then after 20 years there would have been major destruction of the ozone layer due to an increase in CFC levels in the environment.

62. Which of the following sets represents the substances required for the formation of ozone?

(a) Oxygen and IR radiations

(b) Oxygen and UV radiations

(c) Oxygen and radiations of longer wavelengths

(d) Carbon dioxide, water vapour and UV radiations

Ans. (b) Oxygen and UV radiations

Explanation :

Ozone is formed by the action of UV radiations on the oxygen atoms in the upper layers of the atmosphere.

63. Which of the following options complete the statement given below?

Ozone is both harmful and beneficial because it is _____.

(a) not poisonous to the ecosystem

(b) poisonous but not for humans

(c) poisonous in very high amounts, and its concentration is very low in the atmosphere

(d) poisonous to humans but it also prevents UV rays from entering into the

earth's atmosphere

Ans. (d) poisonous to humans but it also prevents UV rays from entering into the earth's atmosphere

Explanation :

Ozone acts as a blanket around the earth and prevents the UV rays from entering the earth's atmosphere. However, at the surface level, it acts as a pollutant.

64. Ozone formation is possible in the upper layers of atmosphere because of the:

- (a) presence of active molecules of carbon
- (b) presence of high energy UV rays
- (c) presence of activated oxides of carbon
- (d) presence of longer wavelength radiations

Ans. (b) presence of high energy UV rays

Explanation :

The high energy of UV rays help in the formation of ozone from oxygen.

65. Which of the following is the set of greenhouse gases in the atmosphere?

- (a) Ozone and CFC
- (b) Carbon monoxide and sulphur dioxide
- (c) Carbon dioxide and methane
- (d) Hydrogen sulphide and ozone

Ans. (c) Carbon dioxide and methane

Explanation :

Gases that maintain the temperature of the earth by trapping the solar energy in the earth's atmosphere are called greenhouse gases. Increase in the amount of greenhouse gases in the atmosphere can lead to global warming. Carbon dioxide and methane are the greenhouse gases.

66. Refrigerators have led to an environmental imbalance and destroyed ecosystems. How?

- (a) Refrigerators emit CFCs that are harmful to only plant species.
- (b) Storing food in refrigerators makes them environmentally unhealthy.
- (c) Refrigerators use CFCs that are harmful to the ozone layer which forms a blanket around the earth.
- (d) Refrigerators emit greenhouse gases.

Ans. (c) Refrigerators use CFCs that are harmful to the ozone layer which forms a blanket around the earth.

Explanation :

CFCs are used in refrigerators. They are dangerous for the ozone layer that acts as a blanket around the earth and prevents UV rays from the sun to enter the atmosphere.

67. Classify the given activities under reuse and recycle.

- (i) Using plastic bucket for growing plants
 - (ii) Using old newspaper to make paper bags
 - (iii) Using broken glass to melt and make a new glass
 - (iv) Dissolving paper, bleaching and drying it to form a new paper.
- (a) (i) and (ii) are examples of reuse and (iii) and (iv) are the examples of recycle.
- (b) (ii) and (iii) are the examples of reuse and (i) and (iv) are the examples of recycle.
- (c) (i), (ii) and (iii) are the examples of reuse and (iv) is the example of recycle.
- (d) (i), (ii) and (iii) are the examples of recycle and (iv) is the example of reuse.

Ans. (a) (i) and (ii) are examples of reuse and (iii) and

(iv) are the examples of recycle.

Explanation :

Reuse involves using again the same substance for some other purpose. Recycle involves forming a new substance from the old substance to be used for the same or different purpose.

68. In an ecosystem, the matter is recyclable because of

- (a) decomposition activity of decomposers
- (b) the sun, which is an ultimate source of energy
- (c) the fact that matter is made up of atoms
- (d) None of these

Ans. (a) decomposition activity of decomposers

Explanation :

Decomposers convert the complex organic molecules into simpler ones and make them available for other organisms.

69. Different types of enzymes are present in our body because:

- (i) each enzyme has a specific function
 - (ii) each enzyme has a specific substrate
 - (iii) it makes the metabolic process faster
 - (iv) it makes the replacement of the defective enzymes easy
- (a) (i) and (ii)
 - (b) (iii) and (iv)
 - (c) (i) and (iv)
 - (d) All of these

Ans. (a) (i) and (ii)

Explanation :

Each enzyme has a specific substrate and has a specific function to perform. Each enzyme is a protein and each protein is made by a specific gene.

70. Disposable plastic plates should not be used because :[NCERT Exemplar]

- (a) they are made of materials with light weight.
- (b) they are made of toxic materials.
- (c) they are made of biodegradable materials.
- (d) they are made of non-biodegradable materials.

Ans. (d) they are made of non-biodegradable materials.

Explanation :

There are some substances that cannot be acted upon by decomposers and hence, these items are called as non-biodegradable. Example- plastics, chemicals like DDT, etc. When items like disposable plastic plates are used they persist in the environment because they cannot be degraded and may cause hazardous effects on the other biotic components of the ecosystem. Therefore, usage of disposable plastic should be avoided as they have hazardous effects on the environment.

71. Some wastes stay in the environment for a longer duration because:

- (a) they are non-biodegradable materials and decomposers cannot decompose them.
- (b) they are biodegradable materials but decomposers do not act on these materials.
- (c) these play role in maintaining ecological balance.
- (d) these are recyclable.

Ans. (a) they are non-biodegradable materials and decomposers cannot decompose them.

Explanation :

Some waste materials are non-biodegradable. Decomposers cannot break them into simpler forms. Therefore, these materials stay in the environment for a longer duration.

72. In the following groups of materials, which groups contain only non-

biodegradable items ?

[NCERT Exemplar]

- (i) Wood, paper, leather
- (ii) Polythene, detergent, PVC
- (iii) Plastic, detergent, grass
- (iv) Plastic, bakelite, DDT
- (a) (iii)
- (b) (iv)
- (c) (i), (iii)
- (d) (ii), (iv)

Ans. (d) (ii), (iv)

Explanation :

Those items which cannot be acted upon by detritivores or decomposers are called as non-biodegradable. As a result, such materials are unable to degrade or decompose. They are, in some ways, an inextricable part of the environment that cannot be removed. Polythene, thermosetting plastics such as Bakelite, insecticides such as DDT, detergent, and PVC are few examples of non-biodegradable items.

73. UV rays are harmful to the life on earth. However, they play an important role in the upper atmosphere. Which of the following statements holds for this fact?

- (i) UV rays are needed for the formation of the ozone layer in the upper atmosphere.
- (ii) UV rays are less active and inside the atmosphere, they become activated due to the other atmospheric contents.
- (iii) In the upper atmosphere, UV rays have less energy and are not harmful and form the part of the atmosphere.
- (a) Only (i)

- (b) Only (ii)
- (c) Only (iii)
- (d) Both (i) and (iii)

Ans. (a) Only (i)

Explanation :

In the upper atmosphere, high energy UV rays are required for the formation of the ozone layer. Ozone prevents the entry of UV rays into the earth's atmosphere.

Assertion and Reasoning Based Questions

Directions : In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as :

- (a) Both assertion and reason are correct and reason is the correct explanation of assertion.
- (b) Both assertion and reason are correct but reason is not the correct explanation of assertion.
- (c) Assertion is true but Reason is false.
- (d) Assertion is false but Reason is true.

74. Assertion: Green plants of the ecosystem are the transducers.

Reason: Producers trap the radiant energy of the sun and change it into chemical energy.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Green plants of the ecosystem are the transducers because producers trap the radiant energy of the sun and change it into chemical energy. Thus, both assertion and the reason are correct and reason is the correct explanation of the assertion.

75. Assertion: Energy available at each trophic level gets diminished progressively.

Reason: Little usable energy remains after four trophic levels.

Ans. (c) Assertion is true but reason is false.

Explanation :

The energy available at each trophic level gets diminished progressively due to loss of energy at each level. The usable energy available at each trophic level gets diminished progressively due to loss of energy at each level.

Thus, assertion is true but reason is false.

76. Assertion: The flow of energy is unidirectional.

Reason: Energy as it progresses through the various trophic levels is no longer available to the previous level.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

The flow of energy is unidirectional. The energy that is captured by the autotrophs does not revert to the solar input and the energy which passes to the herbivores does not come back to autotrophs. As it moves progressively through the various trophic levels it is no longer available to the previous level. Moreover, the energy available at each trophic level gets diminished progressively due to loss of energy at each level. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

77. Assertion: Chemicals and toxins accumulate more and more as we move up the food chain.

Reason: Anything that gets into biological tissue, that is not normally there, has the potential to accumulate and magnify.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Biomagnification is the increase in concentration of toxins up the food chain. Chemicals and toxins accumulate more and more as we move up the food chain, because they do not get broken down in the body. Anything that gets

into biological tissue, that is not normally there, has the potential to accumulate and magnify as it moves up the food chain. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

78. Assertion: Arctic's ozone depletion tends to be milder and short lived than the Antarctic's.

Reason: CFCs, Frigid temperatures and sunlight are not present at the Arctic at the same time.

Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

It is necessary to have all three at the same time for ozone layer to deplete. Thus, both assertion and reason are true and reason is the correct explanation of the assertion.

79. Assertion: Plastics are non-biodegradable.

Reason: Enzymes cannot degrade plastics.

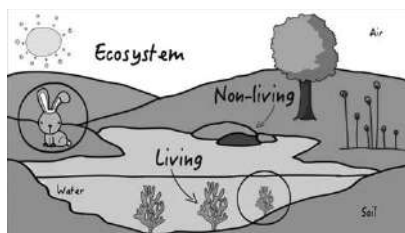
Ans. (a) Both assertion and reason are correct and reason is the correct explanation of assertion.

Explanation :

Substances which cannot be decomposed by the action of microorganisms are known as non-biodegradable substances. Microorganisms release enzymes which decompose the materials but these enzymes are specific in their action that is why enzymes cannot decompose all the materials. Thus, both assertion and reason are correct and reason is the correct explanation of the assertion.

Case Based Questions

80. Take a look at the picture carefully and answer the following questions from (i) to (v):



(i) While designing an aquarium what are the things you would like to include to make it a complete ecosystem?

(a) Fishes, aquatic plants, pleco fish (algae eating fish), aerator, pebbles, fish food.

(b) Fishes, grass, plants, pleco fish (algae eating fish), fish food.

(c) Fishes, plants, oxygen pump, food, stones.

(d) Animals, fishes, plants, oxygen pump, food.

Ans. (a) Fishes, aquatic plants, pleco fish (algae eating fish), aerator, pebbles, fish food

(ii) Which one of the following is not a producer?

(a) Blue green algae

(b) Cactus

(c) Fungi

(d) Spinach

Ans. (c) Fungi

(iii) Herbivores, carnivores, omnivores, and parasites all come under:

(a) producers

(b) consumers

(c) ecosystem

(d) food web

Ans. (b) consumers

(iv) Which one is not true about an ecosystem?

(a) Ecosystem consists of living and non-living things both.

(b) Living organisms interact with each other.

(c) Growth, reproduction, and other activities of living organisms are not affected by the abiotic components of ecosystem.

(d) A garden is considered an ecosystem.

Ans. (c) Growth, reproduction, and other activities of living organisms are not affected by the abiotic components of ecosystem

(v) Ecosystems can be of how many types?

(a) Two types – man-made and natural

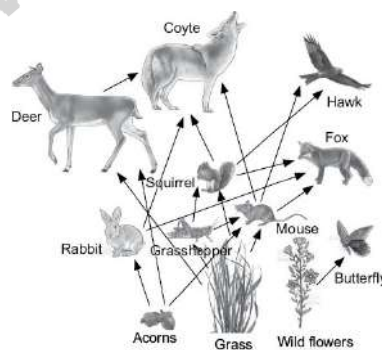
(b) Two types – terrestrial and aquatic

(c) Four types – forests, ponds, lakes, and garden

(d) All of the above

Ans. (d) All of the above

81. Study the figure given below and answer the following questions from (i) to (v):



(i) What is the name of the interrelation shown in this figure?

(a) Food chain

(b) Food web

(c) Trophic level

(d) Energy conservation

Ans. (b) Food web

(ii) The series of branching lines shown in above figure appears in nature because:

(a) the length and complexity of food chains vary.

(b) each organism is generally eaten by two or more other kinds of organisms.

(c) straight line food chains are not practically possible.

(d) all of the above

Ans. (d) all of the above

(iii) Which one of the following is true for a food web?

(a) Food web does not help in stabilising the ecosystem.

(b) Secondary consumers cannot feed on other species in the event of decrease in population of prey.

(c) A food web provides alternative pathways of food availability.

(d) Food webs are straight.

Ans. (c) A food web provides alternative pathways of food availability.

(iv) The main source of energy flowing in any food web is the:

(a) animals

(b) consumer

(c) primary producer

(d) sun

Ans. (d) sun

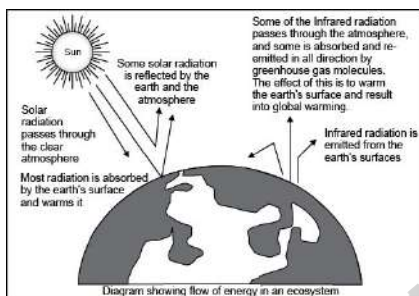
(v) In the picture shown above concentration of a chemical absorbed from soil is likely to be highest in:

- (a) wildflowers
- (b) grass
- (c) coyote
- (d) rabbit

Ans. (c) coyote

82. Read the passage given below and answer the following questions from (i) to (v):

The energy flow in the ecosystem is one of the major factors that support the survival of such a great number of organisms. For almost all organisms on earth, the primary source of energy is solar energy. It is amusing to find that we receive less than 50 per cent of the sun's effective radiation on earth. When we say effective radiation, we mean the radiation, which can be used by plants to carry out photosynthesis.



(i) Every food chain in the ecosystem begins with _____. Which are the original?

- (a) saprophytes
- (b) parasites
- (c) producers
- (d) none of these

Ans. (c) producers

(ii) If 100 J energy is available at the producer level in a food chain then the energy available to the secondary consumer will be:

- (a) 10 J
- (b) 0.1 J
- (c) 1 J
- (d) 0.01 J

Ans. (c) 1 J

(iii) The constituents which do not form eco-system are:

- (a) Biotic constituents
- (b) Plastic bags
- (c) Abiotic constituents
- (d) All of the above

Ans. (b) Plastic bags

(iv) Which of the two sets belong to the same trophic level?

- (a) Frog : Lizard
- (b) Rabbit : Tiger
- (c) Vulture : Crow
- (d) Deer : Hawk

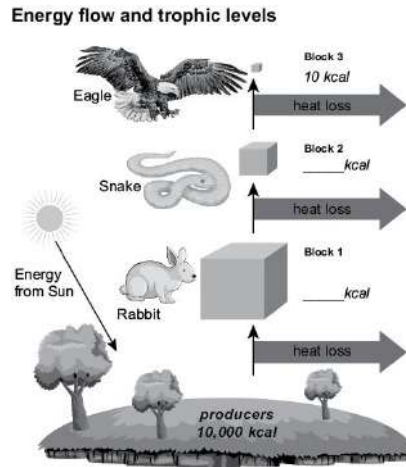
Ans. (a) frog : lizard

(v) A food chain comprising birds, green plants, fish and man. The concentration of harmful chemical entering the food chain will be maximum in:

- (a) plant
- (b) man
- (c) birds
- (d) fish

Ans. (b) man

83. Refer the figure given below and answer the following questions from (i) to (v):



(i) How are the organisms on Block 1 level best described as:

- (a) primary consumers
- (b) secondary consumers
- (c) tertiary consumers
- (d) decomposers

Ans. (a) primary consumers

(ii) In the figure given above what would be the amount of energy available at block 1 and block 2 levels if energy at producer level is 10,000 kcal?

- (a) 1000 kcal and 100 kcal
- (b) 100 kcal and 1000 kcal
- (c) 10,000 kcal and 100 kcal
- (d) 100 kcal and 10 kcal

Ans. (a) 1000 kcal and 100 kcal

(iii) What is represented by eagle at block 3?

- (a) Decomposers

- (b) Secondary consumers
- (c) Tertiary consumers
- (d) Predator

Ans. (c) Tertiary consumer

(iv) After solar energy enters our atmosphere, which statement does not hold good regarding subsequent events?

- (a) Most of the radiation is absorbed by the Earth's surface and used to warm the surface.
- (b) Some of the solar radiation is reflected by Earth and atmosphere.
- (c) Some of the infra-red radiation is absorbed by the atmosphere and re-emitted in all directions by the green-house gases.
- (d) No infra-red radiation is emitted by Earth.

Ans. (d) No infra-red radiation is emitted by Earth.

(v) Energy flow diagram definitely conveys all the points given below, except:

- (a) the flow of energy is multi-directional.
- (b) the energy captured by the autotrophs does not return to the solar input.
- (c) the energy that passes to the herbivores does not come back to the autotrophs.
- (d) the energy moves progressively through the various trophic levels and it is no longer available to the previous level.

Ans. (a) the flow of energy is multi-directional.

84. Read the passage given below and answer the following questions from (i) to (v):

[CBSE Question Bank]

Frothing in Yamuna:

The primary reason behind the formation of the toxic foam is high phosphate

content in the wastewater because of detergents used in dyeing industries, dhobi ghats and households.

Yamuna's pollution level is so bad that parts of it have been labelled 'dead' as there is no oxygen in it for aquatic life to survive.



(i) Predict the pH value of the water of river Yamuna if the reason for froth is high content of detergents dissolved in it.

(a) 10-11

(b) 5-7

(c) 2-5

(d) 7

Ans. (a) 10-11

(ii) Which of the following statements is correct for the water with detergents dissolved in it?

(a) Low concentration of hydroxide ion (OH^-) and high concentration of hydronium ion (H_3O^+)

(b) High concentration of hydroxide ion (OH^-) and low concentration of hydronium ion (H_3O^+)

(c) High concentration of hydroxide ion (OH^-) as well as hydronium ion (H_3O^+)

(d) Equal concentration of both hydroxide ion (OH^-) and hydronium ion (H_3O^+).

Ans. (b) High concentration of hydroxide ion

(OH⁻) and low concentration of hydronium ion (H₃O⁺)

(iii) The table provides the pH value of four solutions P, Q, R and S:

P	2
Q	9
R	5
S	11

Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration?

(a) P > Q > R > S

(b) P > S > Q > R

(c) S < Q < R < P

(d) S < P < Q < R

Ans. (c) S < Q < R < P

(iv) High content of phosphate ion in river Yamuna may lead to:

(a) decreased level of dissolved oxygen and increased growth of algae.

(b) decreased level of dissolved oxygen and no effect of growth of algae.

(c) increased level of dissolved oxygen and increased growth of algae.

(d) decreased level of dissolved oxygen and decreased growth of algae.

Ans. (a) decreased level of dissolved oxygen and increased growth of algae.

(v) If a sample of water containing detergents is provided to you, which of the following methods will you adopt to neutralise it?

(a) Treating the water with baking soda.

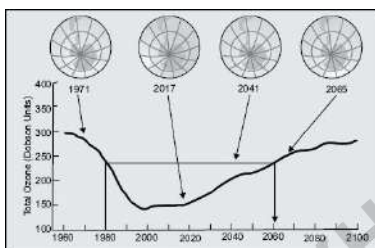
(b) Treating the water with vinegar.

- (c) Treating the water with caustic soda.
- (d) Treating the water with washing soda.

Ans. (b) Treating the water with vinegar.

85. Read the passage given below and answer the following questions from (i) to (v):

The amount of ozone in the atmosphere has begun to drop sharply from 1980s. This decrease has been linked to synthetic chemicals. In 1987, the United Nations Environment Programme (UNEP) succeeded in forging an agreement to freeze harmful chemicals production at 1986 levels.



(i) At what level of atmosphere ozone layer is found?

- (a) Troposphere
- (b) Stratosphere
- (c) Biosphere
- (d) Ionosphere

Ans. (b) Stratosphere

(ii) At higher level of atmosphere radiations act upon oxygen molecule to form:

- (a) oxygen
- (b) ozone
- (c) carbon monoxide
- (d) all of these

Ans. (b) ozone

(iii) What is the major cause of ozone depletion?

- (a) Chlorofluorocarbons
- (b) Hydrochlorofluorocarbons
- (c) Carbon tetrachloride and methyl chloroform
- (d) All of the above

Ans. (d) All of the above

(iv) Which of the following sources is responsible for the depletion of ozone layer?



- (d) All of the above

Ans. (d) All of the above

(v) In which of the following countries Ozone hole has appeared?

- (a) Africa
- (b) North America
- (c) Japan
- (d) Antarctica

Ans. (d) Antarctica

86. Read the passage given below and answer the following questions from (i) to (v):

Humans modify the environment around them through agriculture and urbanisation as the major activities. Human impact on the environment is so substantial that there is nothing left called pristine nature or ecosystems untouched by human intervention. The major impact of these interventions is ever increasing levels of all forms of pollution on our Earth. Waste disposal and depletion of ozone layer are two major concerns in this world.

(i) Which one of the following sentences is not true about ozone?

- (a) Ozone is deadly poisonous.
- (b) Ozone protects us from harmful UV rays emitted by the sun.
- (c) Ozone is formed from oxygen in presence of UV rays.
- (d) Ozone causes skin cancer in humans.

Ans. (d) Ozone causes skin cancer in humans.

(ii) Which one of the below given reason holds good for increase in the amount of waste generated by humans?

- (a) Religious practices
- (b) Change in packaging style and products
- (c) Home cooking
- (d) Use of plant-based products

Ans. (b) Change in packaging style and products

(iii) An environment enthusiast would certainly not choose one of these for a tea party at her home.

- (a) Paper cups
- (b) Thermocol cup
- (c) Steel cup
- (d) Earthen cups

Ans. (b) Thermocol cup

(iv) Which of the following groups contains a non-biodegradable item?

- (a) Grass, flowers, lime-juice, and leather.
- (b) Grass, wood, leather, and plastic.
- (c) Cake, wood, flowers, and grass.
- (d) Fruit-peels, cake, leather, and lime-juice.

Ans. (b) Grass, wood, leather, and plastic

(v) Which of the following waste management plans is likely to work the best?

- (a) Integrated waste management plan
- (b) Recycling waste management plan
- (c) Reducing waste management plan
- (d) Reusing waste management plan

Ans. (a) Integrated waste management plan

87. Read the passage given below and answer the following questions from (i) to (v):

The waste generated by humans has been detrimental to our environment and is causing threat to our ecosystem. We are generating too much trash and failing to deal with it in a sustainable way. Every day we are disposing tons and tons of non-biodegradable and unrecyclable waste into our oceans and landfills. Plastic waste is an example. In 2017 the Environmental Protection Agency in the US calculated that the total generation of municipal solid waste in the United States in 2017 was 267.8 million tons; compared with 2015 levels, it was a 5.7 million increase.

(i) Non-biodegradable substances are:

- (a) broken down by biological processes.
- (b) not broken down by biological processes.
- (c) prepared by biological processes.

(d) cannot be broken down by physical processes.

Ans. (b) not broken down by biological processes.

(ii) Which one of the following is not likely to happen in the case of solid waste disposal in landfills?

(a) Unpleasant odours

(b) Ground water pollution

(c) Fires and explosions

(d) Infrared radiation

Ans. (d) Infrared radiation

(iii) Humans are not supposed to get any energy by eating coal, because:

(a) coal is harmful.

(b) coal is burnt.

(c) humans do not have enzymes to digest coal.

(d) coal is black.

Ans. (c) humans do not have enzymes to digest coal.

(iv) Man-made plastics are not bio-degradable because:

(a) they are hard.

(b) bacteria and saprophytes do not contain enzymes to decompose plastics.

(c) plastics are made in industries.

(d) plastics do not absorb water.

Ans. (b) bacteria and saprophytes do not contain enzymes to decompose plastics.

(v) The depletion in the Ozone layer is caused by _____ .

(a) nitrous oxide

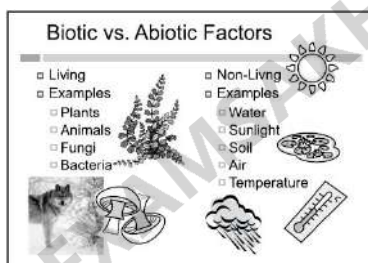
- (b) carbon dioxide
- (c) chlorofluorocarbons
- (d) methane

Ans. (c) chlorofluorocarbons.

88. Read the passage given below and answer the following questions from (i) to (v):

[CBSE Question Bank]

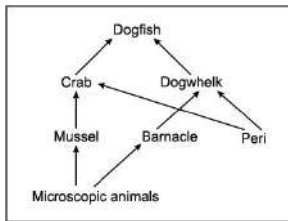
Biosphere is a global ecosystem composed of living organisms and abiotic factors from which they derive energy and nutrients. The ecosystem is defined as structural and functional unit of the biosphere comprising of living and non-living environment that interact by means of food chains and chemical cycles resulting in energy flow, biotic diversity and material cycling to form a stable, self-supporting system.



- (i) Which trophic level is incorrectly defined?
- (a) Carnivores—secondary or tertiary consumers.
- (b) Decomposers—microbial heterotrophs
- (c) Herbivores—primary consumers
- (d) Omnivores—molds, yeast and mushrooms

Ans. (d) Omnivores—molds, yeast and mushrooms

- (ii) The diagram below shows a food web from the sea shore.

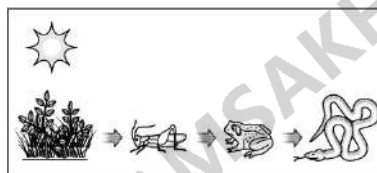


The mussel can be described as:

- (a) Producer
- (b) Primary consumers
- (c) Secondary consumer
- (d) Decomposer

Ans. (c) Secondary consumers

(iii) The given figure best represents:



- (a) Grassland food chain
- (b) Parasitic food chain
- (c) Forest food chain
- (d) Aquatic food chain

Ans. (a) Grassland food chain

(iv) Consider the following statements concerning food chains:

- (i) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation.
- (ii) Removal of most of the carnivores resulted in an increased population of herbivores.
- (iii) The length of the food chains is generally limited to 3 – 4 trophic levels due to energy loss.

(iv) The length of the food chains may vary from 2 to 8 trophic levels.

Which two of the above statements are correct?

(a) (i), (iv)

(b) (i), (ii)

(c) (ii), (iii)

(d) (iii), (iv)

Ans. (c) (ii), (iii)

(v) Which of the following groups of organisms are not included in ecological food chain?

(a) Carnivores

(b) Saprophytes

(c) Herbivores

(d) Predators

Ans. (b) Saprophytes

Reasoning Based Questions

89. Give reason to justify the following:

[Board Question]

(i) The existence of decomposers is essential in a biosphere.

(ii) Flow of energy in a food chain is unidirectional.

Ans. (i) Decomposers breakdown complex organic substances into simple inorganic substance. These simple substances get mixed up in the soil and are used as nutrients by the producers. Thus, they replenish the soil naturally and help in degradation of biodegradable wastes. So, the existence of decomposers is essential in a biosphere as they maintain the balance in the ecosystem and provide space for new life in ecosystem.

(ii) In a food chain the energy moves progressively through the various trophic levels and it is no longer available to the previous trophic level. Energy

captured by autotrophs cannot be reverted back to sun but it passes to herbivores then to carnivores following 10% Law. Thus flow of energy from sun to autotrophs then to heterotrophs to carnivores is unidirectional.

90. We do not clean ponds or lakes, but an aquarium needs to be cleaned. Why?

Ans. Ponds or lakes are natural, self-sustaining and complete ecosystem. They have decomposers like bacteria or fungi which break down the waste material and hence they remain clean. But an aquarium is a man-made, incomplete ecosystem and they do not have decomposers to clean the waste material. So an aquarium needs to be cleaned but we do not clean ponds or lakes.

91. Why is lake considered to be a natural ecosystem?

[Board Question]

Ans. A lake is considered as a natural ecosystem as it consists of both biotic and abiotic components and these components are interdependent on each other and do not require any human interference for their sustenance.

92. The first trophic level in a food chain is always a green plant. Why?

Ans. Green plants are the producers which prepare their own food by utilising solar energy from inorganic sources and all other living organisms depend on them for food. Herbivores and carnivores depend upon green plants either directly or indirectly for food. Hence the first trophic level in a food chain is always a green plant.

93. Why is food chain having two trophic levels most advantageous in terms of energy?

Ans. A food chain having two trophic levels only would minimise the energy lost as heat which is an advantage in terms of energy.

94. Why does vegetarian habit help us in getting more energy? In terms of energy who is at an advantageous position (vegetarian or a non-vegetarian) and Why?

Ans. Vegetarians obtain food directly from plants, while non-vegetarians get food from animals which feed upon plants. As a result animals which are herbivores get 10% of energy from plants suppose 100 J according to 10% rule. When non-vegetarians feed upon these animals they get only 10 J which is 10% of 100 J. But vegetarians which feed directly on plants get 100 J hence vegetarians are at an advantageous position and get more energy than non-

vegetarians.

95. Why do harmful chemicals concentrate as we go up in a food chain?

Ans. The process of increasing concentration of harmful chemicals at each trophic level of a food chain is called biomagnification. These substances are non-biodegradable so they persist in environment for a long time and are not easily degraded or excreted and when they move up in the food chain their concentration goes on increasing and gets accumulated in tissues or internal organs.

96. Why is damage to the ozone layer a cause of concern? What steps are being taken to limit this damage? [\[NCERT\]](#)

Ans. Ozone layer is found in stratosphere which prevents the harmful UV rays of sun from entering earth's surface. Various ozone depleting substances like CFCs cause a great damage to ozone layer thus leading to its depletion. So harmful UV rays from sun can easily pass through this layer and cause various genetic disorders, mutations, cancer, eye diseases etc., in humans. UV rays also affect plants and animals.

In 1987, **UNEP [United Nations Environment Programme]** succeeded in forging an agreement called Montreal Protocol which states the significance and measures to reduce the use of CFCs and replace CFCs with other alternatives.

97. Why did United Nations act to control the production of CFCs used in refrigerators?

Ans. CFCs is an ozone layer depleting substance which is used in refrigerators, air-conditioners etc. So United Nations act to control the production of CFCs used in refrigerators.

98. Why Ozone is present only in the Stratosphere?

Ans. Ozone in the stratosphere absorbs most of the ultraviolet radiation from the Sun. Without ozone, the Sun's intense UV radiation would sterilize the Earth's surface. Ozone screens all of the most energetic, UV-c, radiation, and most of the UV-b radiation.

99. Why non-biodegradable substances persist in environment for longer time?

Ans. Non-biodegradable substances cannot be degraded by microbes through biological process to simpler forms hence they persist in environment

for longer time.

100. Why should biodegradable and non-biodegradable wastes be discarded in two separate dustbins?

Ans. Biodegradable wastes can be easily degraded by natural organisms like bacteria and fungi but non-biodegradable wastes cannot be degraded in a natural way by the action of microbes, they stay in environment as such. There are various techniques like recycling to degrade these non-biodegradable substances. Hence both biodegradable and non-biodegradable wastes should be discarded in two separate dustbins.

101. Why are some substances biodegradable and some non-biodegradable? [NCERT]

Ans. There are various types of waste substances released into our environment. Those substances which are degraded into simpler form naturally by the action of microbes like bacteria or fungi are called biodegradable substances. Examples—Vegetables and fruits peels, paper, agricultural wastes etc.

Those substances which cannot be degraded into simpler forms naturally by the action of microbes are called non-biodegradable substances. Examples—Aluminium foils, plastic bottles, glass apparatus etc.

102. Why is it necessary to conserve the environment?

Ans. It is necessary to conserve the environment to prevent the damage to the environment and to protect the endangered species.

Very Short Answer Type Questions

103. What is the role of decomposers in the ecosystem?

[NCERT]

Ans. Decomposers act upon dead and decay organisms and convert them into simpler forms. These simple substances get mixed up in the soil and are used as nutrients by the producers. From producers it goes to consumers and so on. They maintain the balance in the ecosystem and provide space for new life in ecosystem.

104. What is an ecosystem? [Board Question]

Ans. An ecosystem is a self-sustaining system where biotic and abiotic

organisms of various communities interact with each other. Ponds, forests, grasslands etc., are the few examples of ecosystem.

105. Why is forest considered a natural ecosystem?

Ans. Forests are considered as natural ecosystem because they have species of plants and animals that grow without human intervention and they are naturally sustainable.

106. Name two natural ecosystems. [Board Question]

Ans. River, pond, forest, ocean etc., are natural ecosystems.

107. Select the mis-matched pair and correct it:

(a) **Detritivores**—Organisms which feed on detritus and degrade into simple substances.

(b) **Ecosystem**—Abiotic and biotic components of environment.

(c) **Trophic level**—It is made by interlinking of food chains.

(d) **Producers**—They synthesise their own food from inorganic substances.

Ans. (c) Trophic levels are distinct sequential steps in the food chain where transfer of energy occurs.

108. What will happen if we kill all the organisms in one trophic level? [NCERT]

Ans. If we kill all the organisms of one trophic level, it will lead to an increase in the number of organisms at the lower trophic level and decrease in the number of organisms at the higher trophic level. This will result in disruption in the food web and hence the ecosystem.

109. Consider a food chain of the following:

Fish, crab, plankton, shark.

Arrange the above chain in proper order of trophic level. Assign trophic level to shark.

Ans. Plankton → Crab → Fish → Shark.

Shark occupies fourth trophic level (Tertiary consumer).

110. In a food chain of frog, grass, insect and snake assign trophic level to frog. [Board Question]

Ans. Frog will be at third trophic level.

Grass → Insect → Frog → Snake

111. Write the common food chain of a pond ecosystem.

Ans. Phytoplanktons → Zooplanktons → Fish → Bird

112. In the following food chain, grass provides 4000 J of energy to the grasshopper.

Grass, grasshopper, frogs, snakes.

How much energy will be available to snakes and frogs?

Ans. If grass provides 4000 J energy, then according to 10 per cent law, it will give 10% of its energy to next trophic level.

Hence,

Grass ----> Grasshopper ----->

(4000 J) (400 J)

Frogs -----> Snakes (40 J) (4 J)

So, for snakes and frogs, 4 J and 40 J energy will be available by 10 per cent law.

113. What limits the number of trophic levels in a food chain?

Ans. The flow of energy in each trophic level follows 10% law *i.e.*, only 10% of the energy is available to the next higher trophic level hence the amount of energy goes on decreasing at each trophic level which limits the number of trophic levels in a food chain.

114. In the following food chain, 100 J of energy is available to the lion. How much energy was available to the producer?[\[Board Question\]](#)

Plant → Deer → Lion

Ans. There are three trophic levels – the producer, the consumer and the secondary consumer according to 10 per cent law of energy transfer in trophic level, If the lion has 100 J of energy then, deer will have:

According to 10% law 100 J of energy is available to lion, so deer will get:

10% of $x = 100 \text{ J}$

$x = 1000 \text{ J}$

Plant is the producer, it will have:

10% of $y = 1000$

$y = 10000 \text{ J}$

115. In the following food chain plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes?[Board Question]

Plants → Rats → Snakes → Hawks

Ans. 500 J of energy is available to rats from plants is then according to 10 per cent law 50 J of energy will be available to snakes and only 5 J of energy will be available to hawks.

116. What will be the amount of energy available to the organisms of the second trophic level of a food chain, if the energy available at the first trophic level is 10,000 J?[Board Question]

Ans. 1000 J amount of energy will be available to the organisms of the second trophic level of a food chain, if the energy available at the first trophic level is 10,000 J.

117. If a harmful chemical enters a food chain comprising snakes, hawks, mice and plants which of these organisms is likely to have maximum concentration of the harmful chemicals in its body ?

Ans. Hawks are likely to have maximum concentration of the harmful chemicals in their body as they are placed at top in this example of food chain.

118. Write the full name of the group of compounds mainly responsible for the depletion of ozone layer?

Ans. CFCs (Chlorofluorocarbons) are mainly responsible for the depletion of ozone layer.

119. Mention one negative effect of our affluent lifestyle on the environment?

Ans. The affluent life style of few persons results in overuse of natural resources and in long term effects it can led to scarcity of resources. For example: usage of personal vehicles instead of public transport increases consumption of fuel, pollution, use of air conditioners, refrigerators etc., which contain CFCs when released into atmosphere leads to depletion of ozone layer.

120. Why is biogas considered an excellent fuel?

[Board Question]

Ans. Biogas is considered as an excellent fuel because:

1. It causes no pollution, as it is environmental friendly.
2. Biogas plant from which biogas is produced serves as an excellent way of waste disposal.
3. It is economical and produces a large amount of heat per unit mass.

121. Write the name of the main constituent of biogas. Also state its percentage. [Board Question]

Ans. Methane is the main constituent of biogas. Its formula is CH_4 . Its percentage is approximately 50-75%.

122. What are the by-products of fertiliser industries? How do they affect the environment?

Ans. The by-products of fertiliser industries are oxides of nitrogen and sulphur which when released into atmosphere cause air pollution. They are mainly responsible for formation of acid rain. Acid rain damages marbles of monuments, statues etc. Acid rain also reduces the fertility of soil by decreasing the pH of soil thus growth of food crops is affected. They affect the microbes in soil and aquatic organisms in water bodies.

123. Why is improper disposal of waste a curse to environment ?

Ans. Improper disposal of waste would lead to environmental pollution, which causes harmful effects on living organisms like plants, animals, human beings etc.

124. How can you help in reducing the problem of waste disposal? Give any two methods. [NCERT]

Ans. We can help in reducing the problem of waste disposal by the following two methods:

1. By separating biodegradable substances from non-biodegradable substances.
2. By putting the biodegradable organic waste into compost pits dug in the ground and preparing compost.

125. List two non-biodegradable wastes generated daily in kitchen which can be recycled ?

Ans. Milk bags, tin cans are non-biodegradable wastes generated daily in kitchen which can be recycled.

126. Expand the term UNEP.

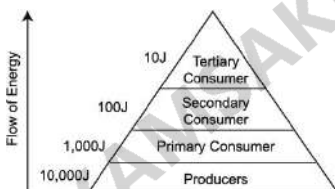
Ans. United Nations Environment Programme.

Short Answer Type Questions

127. Define an ecosystem. Draw a block diagram to show the flow of energy in an ecosystem.

[Board Question]

Ans. Ecosystem refers to the interaction of all the biotic and abiotic components present in a particular area. Energy flows across the trophic levels following the 10% law. Only 10% of the energy, available to a trophic level is passed on to the next trophic level.



128. Will the impact of removing all the organisms in a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?

[NCERT]

Ans. Yes, the impact of removing all the organisms in a trophic level will be different for different trophic levels. For example, If all producers will be removed then all herbivores will die of starvation. The various categories of carnivores which depend on herbivores for food will also be affected. Similarly if we will remove all organisms of higher trophic level the number of organisms in lower trophic level will increase thus creating imbalance in the ecosystem. So if organisms of any trophic level would be removed it will cause damage to the ecosystem.

129. What are decomposers? What will be the consequence of their absence in an ecosystem?

Ans. Decomposers are the microbes that feed on dead and decay organisms.

Dead plants and animals will get accumulated in the ecosystem as there would be no decomposers to decompose them. The decomposers will act upon dead and decayed organisms into simpler forms and get mixed in the soil which is used by producers again. But in the absence of decomposers this whole process would not occur and the dead organisms will get accumulated in the ecosystem.

130. Describe how decomposers facilitate recycling of matter in order to maintain balance in the ecosystem?

Ans. Decomposers act upon dead and decay organisms to convert them into simpler forms. These simple substances get mixed up in the soil and are used as nutrients by the producers. From producers it goes to consumers and so on. Thus there is recycling of matter which is done by decomposers that maintain the balance in the ecosystem.

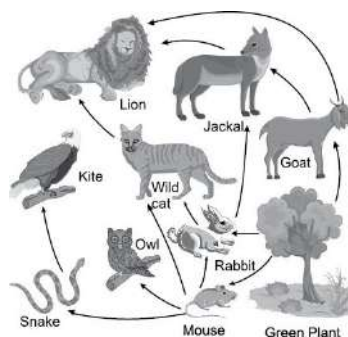
131. What is a food web? Give few characteristics of a food web? Give an example of a food web?

Ans. Food web is a network of food chains which become interconnected at various trophic levels so as to form a number of feeding connections amongst different organisms of a biotic community.

Some characteristics of a food web are:

1. Food web is an interlink of different food chains.
2. It provides alternative pathways of food availability.
3. Due to greater alternatives for food, it makes the ecosystem stable.
4. It helps in development of an ecosystem.

Example of food web:



132. What are trophic levels? Give an example of food chain and state the different trophic levels in it?

[NCERT]

Ans. The distinct sequential steps or levels in the food chain where transfer of energy occurs are referred to as trophic levels.

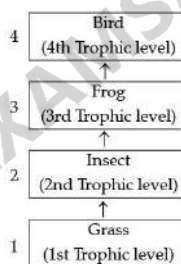
Example of a food chain is:

Grass → Grasshopper → Lizard → Snake → Hawk

Grass is producer, it belongs to first trophic level. Grasshopper is primary consumer, it belongs to second trophic level. Lizard is secondary consumer, it belongs to third trophic level. Snake is tertiary consumer and it belongs to fourth trophic level and hawk is quaternary consumer, it belongs to fifth trophic level.

133. Define a food chain. Design a terrestrial food chain of four trophic levels. If a pollutant enters at the producer level, the organisms of which trophic level will have the maximum concentration of the pollutant in their bodies? What is this phenomenon called? [\[Board Question\]](#)

Ans. It is the sequence of arrangement of living organism in a community in which one organism consumes another organism to transfer food energy.



Grass → Insect → Frog → Bird

The organism at higher trophic level will have the maximum concentration of pollutants. This phenomenon is called Biological Magnification.

134. The following organisms form a food chain.

Insects, hawk, grass, snake, frog.

Arrange them in proper sequence to form a food chain? Which of these will have the highest concentration of non-biodegradable chemicals? Name the phenomenon associated with it?

Ans. Grass, insects, frog, snake, hawk.

Hawk will have the highest concentration of non-biodegradable chemicals as it is placed at the top level of the food chain. This phenomenon is called

Biomagnification.

135. Give some characteristics of a food chain?

Ans. Some characteristics of food chain are:

1. A food chain always progresses in a straight chain.
2. There is an unidirectional flow of energy from sun to producers to a series of consumers.
3. There are 3-4 trophic levels or maximum upto 5 levels in a food chain.
4. It helps in understanding the food relationships and interaction among various living organisms present in an ecosystem.

136. What are the characteristics of energy transfer in biosphere?

Ans. The characteristics of energy transfer in biosphere are:

1. The ultimate source of energy is sun and is converted from one form to another.
2. Energy gets continuously transferred through food chain and energy flow is unidirectional.
3. There is loss of some energy during transfer from one trophic level to the next.
4. Only 10% of energy is transferred from one trophic level to the next. The solar energy trapped by producers does not revert back to the sun.
5. At each trophic level, some of the energy is utilised by organisms, rest is lost to environment and only 10% is available to the next trophic level.

137. What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem? [NCERT]

Ans. The increase in concentration of harmful toxic substances in the body of organisms at each trophic level of a food chain is called biological magnification. Yes, the levels of this magnification will be different at different levels of the ecosystem because the concentration of chemicals goes on increasing at different trophic levels. It is maximum at higher trophic levels and minimum at lower trophic levels. Suppose a food chain is Grass → Rabbit → Eagle, it will be the highest in eagle and minimum in grass.

138. “The maximum concentration of harmful chemicals accumulates in

human beings.” State the phenomenon involved and justify this statement.

Ans. Human beings are always placed at the top of a food chain. The concentration of harmful chemicals [non-biodegradable substance] goes on increasing at every trophic level as a result as human beings are placed at the apex of every food chain so maximum concentration of harmful chemicals get accumulated in their body. This phenomenon is called biomagnification.

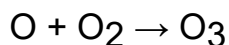
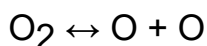
139. What is ozone and how does it affect any ecosystem?[\[NCERT\]](#)

Ans. Ozone is a triatomic molecule made of three oxygen atoms. It is present as a layer in stratosphere which prevents the harmful UV radiations of sun from entering the earth's surface, thus protecting us from skin cancers, genetic mutations, eye diseases like cataract etc. Ozone is a molecule made from three atoms of oxygen.

The harmful chemicals like CFCs which are used as coolants in refrigerators, air conditioners when released into atmosphere break down the ozone thus leading to depletion of ozone layer. Hence harmful UV rays can easily pass through ozone layer and cause various types of disorders in humans, plants and animals.

140. Show the reactions of formation of ozone from oxygen in the atmosphere? Name the pollutant and its role in depletion of ozone layer.

Ans. Ozone is formed by absorption of UV rays coming from sun.



UV radiations split oxygen molecules to oxygen atoms and the oxygen atoms combine with oxygen molecule to form ozone.

CFCs are mainly responsible for ozone layer depletion. CFCs release chlorine atoms which break ozone to oxygen. More amounts of CFCs thus released will cause depletion of ozone layer.

141. You have been selected to talk on “Ozone layer and its protection” in the school assembly on Environment Day.”[\[Board Question\]](#)

(i) Why should ozone layer be protected to save the environment?

(ii) List any two ways that you would stress in your talk to bring in awareness

among your fellow friends that would also help in protection of ozone layer as well as the environment.

Ans. (i) Ozone layer is present in stratosphere which prevents the ultra-violet rays from sun to penetrate the Earth's surface. But due to depletion of ozone layer ultra-violet rays enter into the surface of Earth and cause many health hazards like skin cancer, cataract in eyes etc. So, it is necessary to save the environment by protecting the ozone layer.

(ii) Some of the ways to protect the ozone layer are:

1. Banning the use of CFC's and other ozone depleting substances.
2. Reducing the use of fluorescent lights, limited use of supersonic planes, control over large scale nuclear explosions etc.

142. Write the essential functions performed by ozone at the higher levels of the Earth's atmosphere? How is it produced? Name the synthetic chemicals mainly responsible for the drop of amount of ozone in the atmosphere. How can the use of these chemicals be reduced?
[Board Question]

Ans. Ozone layer absorbs most of the harmful ultraviolet radiations from the sun to the earth. It is formed high up in the atmosphere by the action of ultraviolet radiation on oxygen gas. Chlorofluorocarbons are the synthetic chemicals responsible for the drop of amount of ozone in the atmosphere.

The use of these chemicals can be reduced by:

1. Replacement of chlorofluorocarbons with hydrochlorofluorocarbons because it breaks down more quickly.
2. Safe disposal of old appliances such as refrigerators and freezers.

143. Briefly describe different methods of wastes disposal?

Ans. The various methods of waste disposal are:

- 1. Land-fills:** In urban areas wastes are filled or deposited in low lying areas. These are also known as dumping grounds where wastes are buried.
- 2. Recycling of wastes:** Some wastes like papers, plastics, metals etc., which can be recycled are sent to special recycling treatment plants so that new substances can be made from them.
- 3. Preparation of compost:** Biodegradable wastes like kitchen wastes, peels

of fruits and vegetables etc., can be used to prepare compost which serves as a good manure to the plants.

4. Incineration: Some wastes like medical wastes, chemical wastes are burnt at very high temperature in an incinerator and the ashes left behind are disposed by landfills.

5. Production of biogas: Biodegradable wastes can be used in biogas plants to produce biogas which is used for several purposes like as a fuel.

144. What are the advantages of paper bags over plastic bags during shopping?

Ans. The advantages of paper bags are:

1. They are made up of biodegradable material.
2. They do not cause any environmental pollution.
3. They can be recycled and reused.
4. They are capable of carrying more things and are washable.
5. They are more strong and durable than plastic bags.

145. Give any two examples of each:

- (i) Organisms occupying the first trophic level.
- (ii) Carnivores.
- (iii) Biodegradable wastes of humans.
- (iv) Ecosystem.
- (v) Abiotic factors of an ecosystem

Ans. (i) Grass, green plants

(ii) Tiger, Eagle

(iii) Kitchen waste like peels of vegetables, fruits, left over foods and old newspaper.

(iv) Natural ecosystem includes forest, pond and artificial ecosystem which include garden, parks, crop fields.

(v) Physical factors like temperature, sunlight and edaphic factors like soil.

146. Suggest any four activities in daily life which are ecofriendly?

[NCERT]

Ans. The four activities in daily life which are ecofriendly are:

1. Carrying paper bags instead of polythene bags for shopping.
2. Use of compost and biofertilizers, biopesticides instead of chemical fertilizers and pesticides.
3. Segregating biodegradable and non-biodegradable substances and putting them in separate dustbins.
4. Rain water harvesting.

147. Give any two ways in which biodegradable substances would affect the environment.

[NCERT]

Ans. The two ways in which biodegradable substances would affect the environment are:

1. Decomposition of biodegradable substances results in production of foul smell.
2. The area where biodegradable wastes are accumulated serves as a good breeding place for mosquitoes, flies etc. which are the main carriers of germs for diseases like cholera, jaundice, typhoid etc.

148. What are the problems caused by the non-biodegradable wastes that we generate?**[NCERT]**

Ans. The problems caused by the non-biodegradable wastes are:

1. As non-biodegradable substances cannot be degraded naturally so they accumulate in the soil causing pollution and also reduces the fertility of the soil.
2. Some pesticides like DDT, mercury etc., which are non-biodegradable undergo biological magnification by entering into food chain.
3. If these substances do not undergo proper disposal techniques they will accumulate in soil thus will reduce the fertility of soil.
4. Some harmful non-biodegradable substances may cause diseases in living organisms.

149. If all the waste we generate is biodegradable, will this have no

impact on the environment? [NCERT]

Ans. If all the waste we generate is biodegradable then their decomposition at right time will not be possible as number of decomposers would be less as compared to the amount of biodegradable substances. It will get accumulated in the environment causing foul smell and will form a good breeding place for flies, mosquitoes etc., which will carry many disease causing germs. Thus various diseases like cholera, typhoid, jaundice, malaria, dengue etc., will be spread.

Long Answer Type Questions

150. What is an ecosystem? What are the components of an ecosystem? Also discuss the types of ecosystem? Draw a block diagram to show the flow of energy in an ecosystem?

Ans. An ecosystem is the structural and functional unit of biosphere where there is an interaction between living and non-living components to maintain balance between them.

The components of ecosystem are:

1. Biotic components: They are the living organisms like plants, animals, human beings etc. Based on the mode of obtaining food they are classified as producers, consumers and decomposers.

(a) Producers: They are autotrophs which have the capacity to prepare their own food by trapping solar energy and converting them to chemical energy in the form of carbohydrates by the process of photosynthesis.

(b) Consumers: They depend upon producers for food either directly or indirectly. They can be primary, secondary, tertiary or quaternary consumers.

(c) Decomposers: They obtain food from dead and decayed organisms by breaking them down into simpler forms.

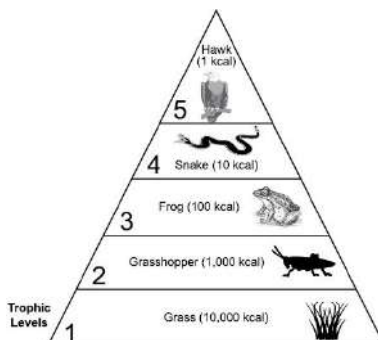
2. Abiotic components: They are the non-living components i.e., the physical factors like temperature, light, wind, water, humidity and edaphic factors like soil, minerals etc.

The two types of ecosystem are:

(a) Natural ecosystem: They are made by nature themselves without human interference. They can be terrestrial like forest, grassland and desert ecosystem and aquatic like freshwater and marine ecosystem.

(b) Artificial ecosystem: They are made and maintained by human beings. Examples—Gardens, parks, croplands etc.

151. Explain energy relationships with trophic levels?



Ans. Each step or level of the food chain where transfer of food or energy takes place is referred to as a trophic level. The energy relationship within trophic levels is shown in a form of pyramid.

Consider a food chain :

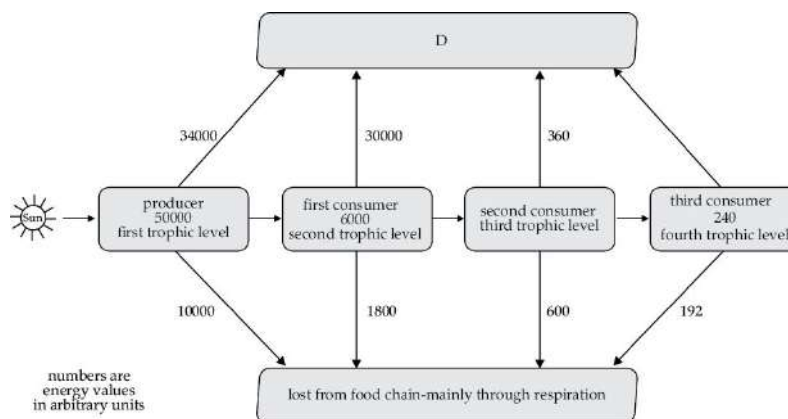
Grass → Grasshopper → Frog → Snake → Hawk.

This food chain can also be considered as energy chain. We can place these animals in different trophic levels, for example:

Grass: They are the producers so are placed in first trophic level. They utilise solar energy to prepare food. They transfer this energy to grasshopper, but only 10% of the energy is available to grasshopper according to Lindeman's 10% Law. If grass has 10,000 kcal of energy, only 1000 kcal will be transferred to grasshopper. So energy at next trophic level is reduced.

Similarly grasshopper is placed at second trophic level; frog in third, snake in fourth and fifth trophic level is occupied by hawk. At each trophic level the energy goes on decreasing i.e., frog will receive 100 kcal of energy, snake 10 kcal and finally hawk only 1 kcal. Thus energy at each trophic level goes on decreasing and the animal placed at apex will receive lowest energy. Thus a food chain can be only up to maximum 5 trophic levels. In this way there exists a relationship between trophic levels and energy.

152. Study the given flow chart and answer the below given questions.



(i) Which form of the Sun's energy is trapped by the producer?

(ii) Into which energy form is the Sun's energy converted when it is trapped by the producer?

(iii) What does D refer to in the box?

Ans. (i) Sun's energy is trapped by the producer in the form of Light (or solar) energy.

(ii) Sun energy trapped by producer is converted into Chemical energy.

(iii) D refer to Decomposers like bacteria or fungi.

153. A team of Indian researchers went to Antarctica to study the ozone layer. They confirmed the presence of largest ozone hole over Antarctica and was just short of 27 million sq. km. After few days of their return, one of the scientists developed rashes, burning sensation and other skin problems which the doctors have confirmed as skin cancer.

(i) What may be the cause of cancer just after return from Antarctica?

(ii) What do we learn from this incident?

Ans. (i) The scientists were exposed to harmful UV-radiations of the sunlight as there was a big hole over Antarctica and this might be the cause of skin cancer. The ozone layer acts as an ozone shield and absorbs the harmful UV-radiations. The UV-radiations have extremely harmful effects on human beings, animals as well as plants.

(ii) We learn that the ozone layer is very important for the existence and survival of life on earth. Ozone layer absorbs high energy UV-radiations causing a rise in temperature of the stratosphere. The use of chemicals like CFCs has endangered the ozone layer. CFCs used as refrigerator coolants

rise to the stratosphere where these molecules are broken down by UV-rays resulting in attack on the ozone molecules damaging the ozone umbrella of earth. Due to ozone layer depletion UV-rays reaching the earth cause skin cancer, cataracts, damage immune system, etc. UV-rays also decreases crop yield and certain fish larvae which are important constituents of aquatic food chains. It may also disturb global rainfall causing ecological disturbance. In this way all on the earth would be destroyed gradually.

154. Name the wastes which are generated in your house daily. What measures would you take for their disposal?

Ans. The wastes which are generated in our house daily are:

1. Peels of vegetables and fruits.
2. Old and used newspaper.
3. Old plastics apparatus, broken glass apparatus.
4. Plastic and polythene bags.
5. Wastes from kitchen like left over foods, broken plates, cups etc.
6. Old clothes, toys, utensils.

Measures that should be taken for their disposal are:

1. Biodegradable and non-biodegradable substances should be separated and disposed separately.
2. Kitchen wastes can be used to make compost.
3. Old clothes, toys, utensils etc., can be reused by giving to poor and needy people.
4. Plastic, polythene and glass apparatus can be recycled by using proper recycling techniques.
5. Old and used newspaper can also be recycled.
6. Safe disposal of plastic and polythene bags.

155. Answer the following:

(i) What is meant by non-biodegradable waste? Identify non-biodegradable wastes from the following:

Empty packet of chips, empty plastic bottle of mineral water, empty paper box

of sweets, empty tin of cold drink.

(ii) Pesticides added to the field are seen in increased amounts in the crop and in the birds that feed on them. What is this phenomenon called?

(iii) Which gas shields the surface of the earth from the harmful UV radiations from the sun?

(iv) Name the group of chemical compounds which adversely affect the ozone layer?

Ans. (i) The substances that cannot be degraded naturally by the action of microbes and persist in environment for longer period of time are called non-biodegradable substances.

The non-biodegradable wastes are empty packet of chips, empty plastic bottles of mineral water, empty tin of cold drink.

(ii) This phenomenon is called Biological Magnification.

(iii) Ozone gas shields the surface of the earth from the harmful UV radiations of the sun.

(iv) Chlorofluorocarbons (CFCs) are the group of chemical compounds which adversely affect the ozone layer.

156. Answer the following questions:

(i) If Sita is consuming curd/yogurt for lunch, which trophic level in a food chain should she be considered as occupying?

(ii) Aquarium needs to be cleaned once in a while whereas ponds or lakes do not require any cleaning. Explain.

(iii) To protect the food plants from insects, an insecticide was sprayed in small amounts but it was detected in high concentration in human beings. How did it happen?

Ans. (i) In the predatory food chain, it consists of first, second, and third to fifth trophic levels where the first trophic level is occupied by producers i.e, plants. The animals which consume plants are placed in the second trophic level. They are primary consumers. Herbivores are included in this trophic level. The organisms that depend on the organisms in the second trophic level are called secondary consumers; they are categorized under the third trophic level. Curd and yogurt are the products of cow or buffalo that belong to the second trophic

level. So, Sita who is eating either curd or yogurt belongs to the third trophic level.

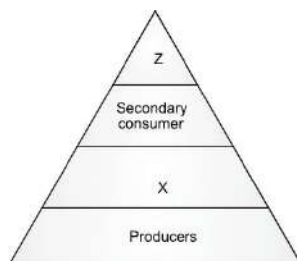
(ii) Aquariums are artificially built ecosystems which generally do not contain every aspect of a natural ecosystem. These artificial systems do not contain any form of natural decomposers and cleaners in the ecosystem as a result, food and waste generated by the organisms living in the aquarium accumulate and contaminate the water in the tank making it toxic. Hence, they have to be cleaned manually.

Ponds and lakes being natural ecosystems have natural decomposers and cleaners embedded as an integral part of the ecosystem, hence we do not have to clean them.

(iii) Insecticide are chemicals that are either washed down into the soil or into the water bodies. From the soil, these are absorbed by the plants along with water and minerals, and from the water bodies these are taken up by aquatic plants and animals. This is one of the ways in which they enter the food chain. As these chemicals are not degradable, these get accumulated progressively at each trophic level. As human beings occupy the top level in any food chain, the maximum concentration of these chemicals get accumulated in our bodies. This phenomenon is known as biological magnification. This is the reason why our food grains such as wheat and rice, vegetables and fruits, and even meat, contain varying amounts of pesticide residues. They cannot always be removed by washing or other means.

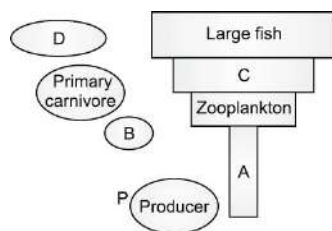
Diagram Based Questions

157. Write the appropriate names of the trophic levels Z and X in the figure given below:



Ans. X –Primary consumers; Z – Tertiary consumers

158. Complete the below diagram by filling spaces marked as A, B, C and D:



Ans. A – Phytoplankton; B – Herbivores

C – Small fish; D – Secondary carnivores

159. Which of the labelled arrows in the below diagram represents the smallest amount of energy transferred between organisms and the largest amount of energy lost to ecosystem?



Ans. The arrow which represents the smallest amount of energy transferred between organisms is Q and the largest amount of energy lost to ecosystem is R.

Differentiate Between

160. Distinguish between producers and consumers.

Ans.

Producers	Consumers
They prepare their own food.	They depend on producers for their food.
They prepare food from inorganic material by the process of photosynthesis.	They depend on readymade food.
They always constitute the first trophic level.	They are placed at second or higher trophic levels.
They possess chlorophyll which helps them in synthesising their own food.	They do not possess chlorophyll pigments.

They have the capacity to trap solar energy and convert it to chemical energy in the form of carbohydrates. Examples – Green plants, algae etc.	They cannot trap solar energy and convert it to chemical energy. They eat producers to get chemical energy. Examples – Humans, other animals like goat, rabbit, lion, tiger etc.
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161. Differentiate between food chain and food web?

Ans.

Food chain	Food web
The sequential interlinking of organisms where energy in the form of food is transferred from the producers through a series of consumers.	It is a network of food chains interlinking many organisms at different trophic levels which eat or being eaten and thus formed a number of feeding connections.
A food chain shows one path how energy in the form of food flows from producers to consumers.	A food web shows many paths <i>i.e.</i> , it is a network of food chains where an organism eats several types of organisms or eaten by many different organisms.

162. Differentiate between biodegradable and non-biodegradable substances.

Ans.

Biodegradable Substances	Non-biodegradable Substances
These substances are easily degradable in nature by the action of microbes like bacteria and fungi.	These substances are not degraded in nature by the action of microbes.
These substances remain for a short period of time in environment. Examples – Peels of vegetables, fruits, paper etc.	They persist for longer period of time in the environment. Examples – Plastic, metals, glass objects etc.

163. Suggest one word for each of the following statements or definitions.

- (i) The physical and biological world where we live in.
- (ii) Each level of food chain where transfer of energy takes place.
- (iii) The physical factors like temperature, rainfall, wind and soil of an ecosystem.
- (iv) Organisms which depend on the producers either directly or indirectly for food.

Ans. (i) Environment

(ii) Trophic level

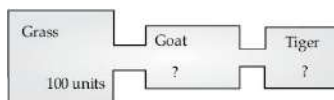
(iii) Abiotic factors

(iv) Heterotrophs

164. Why are crop fields known as artificial ecosystems?

Ans. Crop fields are made by man, most of the factors like sowing of seeds, watering etc., are done by man. Various types of crops are grown depending upon the type of soil and climatic conditions. Hence crop fields are known as artificial ecosystems.

165. Given below is an energy flow diagram. Study it carefully and answer the following questions :



- (i) How much energy (in units) will pass from grass to goat ?
- (ii) How much energy (in units) will pass from goat to tiger ?
- (iii) Which law operates during the transfer of energy from grass to goat to tiger ?

Ans. (i) 10 units of energy will pass from grass to goat.

(ii) 1 unit of energy will pass from goat to tiger.

(iii) Lindeman's Ten percent law operates during the transfer of energy from

grass to goat to tiger.

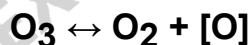
166. What is energy pyramid ? Why is it broader at base and narrower at the apex region ?

Ans. An energy pyramid is a graphical representation of the flow of energy from the producers through the various consumers. It shows the amount of energy available and the loss of useful energy at each step of the food chain in an ecosystem. As the energy gets transferred from lower trophic level to the higher one, there is a loss of large amount of energy due to metabolism and as heat. As a result very little energy (*i.e.*, 10%) gets transferred to the next level. So the trophic level at the base has maximum energy and that at the top has the least amount of energy. Hence energy pyramid is broader at the base and narrower at the top.

167. When plants are eaten by primary consumers a great deal of energy is lost as heat to the environment and some amount goes in carrying out various life processes. State the average percentage of energy lost in this manner.

Ans. The average percentage of energy lost when plants are eaten by primary consumers is 90%.

168. Given below is a reaction which occurs in the stratosphere.



(i) Name the two reactions which are in equilibrium thereby maintaining steady concentration of ozone in the ozonosphere.

(ii) What is being absorbed by the ozone for the occurrence of above two reactions ?

Ans. (i) Photodissociation of ozone and generation of ozone are the two reactions which are in equilibrium thereby maintaining steady concentration of ozone in the ozonosphere.

(ii) Ultraviolet radiations from sun are being absorbed by the ozone for the occurrence of above two reactions.

169. Write one word answer for the following statements or definitions ?

(i) Decline in the thickness of ozone layer over a restricted area.

(ii) The substances which react with the ozone layer in the stratosphere and destroy it.

(iii) The useless left over or discarded materials.

Ans. (i) Ozone hole

(ii) Ozone depleting substances

(iii) Wastes

170. Why have been kulhads banned for serving tea on platforms ? What types of cups are used in trains and platforms ?

Ans. Kulhads are made from the top fertile layer of soil. Use of this soil to make kulhads on a large scale would lead to loss of fertile top soil. This fertile top soil is of great use for the growth of plants as it contains many useful nutrients. Hence kulhads have been banned for serving tea on platforms. Nowadays disposable paper cups are used in trains and platforms.

171. "Industrialization is one of the main cause of deterioration of environment." List any four reasons in favour of this statement.

Ans. 1. Industrialization leads to generation of harmful gases which when released to environment deteriorate the quality of air. It causes air pollution which affects life of plants, humans, animals etc.

2. The effluents generated from industries if comes in contact with water bodies like rivers, lakes etc., will cause water pollution.

3. Big machines used in industries produce a lot of noise causing noise pollution.

4. The harmful chemicals and toxic substances generated from industries if released into soil will contaminate the soil leading to loss of fertility of the soil thus causing soil pollution.

172. Complete the following analogy.

(i) Sewage : Biodegradable : : Mercury : _____

(ii) Automobile exhaust : Gaseous waste : : Trash and rubbish : _____

(iii) Paper and plastic : Recycling : : Hospital waste : _____

(iv) Global warming : Troposphere : : Ozone depletion : _____

(v) Household waste : Compost : : Incineration : _____

Ans. (i) Non-biodegradable

(ii) Solid waste

(iii) Incineration

(iv) Stratosphere

(v) Chemical waste

Application Based Questions

173. Your uncle has come from the village to renew the contract to supply frogs to the laboratories of the colleges of the town. While talking to you, he mentioned that cases of malaria have increased in his village. In addition population of grasshoppers has also increased that are damaging crops.

(i) What could be the reasons for such problems faced by villagers?

(ii) What suggestions will you give to your uncle?

Ans. (i) As uncle is supplying frogs from his village to laboratories so the number of frog population is decreasing. Frogs eat grasshoppers and mosquitoes. But as the number of frogs population is reduced so the population of grasshoppers and mosquitoes are increasing. So malaria is spreading in the village by mosquitoes and grasshoppers are causing damage to the crops.

(ii) He must stop the supply of frogs to the laboratories as the reduced frog population is causing an imbalance in the food chain and proper ratio of frogs, grasshoppers and mosquitoes can not be maintained in the ecosystem.

174. A huge water body was being used for fishing, but after the set of industries near this water body when people consume fishes they started falling ill.

(i) What might be the cause of their illness after setting up of industries?

(ii) What steps must be taken by authorities to overcome this problem?

(iii) Name the biological phenomenon involved in this case.

Ans. (i) The effluents of industries containing non-biodegradable wastes get mixed with water bodies. These non-biodegradable toxic wastes get accumulated in the body of the fishes and when people consumed these fishes they fall ill.

(ii) Effluents should be properly treated before letting them into water bodies.

(iii) This phenomenon is called biomagnification.

175. While going to school and coming back from school Tarun watches that in a slum area they burn plastics which produce lot of gases.

(i) Is burning of plastic environmental friendly?

(ii) Suggest two alternatives for proper disposal of plastics?

Ans. (i) No, burning of plastics is not environment friendly because it releases various harmful and toxic gases which may cause health hazards. Some of the gases are carcinogenic and they also cause respiratory problems.

(ii) We should reuse plastics or we can recycle plastics in recycle plants.

176. Meera saw that her friend Reema was carrying polythene bags for shopping. She immediately stopped her and told her not to carry polythene bags.

(i) Why Meera stopped her friend Reema to carry polythene bags for shopping?

(ii) What alternatives could be done to replace polythene bags?

Ans. (i) Polythene is made from a polymer which is a chemical and is non-biodegradable which needs proper disposal techniques. It can accumulate in soil causing loss of fertility or might block drains leading to water logging. If not disposed properly, animals like cow would eat them which might block their alimentary canal. So, Meera stopped her friend Reema to carry polythene bags for shopping.

(ii) We can replace polythene bags with jute bags or paper bags for shopping.

177. Ayush went to a nearby park with his friends for a picnic. He saw that after picnic is over all his friends were throwing the leftover food, plates, cups, glasses here and there. He suggests them not to do like that and segregate the wastes and dispose them in red and green dustbins kept in park.

(i) Why do you think Ayush told his friends to segregate wastes and throw in separate dustbins?

(ii) How can we contribute in keeping parks, roads, sea beaches clean?

Ans. (i) Ayush told his friends to segregate wastes because there are two types of wastes- biodegradable wastes which include leftover foods, peels of vegetables, fruits, paper plates etc., and the other type of wastes is non-biodegradable which includes plastic cups, glasses etc. Both these wastes undergo separate techniques for their degradation hence they should be kept in separate dustbin.

(ii) We can help in keeping parks, roads, sea beaches clean by not littering, organise campaigns to create awareness among people about cleanliness, keeping dustbins in these places and throwing wastes only in dustbins, separating biodegradable and non-biodegradable wastes and proper disposal of these wastes.

Creating Based Questions

178. Study the table and complete the missing terms.

S. No.	Nature of food chain	Producers	Consumers	Consumers	Consumers
1.	Forests	Trees, shrubs	Deer	____(a)____	Man
2.	Grasslands	____(b)____	Grasshopper/Frog	____(c)____	Vulture
3.	Pond	Decay plants	Worms	Fish	____(d)____

Ans. (a) Tiger

(b) Grass

(c) Snake

(d) Shark

179. Using the following information, form a pathway which shows the

flow of energy at each trophic level. And also include information that is not mentioned below to complete it.

light energy, organic products, first trophic level, herbivores, second trophic level, energy.

Ans. Light energy green surfaces of plants → chemical energy stored in various → organic products in the plants first trophic level herbivores consume → plants as food second trophic level convert **chemical energy** into **kinetic energy** herbivores

→ are consumed by carnivores of the first order → **(secondary consumers)** third trophic level → **primary carnivores** are consumed by → **top carnivores** (last level) energy will be degraded.

180. Why energy transfer is said to be unidirectional whereas biochemical transfer is said to be cyclic?

Ans. Energy transfer is said to be unidirectional because when the energy is absorbed by autotrophs from the sun, it is never reabsorbed by it. Similarly, when consumers eat up the producers directly or indirectly the energy transferred in this process can never be reversed in the food chain. In biogeochemical cycles chemical elements move from environment to organism and back to the environment.

181. Rita wants to have an aquarium at home. What are the things that she needs to keep in mind in designing an aquarium?

Ans. The fish would need a free space for swimming, water, oxygen and food. Thus, she needs a good aquarium tank, oxygen can be provided through an oxygen pump (aerator) and fish food is available in the market.

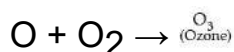
Water parameters for nitrate, nitrite, ammonia and pH levels are to be maintained. To condition water properly, use a de-chlorinating and biological aquarium supplement. It is recommended to change 25 percent of the aquarium water at least once a month. This will help maintain a clean and healthy tank, plus it keeps nitrate concentrations at a safe level. Overcrowding can lead to low oxygen levels in the water. Another crisis of overcrowding includes excess waste, which clogs the filter and degrades the aquarium water.

182. Using the following information form a pathway showing the formation of ozone at higher levels. And also include information that is

not mentioned below to complete it.

Ozone, UV, Molecular oxygen.

Ans. Ozone production \rightarrow UV radiation acting on oxygen (O_2) molecule \rightarrow the higher energy UV radiations split apart some molecular oxygen (O_2) $\rightarrow O_2 \xrightarrow{UV} O + O \rightarrow$ free oxygen (O) atoms then \rightarrow combine with molecular oxygen to form ozone



Self-Assessment

183. What is the functional unit of the environment comprising of the living and non-living components called?

184. Name two natural ecosystems and two artificial ecosystems?

185. Which one term in the following includes the others?

Air, flora, fauna, environment, water, sunlight, soil.

186. A student went to study a local pond. In one part of the pond she noticed tadpoles scraping at some pond weed. In another part she saw a water beetle holding a tadpole in its jaws.

(i) Construct a food chain for the pond ecosystem.

(ii) How many trophic levels are there in this chain?

187. What is the difference between the food habits of organisms belonging to the first and third trophic levels? Give one example each of the organisms belonging to these two trophic levels.

188. What are planktons?

189. Give reasons:

(i) Forest ecosystem is more stable than a cropland ecosystem.

(ii) Available energy goes on decreasing at each trophic level in a food chain.

190. Give examples of the following:

(i) Two step food chain in a forest ecosystem.

(ii) Three step food chain in a forest ecosystem.

(iii) Four step food chain in a pond ecosystem.

191. Name the following:

- (i) Organisms feeding on animal and plant food.
- (ii) Organisms breaking down wastes of living beings.
- (iii) The organisms occupying the first trophic level of any food chain.
- (iv) A complex network of many interconnected food chains and feeding relationships.
- (v) The cumulative increase in the concentrations of a persistent substance in successively higher levels of the food chain.

192. At which trophic level a person is feeding when he is eating:

- (i) Roasted chicken
- (ii) Bread
- (iii) Eggs
- (iv) Apple
- (v) Fish

193. State a way to prevent accumulation of harmful chemicals in our bodies.

194. Explain why there are greater chances of accumulation of harmful chemicals in the body?

195. Very briefly explain the phenomenon of ozone layer depletion.

196. Assertion: Arctic's ozone depletion tends to be milder and short lived than the Antarctic's.

Reason: CFCs, Frigid temperatures and sunlight are not present at the Arctic at the same time.

197. The amount of ozone in the atmosphere began to drop sharply in the 1980s. This decrease has been linked to synthetic chemicals like chlorofluorocarbons (CFCs) which are used as refrigerants and in fire extinguishers. In 1987, the United Nations Environment Programme (UNEP) succeeded in forging an agreement to freeze CFC production at 1986 levels. It is now mandatory for all the manufacturing companies to make CFC-free refrigerators throughout the world. Suggest an alternative coolant that can be used.

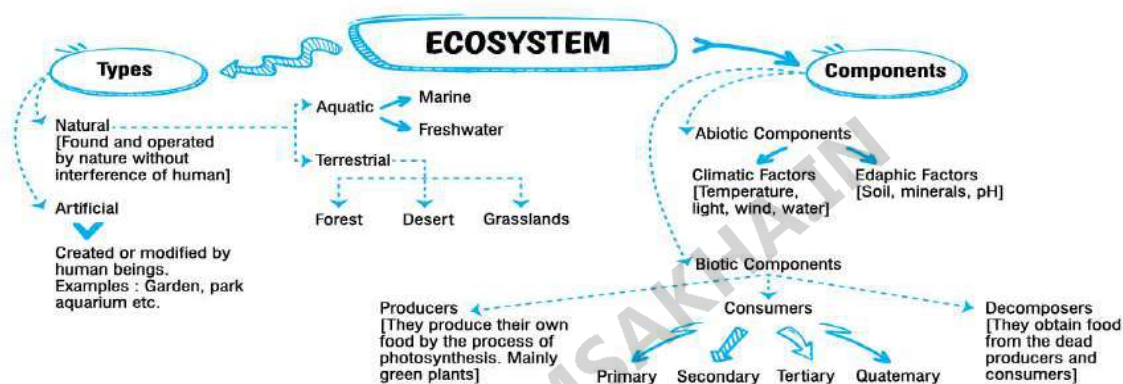
198. We often observe domestic waste decomposing in the by-lanes of

residential colonies. Suggest ways to make people realise that improper disposal of waste is harmful to the environment.

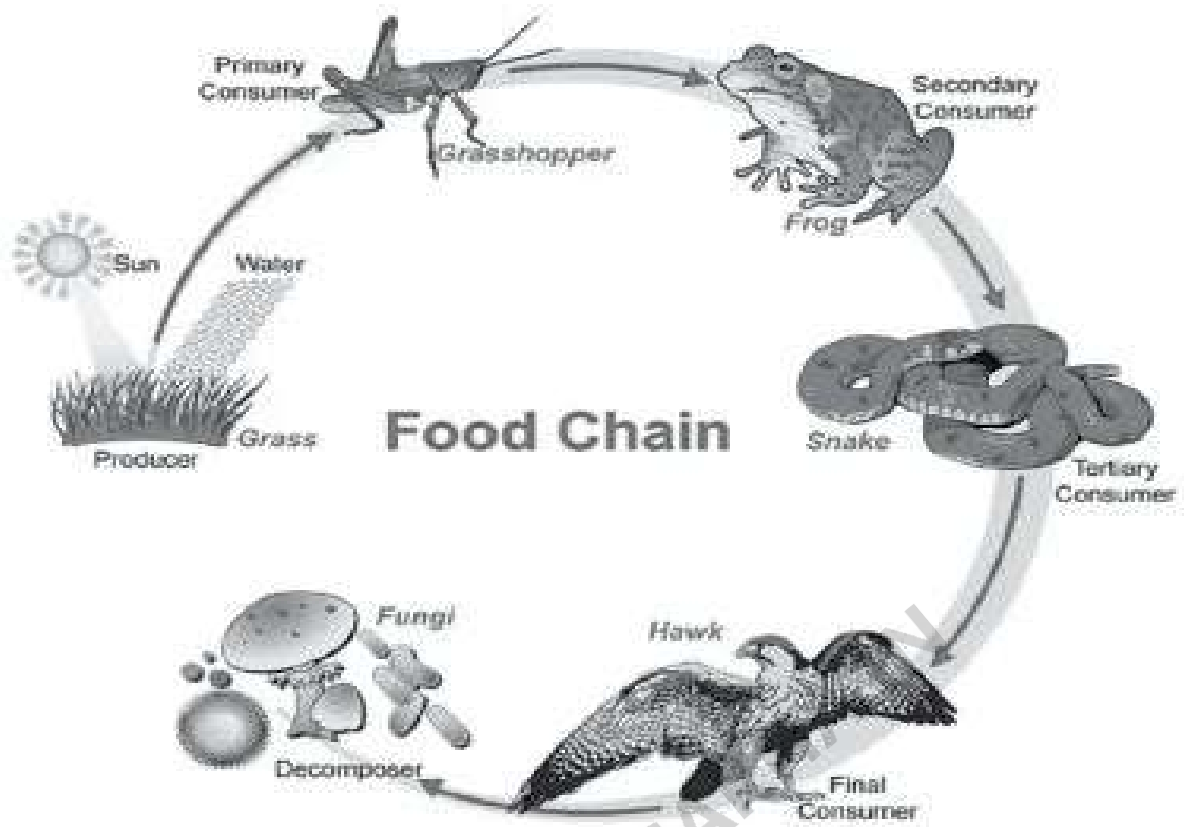
199. What is Montreal Protocol? Why was it signed?

200. What kind of disposable cups being used on large scale in trains now-a-days and why?

- Environment is everything that is around us which includes both biotic and abiotic components.
- Abiotic components are the non-living components i.e., the physical factors like temperature, light, wind, water, humidity, soil, minerals, etc.
- The biotic components are the living organisms like plants, animals, human beings etc. Both biotic and abiotic components interact with each other to form the environment as a whole.
- An ecosystem includes all living organisms along with the abiotic components which interact with each other to maintain a balance in the nature.
- The term ecosystem was introduced by Tansley in 1935.



- Producers are mainly autotrophs.
- Consumers cannot prepare their own food. They depend on autotrophs directly or indirectly for food. They are primary consumers [which eat plants or plants products], secondary consumers. [Feed upon primary consumers], tertiary consumers [feed upon secondary consumers], quaternary consumers [feed upon tertiary consumers and are at the top most level of food chain].
- Decomposers like bacteria, fungi etc., feed upon the decay of dead producers and consumers.
- The transfer of food energy from plant sources through a series of organisms in an ecosystem is known as food chain.
- The interlinking sequence starting from an autotroph to herbivores, carnivores and top most level consumers is called a food chain.



Quaternary