Dr. Mukesh Shrimali Physics Clinic
100 Minutes ,100 Sure Shot Solved Questions
Solved CASE Study Problems of all Units

Based On New Pattern

Subject: Physics

CBSE QUESTIONS BANK

2023

LAST TEN YEARS 1 MARK and 2 MARKS QUESTIONS AND THEIR ANSWERS

PHYSICS IS NOT EASY, BUT GETTING MARKS IN CBSE PHYSICS PAPER IS EASY, SYSTEMATIC AND SMART STUDY WITH THROUGH KNOWLEDGE OF HOW TO WRITE AND WHAT TO WRITE IS IMPORTANT FOR GETTING MARKS IN CBSE EXAMINATION

CONTACT FOR CBSE TEST SERIES, CONCEPTUAL PROBLEMS PRACTICE AND NUMERICAL PRACTICE FOR CBSE EXAMINATION

Dr. MUKESH SHRIMALI

09829506431

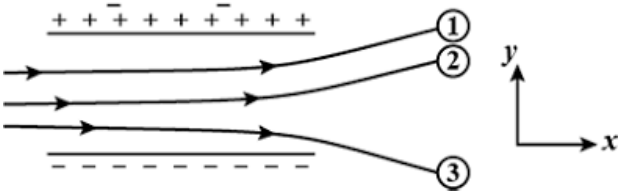
Never ignore revising graph, diagrams and solved examples of NCERT. Attempt CASE STUDYquestions on fresh page. Attempt questions in any manner but properly mention section and question number. If you repeat question then be careful which part to cross. Properly put all units in numericals. If calculation is tough then you can write approximate answers also.Read assertion reason question twice before putting answer

Dr. Mukesh Shrimali Physics Clinic
100 Minutes ,100 Sure Shot Solved Questions
Solved CASE Study Problems of all Units

ONE MARK QUESTIONS AND SOLUTIONS OF LAST TEN YEARS

Dr. Mukesh Shrimali

Q1 The figure shows tracks of three charged particle in a uniform electrostatic field. which particle has the highest charge to mass ratio ?



Solution:- y is proportional to q/m transverse deflection is maximum for particle 3 so it has maximum charge to mass ratio.

Q2 Two metals A and B have work functions 2 eV and 5 eV respectively. Which metal has lower threshold wavelength?

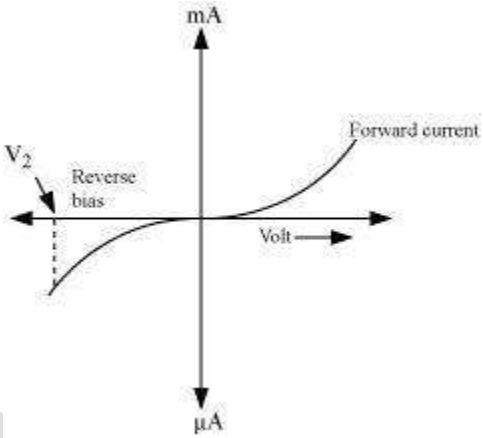
Solution:

$$W = h\nu_0 = \frac{hc}{\lambda_0} \quad \text{i.e} \quad \lambda_0 \alpha \frac{1}{W}$$

Therefore, metal B with higher work function has lower threshold wavelength.

Q3 Draw the voltage-current characteristic of a PN junction.

Solution:- V-I characteristic for a PN junction diode is given below:



Q4 A solenoid with an iron core and a bulb is connected to a d.c. source. How does the brightness of the bulb change when the iron core is removed from the solenoid?

Solution:- The brightness of the bulb remains unchanged because inductive reactance in a d.c. circuit is zero.however if source is AC then removing iron core will decrease self inductance and hence brightness will increases

Q5 Peak value of e.m.f of an a.c. source is E_0. What is its r.m.s and average value of full cycle and half cycle?

Solution:- RMS value will be $E_{rms} = \frac{E_0}{\sqrt{2}}$ however average value will be 0 for full cycle and $2E_0/\pi$ for half cycle

Q6 An electric dipole of dipole moment 20×10^{-6} Cm is enclosed by a closed surface. What is the net flux coming out of the surface?What will happen if we put more than one dipole

Solution:- Net flux coming out of the closed surface is zero because the net charge on the electric dipole is zero. Even if we put more than one dipole than also flux will be zero

Q7 An electron beam, projected along + X-axis, experiences a force due to a magnetic field along the + Y-axis. What is the direction of the magnetic field?Will there be any change in direction if we replace electron with alpha particle

Solution: For electron the magnetic field is along the + Z-axis. For alpha particle it will be along -Z axis.

Q8 The electric mains in a house are marked as 220V, 50Hz. Write down the equations for instantaneous voltage

Solution: E= 311sin 314t

Q9 Electrons are emitted by one of the light through photosensitive surface when it is illuminated by (i) red light (ii) blue light.

Solution: Light which has more wavelength posses less frequency hence
(i) Electrons are not emitted with red light.
(ii) Electrons are emitted with blue light.

Q10 Fraunhoffer diffraction from a single slit of width 1 micro meter is observed with light of wavelength 500nm.Calculate the half angular width of the central maximum.

Solution : $\sin\theta = \lambda/d = 0.5 \quad \theta = 30^0$

Q11 Define 'electric line of force' and give its two important properties.

Solution:- An electric field line is a path, straight or curved, such that tangent to it at any point gives the direction of electric field intensity at that point.

Properties of field lines:

(i) Tangent to the electric field line at any point gives the direction of electric intensity at that point.

(ii) No two electric lines of force can intersect each other.

Q12 State Lenz's law.

Solution: Lenz's law:

It states that the direction of induced current or *emf* in a circuit is always such that it opposes the cause which produces it.

Q13 The image of small electric bulb fixed on the wall to a room is to be obtained on the opposite wall 3 m away by means of a large convex lens.What is the maximum possible focal length of the lens required for the purpose?

Solution:- The minimum distance between an object and its real image is 4f.

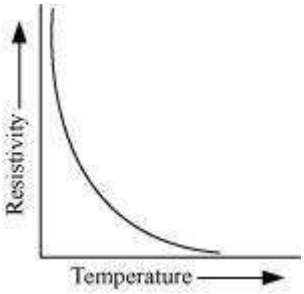
$4f = D \quad f = D/4 \quad = 3/4 \quad = 0.75m$

Q14 Define the term 'dielectric constant' of a medium in terms of capacitance of a capacitor. What is its unit?

Solution:- Dielectric constant of a medium is defined as the ratio of the capacitance of a capacitor with dielectric in between the plates to the capacitance of the same capacitor with vacuum or air in between the plates. It is unit less .

Q15 Sketch a graph showing variation of resistivity of carbon with temperature.

Solution: The resistivity of carbon decreases with increasing temperature as shown in the figure given below.



Q16 The magnetic susceptibility of a given material is – 0.5. Identify the magnetic material

Solution: For negative magnetic susceptibility magnetic material is diamagnetic

Q17. (a)Name two factors on which electrical conductivity of a pure semiconductor at a given temperature depends.

Solution: (I) The width of the forbidden band (ii) Intrinsic Charge Carrier concentration.

Q18 Why is photoelectric emission not possible at all frequencies?

Solution:- Every photosensitive surface has a definite work function and hence a definite frequency called threshold frequency. Frequency of light less than it will not be able to start photoelectric emission.

Q19 Why is germanium preferred over silicon for making semiconductors?

Solution: This is because the energy gap for Ge (0.7eV) is smaller than Si(1.1eV

Q20 Name the physical quantities, whose SI unit is (i)Joule/ coulomb(ii) Newton/coulomb

Solution:- Newton /coulomb is the SI unit of electric field intensity .joule/coulomb is electric potential

Q21 Why does potential barrier set up across a junction diode?

Solution: Due to accumulation of negative charge on p-region and positive charge on n - region potential barrier is set up which opposes the diffusion.

Q22 Is the force acting between two point electric charges q1 and q2, kept at some distance apart in air, attractive or repulsive, when (i) q1q2 > 0 (ii) q1q2 <0 ?

Solution:

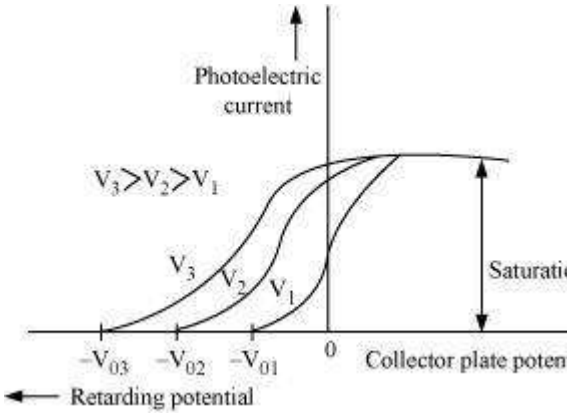
(i) The force is repulsive. When $q1q2 > 0$, it means that charges are either both positive or both negative. This implies that the force between them is indeed repulsive.

(ii) The force is attractive. When $q1q2 < 0$, it means that one of the charges is negative and the other is positive. This implies that the force between them is indeed attractive.

Q23 Show graphically how the stopping potential for a given photosensitive surface

varies with the frequency of incident radiations.

Solution:

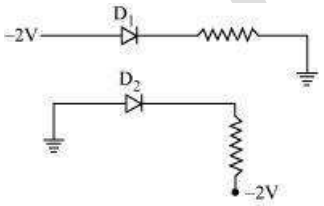


Q24 Why does the width of depletion layer of a PN junction increases in reverse bias

During reserve biasing , the positive terminal of the external battery attracts electrons from n region and negative terminal attracts holes from p region , the majority charge carrier move away from the junction.this increases the width of the depletion layer.

Q25 Which one of the two diodes D1 and D2 in the given figures is (i) forward biased,

(ii) reverse biased ?



Solution:

(i) In the given figure, D_2 is forward biased.

(ii) In the given figure, D_1 is reverse biased.

Q26 Why is neutron so effective as bombarding particle.

Solution:- A neutron carries no charge. It is easily penetrates even by a heavy nucleus without being repelled or attracted by nucleus. And electrons. So it serve as an ideal projectile

Q27 What is the direction of the force acting on a charged particle *q*, moving with a velocity $\vec{v}$ in a uniform magnetic field $\vec{B}$?

Solution:- The force $\vec{F}$ acting on a charged particle *q* moving in a uniform magnetic field $\vec{B}$ with velocity V is given by the relation:

$$\vec{F} = q(\vec{v} \times \vec{B})$$

This relation involves the cross product of V and $\vec{B}$. Hence, magnetic force is always normal to both V and $\vec{B}$.

Q28 Name the part of the electromagnetic spectrum of wavelength 10^{-2} m and mention its one application.

Solution:- The part of the electromagnetic spectrum which ranges from 0.1 m to 10^{-3} m is known as microwave. Microwaves are used in radar systems for aircraft navigation.

Q29 An electron and alpha particle have the same de−Broglie wavelength associated with them. How are their kinetic energies related to each other?

Solution:- Kinetic energy of a particle of mass *m* and velocity *v* is given as:

$$K = \frac{1}{2}mv^2 = \frac{1}{2}m\frac{p^2}{m^2} = \frac{p^2}{2m} \qquad [\because p =$$

$$p^2 = 2mK$$

$$p = \sqrt{2mK} \qquad (1)$$

de-Broglie wavelength associated with a particle of momentum *p* is given as:

$$\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mK}} \qquad (2)$$

It is given that an electron and an alpha particle have the same de-Broglie wavelength. Hence, we can write:

$$\lambda_e = \lambda_\alpha$$

$$\frac{h}{\sqrt{2m_eK_e}} = \frac{h}{\sqrt{2m_\alpha K_\alpha}}$$

$$m_eK_e = m_\alpha K_\alpha$$

$$\frac{K_e}{K_\alpha} = \frac{m_\alpha}{m_e}$$

$$\because m_\alpha > m_e$$

$$\therefore \frac{K_e}{K_\alpha} = \frac{m_\alpha}{m_e} > 1$$

$$K_e > K_\alpha$$

Hence, the kinetic energy of the electron is greater than that of the alpha particle.

Q30 A glass lens of refractive index 1.5 is placed in a trough of liquid. What must be the refractive index of the liquid in order to make the lens disappear?

Solution:- The lens will not be visible if no refraction occurs at the liquid−glass interface. This means that the incident ray should go through the glass without any deviation. For this condition to be fulfilled, the refractive index of the liquid must be equal to 1.5.

Q31 A 500 μC charge is at the centre of a square of side 10 cm. Find the work done in moving a charge of 10 μC between two diagonally opposite points on the square.

Solution:- The 500 μC charge is placed at the centre of a square. This charge is, therefore, at the same distance from all the corners of the square. The opposite corners, say A and C, will have the same potential i.e., $V_A = V_C$.

Work done in moving a charge *q* between points A and C is given as:

$W = q(V_C - V_A) = q \times 0 = 0$

Hence, no work is done in moving the charge between two diagonally opposite points on the square.

Q32 State the reason, why heavy water is generally used as a moderator in a nuclear reactor. not normal water

Solution:- In nuclear reactors, heavy water is generally used as a moderator because unlike normal water, which absorbs neutron, it slows down neutron without absorbing it.

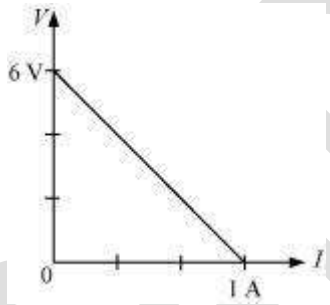
Q33 How does the fringe width and angular fringe width of interference fringes change, upon the whole apparatus of Young's experiment is kept in a liquid of refractive index 1.3?

Solution:- The fringe width will decrease.

$$\text{Fringe width}=\frac{\lambda D}{d}$$

When light enters a denser medium, its wavelength decreases by a factor 1.3 and hence the fringe width also decreases by a factor 1.3. similarly angular fringe width $\theta = \lambda/d$ also changes in same manner.

Q34 The plot of the variation of potential difference across a combination of three identical cells in series versus current is as shown below. What is the emf of each cell?



Solution:- It can be inferred from the given graph that for zero current, equivalent *emf* is 6 V. Since three cells are connected in series, *emf* of each cell will be

$$\frac{6}{3}=2\ \text{V}$$

Q35 A man fixes outside his house one evening a two meter high insulating slab carrying on its top a large aluminium sheet of area $1m^2$. Will he get an electric shock if he touches the metal sheet next morning

Solution:- Yes the aluminum sheet and ground form capacitor.

Q36 Write the following radiations in ascending order with respect to their frequencies: X-rays, microwaves, UV rays and radio waves.

Solution:- The given radiations can be arranged in ascending order with respect to their frequencies as:

Radio waves < Microwaves < UV rays < X-rays

Q37 Magnetic field lines can be entirely confined within the core of a toroid, but not within a straight solenoid. Why?

Solution:- Magnetic field lines form closed loops around a current-carrying wire. The geometry of a straight solenoid is such that magnetic field lines cannot loop around circular wires without spilling over to the outside of the solenoid. The geometry of a toroid is such that magnetic field lines can loop around electric wires without spilling over to the outside. Hence, magnetic field lines can be entirely confined within the core of a toroid, but not within a straight solenoid.

Q38 You are given following three lenses. Which two lenses will you use as an eyepiece and as an objective to construct an astronomical telescope?

Dr. Mukesh Shrimali Physics Clinic
100 Minutes ,100 Sure Shot Solved Questions
Solved CASE Study Problems of all Units

Lens	Power (P)	Aperture (A)
L1	3D	8 cm
L2	6D	1 cm
L3	10D	1 cm

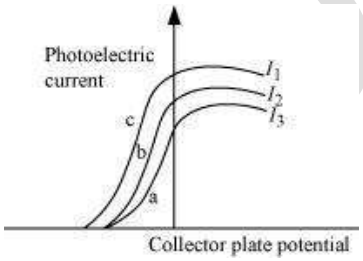
Solution:- For constructing an astronomical telescope, the objective should have the maximum diameter. Of the three lenses given, L1 has the maximum diameter.

The eyepiece should have the highest power for better magnification. Therefore, we use lens L3.

Q39 A 25W and 100 W bulbs are joined in series. And connected to mains. Which bulb will glow brighter?

Solution: The 25 watt bulb will dissipate more power and will glows more brighter.

Q40 The figure shows a plot of three curves a, b, c, showing the variation of photocurrent vs collector plate potential for three different intensities I_1, I_2 and I_3 having frequencies v_1, v_2 and v_3 respectively incident of a photosensitive surface. Point out the two curves for which the incident radiations have same frequency but different intensities.



Solution:- Curves *a* and *b* have the same frequency but different intensities.

Q41 What type of wave front will emerge from a (i) point source, and (ii) distance light source?

Solution:

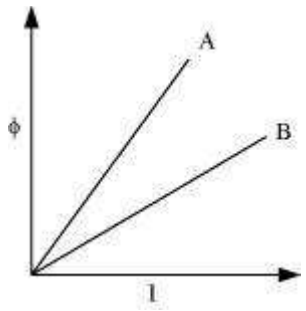
(i) For point source, wavefront will be spherical.

(ii) For a distant light source, the wave fronts will be plane wavefronts.

Q42 Two nuclei have mass numbers in the ratio 1: 2. What is the ratio of their nuclear densities?

Solution:- Nuclear density is independent of mass number. Hence, both the atoms have the same nuclear density.

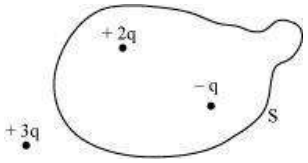
Q43 A plot of magnetic flux (Φ) versus current (I) is shown in the figure for two inductors A and B. Which of the two has larger value of self inductance?



Solution:- Inductor A has the larger value of self-inductance.

Q44 Figure shows three point charges +2q, −q and + 3q. Two charges + 2q and −q are enclosed within a surface 'S'. What

is the electric flux due to this configuration through the surface 'S'?



Solution:- The net electric flux through the surface 'S' is $\frac{q}{\varepsilon_0}$, where ε_0 is the permittivity of free space.(+2q-q= q) We consider charge only confined to the region.

Q45 In which orientation, a dipole placed in a uniform electric field is in (i) stable, (ii) unstable equilibrium?

Solution:- A dipole placed in a uniform electric filed is in

i. Stable equilibrium when the electric field is directed along the direction of the dipole i.e., when $\bar{E}$ is parallel to $\bar{p}$.
ii. Unstable equilibrium when the electric filed is directed at an angle of 180 degrees with the direction of the dipole, i.e., when $\bar{E}$ is anti-parallel to $\bar{p}$.

Q46 Which part of electromagnetic spectrum is used in radar systems?

Solution:- The microwave range of electromagnetic spectrum is used in radar systems.

Q47 Calculate the speed of light in a medium whose critical angle is 30°.

Solution:

Speed of light in the medium

$$= \frac{\text{Speed of light in air}}{\text{Refractive index of the medium with respect to air}}$$

$$= \frac{3\times10^8 \text{ m/s}}{\left(\frac{1}{\sin 30^\circ}\right)}$$

$$= \frac{3\times10^8 \text{ m/s}}{2}$$

$$= 1.5\times10^8 \text{ m/s}$$

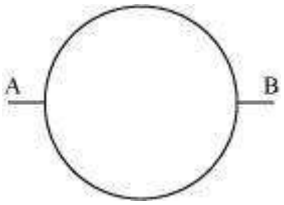
Q48 A metallic rod held horizontally along east-west direction, is allowed to fall under gravity. Will there be an induced emf at its end? Justify your answer.

Solution:- Yes there will be because metallic rod is falling in earth magnetic field and it will cut the magnetic lines of the earth's magnetic field.

Q49 Write the expression for Bohr's radius in hydrogen atom.

Solution:- The expression for Bohr's radius in hydrogen atom is $a_0 = \frac{h^2\varepsilon_0}{\pi m e^2}$.

Q50 A wire of resistance 8R is bent in the form of a circle. What is the effective resistance between the ends of a diameter AB?



Solution:- The effective resistance between the ends of diameter AB is.

$$\frac{1}{\frac{1}{4R}+\frac{1}{4R}}=\frac{1}{\frac{1}{2R}}=2R$$

Q51 A hollow metal sphere of radius 10 cm is charged such that the potential on its surface is 5 V. What is the potential at the centre of the sphere?

Solution:

We know

$E=-\frac{dv}{dr}$ and for hollow shell electric field at center = 0

$$\Rightarrow -\frac{dv}{dr}=0\Rightarrow dv=0$$

Hence V_c = 5V

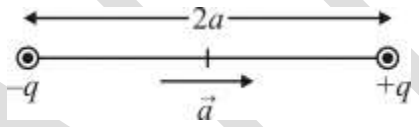
Q52 How are X-rays and Micro Waves are produced?

Solution:- X-rays are produced when inside a vacuum tube high energy electrons emitted by the cathode collides with the anode (usually made of tungsten, copper, etc.)

Micro Wave are produced by special vacuum tubes called klystron, magnetrons and Gunn diodes. Due to short wavelength they are used for radar system

Q53 Define electric dipole moment. Write its S.I. unit.Give its direction

Solution:



Electric dipole moment is the product of the magnitude of the either charge and the distance between the charges (this distance is also called the displacement vector). It is a vector quantity with direction pointing from the negative charge to the positive charge.SI unit of electric dipole moment is coulomb meter (Cm).

On axial line both p and E act in same direction whereas on equatorial lines they act antiparallel.

Q54 How does the pole strength and magnetic moment of each part of a bar magnet change if it is cut in to two equal pieces transverse to length

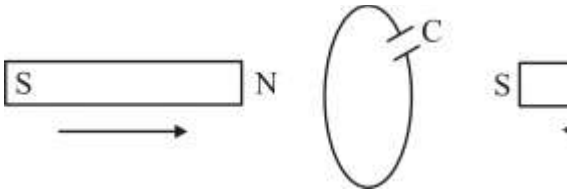
Solution:- The pole strength remain unchanged however magnetic moment will reduce to half

Q55 Define the term 'stopping potential' in relation to photo-electric effect.

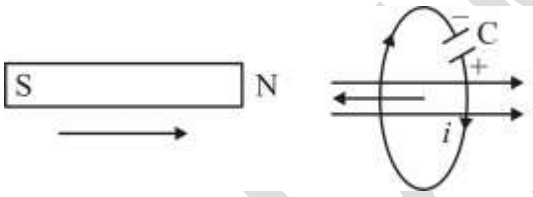
Solution:- If we increase the negative potential of the collector, the photoelectric current decreases rapidly. At a certain

critical value of the negative potential of the collector, the photoelectric current becomes zero. This potential is called stopping potential or cut-off potential and it depends on the frequency of the incident radiation, but independent of its intensity.

Q56 Two bar magnets are quickly moved towards a metallic loop connected across a capacitor 'C' as shown in the figure. Predict the polarity of the capacitor.



Solution:



Polarity of the capacitor: lower plate is positive; upper plate is negative.

Q57 Write any two characteristic properties of nuclear force.

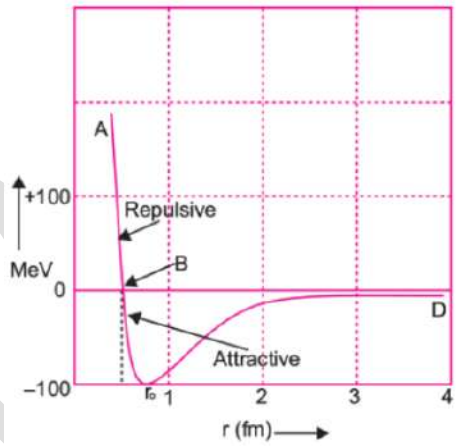
Solution:Characteristic properties of nuclear force are

(i) It is charge independent..

(ii) It is the strongest force in nature.

(iii) It is a very short range force.

(iv) The nuclear force is only felt among hadrons. At much smaller separations between nucleons the force is very powerfully repulsive, which keeps the nucleons at a certain average separation. Beyond about 1.7 femtometer (fm) separation, the force drops to negligibly small values.



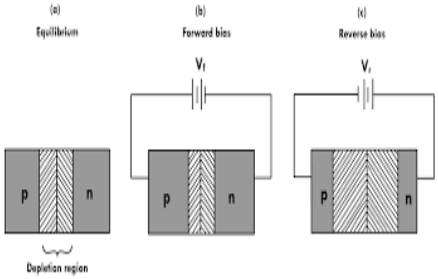
Graph between pair of nucleons and potential energy showing attraction and repulsion

Q58 What happens to the width of depletion player of a p-n junction when it is (i) forward biased, (ii) reverse biased? Which are two important process involve in formation of PN junction

Solution:

(i) In forward bias, the width of the depletion layer decreases.

(ii) In reverse bias, the width of the depletion layer increases.



Two process involve in formation of PN junction are diffusion and drift

Q59 When electrons drift in a metal from lower to higher potential, does it mean that all the free electrons of the metal are moving in the same direction?

Solution:- No, when electric field applied the electrons will have net drift from lower to higher field but locally electrons may collide with ions and may change its direction of motion.

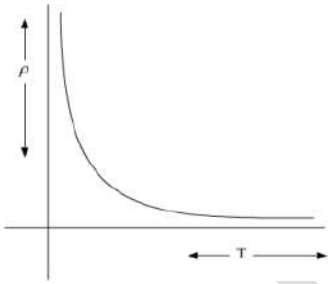
Q60 Write two properties of material suitable for making (a) permanent magnet (b) electromagnet

Solution:- For permanent (i)magnet High Coercivity , (ii)high rentantivity.

For electromagnet (i) High Permeability (ii) Low coercivity

Q61 Show on a graph, the variation of resistivity with temperature for a typical semiconductor.

Solution:- The following curve shows the variation of resistivity with temperature for a typical semiconductor.



This is because, for a semiconductor, resistivity decreases rapidly with increasing temperature.

Q62 Why should electrostatic field be zero inside a conductor?

Solution:- Charge on conductor resides on its surface. So if we consider a Gaussian surface inside the conductor to find the electrostatic field,

$\phi = \frac{q}{\varepsilon_0}$ Where, q = charge enclosed in Gaussian surface.

q = 0, inside the conductor, hence the electrostatic field inside the conductor is zero.

$$\phi = \oint \vec{E}.d\vec{s} = \frac{q}{\varepsilon_0}$$

$$\oint Eds\cos\theta = \frac{q}{\varepsilon_0}$$

$$\Rightarrow E = \frac{q}{4\pi\varepsilon_0 r} = (\text{Since } q = 0)$$

Q63 Name of physical quantity which remains same for microwaves of wavelength 1 mm and UV radiations of 1600 Å in vacuum.

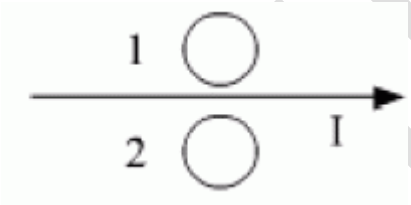
Solution:- Both microwaves and UV rays are a part of the electromagnetic spectrum.

Thus, the physical quantity that remains same for both types of radiation will be their speeds, equal to *c*.

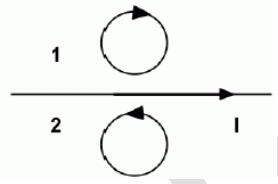
Q64 Under what condition does a biconvex lens of glass having a certain refractive index act as a plane glass sheet when immersed in a liquid?

Solution:- A biconvex lens will act like a plane sheet of glass if it is immersed in a liquid having the same index of refraction as itself. In this case, the focal length $1/f = 0$ or $f \to \infty$.

Q65 Predict the directions of induced currents in metal rings 1 and 2 lying in the same plane where current I in the wire is increasing steadily.



Solution:- Using Lenz's law we can predict the direction of induced current in both the rings. Induce current oppose the cause of increasing of magnetic flux. So,



It will be clockwise in ring 1 and anticlockwise in ring 2

Q66 State de-Broglie hypothesis.

Solution:- de-Broglie Hypothesis states that—

Moving object sometimes acts as a wave and sometimes as a particle; or a wave is associated with the moving particle, which controls the particle in every respect. This wave associated with the moving particle is called matter wave or de Broglie wave, its wave length is given as

$$\lambda = \frac{h}{mv}$$

Where

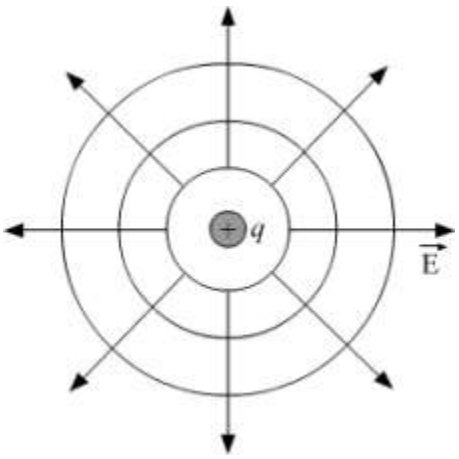
$h \to$ planck's constant

$m \to$ mass of the object

$v \to$ velocity of the object

Q67 What is the geometrical shape of equipotential surfaces due to a single isolated charge?

Solution:- For an isolated charge the equipotential surfaces are co-centric spherical shells and the distance between the shells increases with the decrease in electric field.



Q68 Write the relationship between angle of incidence 'i', angle of prism 'A' and angle

of minimum deviations for a triangular prism.

Solution:- The relation between the angle of incidence I, angle of prism, A and the angle of minimum deviation, Δ_m for a triangular prism is given as is given by

$$i = \frac{A + \Delta_m}{2}$$

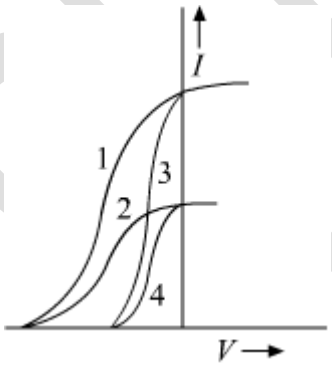
.

Q69 The storage battery of a car has an emf of 12V. If the internal resistance of the battery is 0.4ohm,what is the maximum current that can be drawn from the battery?

Solution: Current will be maximum if external resistance will be zero

I=E/r = 12/0.4 = 30 amp

Q70 The given graph shows the variation of photo-electric current (I) versus applied voltage (V) for two difference photosensitive materials and for two different intensities of the incident radiations. Identify the pairs of curves that correspond to different materials but same intensity of incident radiation.



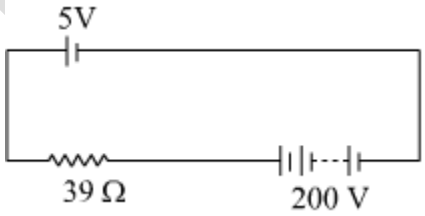
Solution:- Curves 1 and 2 correspond to similar materials while curves 3 and 4 represent different materials, since the value of stopping potential for the pair of curves (1 and 2) & (3 and 4) are the same. For given frequency of the incident radiation the stopping potential is independent of its intensity.

So, the pairs of curves (1 and 3) and (2 and 4) correspond to different materials but same intensity of incident radiation.

Q71 Which of the following waves can be polarized (i) Heat waves (ii) Sound waves? Give reason to support your answer.

Solution:- Heat waves can be polarized because heat waves are transverse waves whereas sound waves cannot be polarized because sound waves are longitudinal waves.

Q72 A 5 V battery of negligible internal resistance is connected across a 200 V battery and a resistance of 39Ω as shown in the figure. Find the value of the current in circuit.



Solution:

Let I be the current flowing in the circuit.

Using Kirchoff's law,

39I=200-5

$$I = \frac{195}{39} = 5 \text{ A}$$

Q73 Two wires of equal lengths are bent in the form of two loops. One of the loops is square shaped whereas the other loop is circular. These are suspended in a uniform magnetic field and the same current is passed through them. Which loop will experience greater torque?

Solution: More will be area more will be torque so circular loop experience more torque.

Q74 A heating element is marked 210 V, 630 W. Find the resistance of the element when connected to a 210 V dc source.

Solution:

$$\because \text{Power is given as, } P = \frac{V^2}{R}, \therefore R = \frac{V^2}{P} = \frac{210^2}{630} = 70$$

Q75 Define the term 'Mobility' of charge carriers in a conductor. Write its S.I. unit

Solution:- Mobility of charge carriers in a conductor is defined as the magnitude of their drift velocity per unit applied electric field.

Mobility, μ=Drift velocity /Electric field

$\mu = V_d / E$ (S.I. unit of mobility is m2V-1s-1 or ms-1N-1C).

Q76 A current is set up in a long copper pipe. Is there a magnetic field (I) Inside(ii) outside

Solution: Inside Zero and finite outside the pipe

Q77 "For any charge configuration, equipotential surface through a point is normal to the electric field." Justify.

Solution:- We know that the work done (*W*) in moving a test charge along an equipotential surface is zero. This is because an equipotential surface is a surface with a constant value of potential at all the points on the surface.

$\therefore W = Fs\cos\theta = 0$
Here, F is the electric force and s is the magnitude of displacement of the charge.

For non-zero displacement, this is possible only when $\cos\theta$ is equal to 0.

i.e. $\cos\theta = 0$

$\Rightarrow \theta = 90°$

Thus, the force acting on the point charge is perpendicular to the equipotential surface. We know that the lines of force or the electric field lines indicate the direction of electric force on a charge. Thus, for any charge configuration, equipotential surface through a point is normal to the electric field.

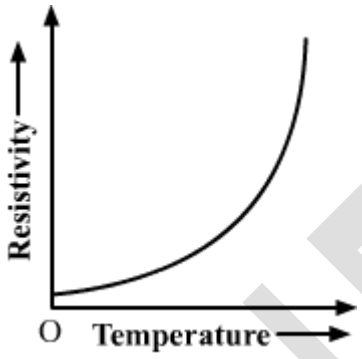
Q78 Two spherical bobs, one metallic and the other of glass, of the same size are allowed to fall freely from the same height above the ground. Which of the two would reach earlier and why?

Solution:- A glass bob is non-conducting, while a metallic bob is conducting. Due to the non-conducting nature of the glass bob, it will only experience the Earth's gravitational pull. So, the glass bob will reach the ground earlier.
Because of its conducting nature, Eddy current is induced in the metallic bob as it falls through the magnetic field of the

Earth.
By Lenz's law, the current induced is such that it opposes the motion of the metallic bob. So, the metallic bob will experience a force in the upward direction. This will slow down the metallic bob by some extent. Hence, it will reach the Earth after the glass bob.

Q79 Show variation of resistivity of copper as a function of temperature in a graph.

Solution:- The variation of resistivity of copper with temperature is parabolic in nature. This is shown in the following graph:



Q80 A convex lens is placed in contact with a plane mirror. A point object at a distance of 20 cm on the axis of this combination has its image coinciding with itself. What is the focal length of the lens?

Solution:- Here, the convex lens is in contact with a plane mirror and the image distance is equal to the object distance. This is possible only when the point object is placed at the centre of the curvature of the lens.

We use the relation f=R2, where *R* is the distance between the centre of the curvature and the pole and *f* is the focal length.

Here, *R* = 20 cm

∴ Focal length of the lens = 20/2 = 10 cm

Q81 Write the expression, in a vector form, for the Lorentz magnetic force F→ due to a charge moving with velocity V→ in a magnetic field B→. What is the direction of the magnetic force?

Solution:- The Lorentz magnetic force is given by the following relation:
$F\rightarrow=qV\rightarrow\times B\rightarrow$
Here, *q* is the magnitude of the moving charge.
The direction of the magnetic force is perpendicular to the plane containing the velocity vector V→ and the magnetic field vector B→.

Q82 If the speed of rotation of the armature of a generator is increased , How would it affect (I) the maximum emf (ii) frequency

Solution: Both maximum emf and frequency get doubled . as e=NBAwsin wt

Q83. A closed loop is held stationary in the magnetic field between the north and south poles of two permanent magnet held fixed. Can we hope to generate current in the loop with these strong magnet

Solution: No, Strong magnet provide flux but current will induced when there will be change in flux so flux has to be changed by some movement.

Q84. An electron and proton having equal momentum, enter a uniform magnetic field at right angles to the field lines. What will be the ratio of their trajectories.

Solution : 1:1 as q and B have same values for both the particles r=mv/qB

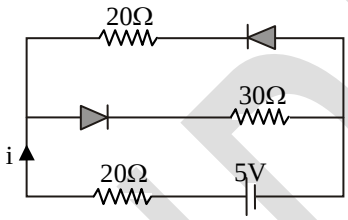
Q85. When light travel from a rarer to denser medium, the speed decreases. Does this decrease in speed imply a decrease in the energy carried by the light wave? Justify your answer.

Solution: Energy depends on amplitude and frequency and not on speed so no change.

Q86. At which angle of incidence , deviation produced by a prism is maximum?

Solution: When angle of incidence is 90^0 .

Q87. Current in the circuit will be -



Solution:PN junction with 30 ohm is forward bias and 20 ohm is reverse bias so I=5 /50 amp

Q88. A variable frequency AC source is connected to a capacitor. Will the displacement current change if the frequency of the AC source is decreased.

Solution : NO. Displacement current has nothing to do with frequency.

Q89. Complete the following nuclear reaction

$_5B^{10} + _0n^1 \rightarrow _2He^4 + $ .....

Solution $_5B^{10} + _0n^1 \rightarrow _2He^4 + _3Li^7$

Q90. Work function of Al is 4.2 eV. If two photons each of energy 2.5 eV are incident will emission of electrons take place?

No each photons must have energy more than work function for photoelectric effect

Solutions: To avoid interference of signals.

Q91. Why does white light disperse when passed through a glass prism ?

Solution: It is because a glass prism offers different refractive index to different wavelength of light.

Q92. A heavy nucleus X of mass number 240 and BE/A 7.6 MeV is split in to fragments Y and Z of mass number 110 and 130. With BE/A 8.5 MeV What will be energy released per fission

(110X8.5) + (130x8.5)- (240x 7.6)=216MeV

Q93. (a)When Can a charge act as a source of electromagnetic wave?

Solution: Only when we have accelerated or oscillating charge, it act as source of electromagnetic wave.

(b) Which Physical quantity, if any ,has the same value for waves belonging to different parts of electromagnetic spectrum?

Solution: Speed of wave in vacuum has same value that is speed of light

Dr. Mukesh Shrimali Physics Clinic
100 Minutes ,100 Sure Shot Solved Questions
Solved CASE Study Problems of all Units

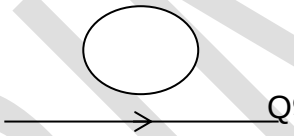
Q94. A plane EMW travels in vacuum along y direction. Write ratio and direction of electric and magnetic field vectors

Solution: E/B =c , Electric vector along Z direction and magnetic along X direction

Q95. Two thin lenses of focal lengths +10cm and -5cm are kept in contact What is focal length of combination

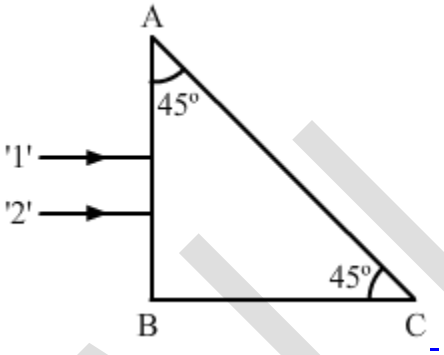
Solution: $1/f = 1/f_1 + 1/f_2$ f= 10cm

Q96. The current through the wire PQ is increasing. In which direction does the induced current flow in the closed loop ?



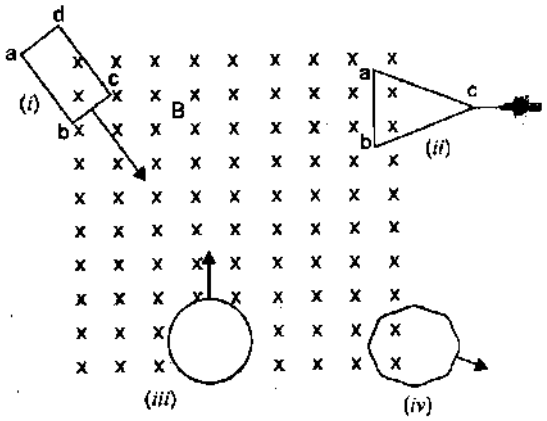
Solution: According to Lenz law, current will flow in closkwise direction.

Q97. Two monochromatic rays of light are incident normally on the face AB of an isosceles right-angled prism ABC. The refractive indices of the glass prism for the two rays '1' and '2' are respectively 1.35 and 1.45. Trace the path of these rays after entering the prism.



Solution; Refractive index n= 1/sin i_c = 1.414. the ray will transmitted through face AC if $i<i_c$ this condition will be satisfied for n<1.414 hence 1 will transmit and 2 will suffer total internal reflection.

Q98. Figure shows planar loops of different shapes moving out of or into a region of magnetic field which is directed normal to the plane of loops downwards. Determine the direction of induced current in each loop using Lenz's law.



Solution : (i) anticlockwise (ii)clockwise (iii) Anticlockwise (iv) clockwise

Q99. Welders wear special glass goggles while working . Why?

Solution: This is because the special glass goggles protect the eyes from large amount of ultraviolet radiations produced by welding arcs .

Q100. A converging lens has a focal length of 20 cm in air. It is made of a material of refractive index 1.5. If it immersed in water of refractive index 4/3, what will be the new focal length ?

$F_{new} = (n_g - 1)/(n_g/n_l - 1) \times f = \left(\frac{1.5-1}{\frac{1.5}{(4/3-1)}}\right) \times 20 = 80$ cm.

**********Wish You Good Luck and all the best**********

Collection Of Case Studies Unit Wise

1. Electrostatics:

1.Electric Dipole

It consist of two equal and opposite charges separated by finite distance known as electric length denoted by 2a .The strength of electric dipole is explained by dipole moment denoted by p. It is It is a vector quantity its direction is always from negative charge to positive charge. All the result are usually expressed in terms of dipole moment for dipole.

1. An electric dipole of dipole moment p is lying along a uniform electric field E. The work done in rotating the dipole by 180^0 is-

A. 2pE

B. pE

C. Zero

D. pE/2

2. An electric dipole is placed at an angle of 30^0 with an electric field intensity 5×10^4 N/C. It experiences a torque equal to 10^4 Nm. Then its dipole moment will be

A. 4×10^{-9} Cm☑

B. 8×10^{-9} Cm

C. 6×10^{-9} Cm

D. 2×10^{-9} Cm

3. Relation of electric field on axial line and equitorial line of dipole will be

A. $E_{axial} = E_{equitorial}$

B. $E_{axial} = 2E_{equitorial}$☑

C. $E_{axial} = E_{equitorial}/2$

D. No relation

4. Which statement is true for electric dipole
   A. Electric field due to dipole is constant
   B. Electric field due to dipole varies inversely with distance
   C. Electric field due to dipole varies inversely with square of distance
   D. Electric field due to dipole varies inversely with cube of distance☑
5. The symmetry of electric field due to dipole is
   A. Linear
   B. Spherical
   C. Elliptical
   D. Cylindrical☑

2. Case Study

. Equipotential Surface

An equipotential surface is a surface with a constant value of potential at all point on the surface. From the formula of potential V= kq/r if r is constant V is constant.thus equipotential surface of a single point charge are concentric spherical surfaces centered at the charge.

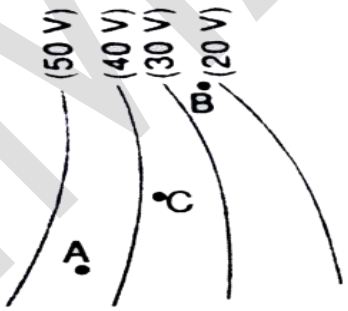
1. If a unit positive charge is taken from one point to another over an equipotential surface then
(a) Work is done on the charge
(b) Work is done by the charge
(c) Work done is constant
(d) No work is done☑

2. Equipotential surfaces associated with an electric field which is increasing in magnitude along the x direction are
(a) Planes parallel to yz plane☑
(b) Planes parallel to xy plane
(c) Planes parallel to xz plane
(d) Coaxial cylinders of increasing radii around the x axis

3. What is not true for equipotential surface for uniform electric field
(a) Equipotential surface is flat
(b) Equipotential surface is spherical☑
(c) Electric lines of forces are perpendicular to equipotential surface
(d) Work done is zero

4. Answer the following

Figure shows sone equipotential surfaces produce by some charges. At which point, the value of electric field is greatest ?



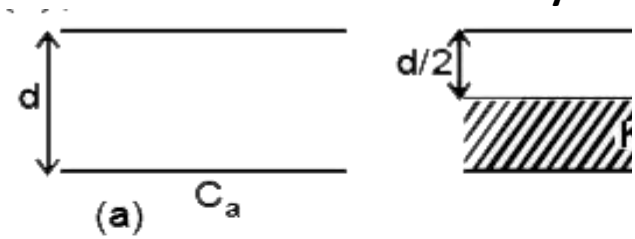
(a) A (b) B☑ (c) C (d) none of above

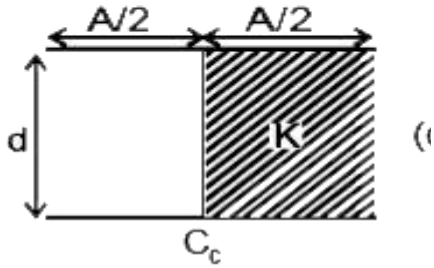
Case Study 3

3. Parallel plate capacitor

A capacitor is an arrangement of two conductors separated by an insulating medium that is used to store charge and electric energy. Capacitance of an insulated conductor is considerably increased when we place an earth connected conductor near it

Dr. Mukesh Shrimali Physics Clinic
100 Minutes ,100 Sure Shot Solved Questions
Solved CASE Study Problems of all Units



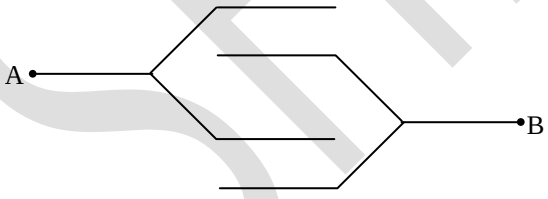


1. If capacity of capacitor of diagram (a) is C then what will be capacitance of (b)
   (i) C_b= KC (ii) C_b= C/2K
   (iii) C_b= 2KC (iv) None of above☑

2. What will be capacity of (c)
   (i) C_c =C(1+K)/2☑ (ii) C_c= C+1/K
   (iii) C_c =KC/2 (iv) C_c= C/K

3. When we insert dielectric Capacitance will
   (i) Increase☑ (ii) decrease
   (iii) Remain same (iv) become Infinite

4. Four plates of the same area A of cross-section are joined as shown in the figure. The distance between each plate is d. The equivalent capacity across AB will be-



(i) $\frac{2\varepsilon_0 A}{d}$ (ii) $\frac{3\varepsilon_0 A}{d}$ ☑

(iii) $\frac{3\varepsilon_0 A}{2d}$ (iv) $\frac{\varepsilon_0 A}{d}$

5. Which of the following is not use of capacitor
   (i) To produced electric field
   (ii) To store electric energy
   (iii) To produce oscillation
   (iv) To produce magnetic field☑

Case Study 4

4. Current Electricity

When terminals of a cell are connected by a wire, an electric current flows in the wire from positive to negative terminals.. but inside the electrolyte of the cell the positive ions flow from lower to the higher potential and negative from higher to lower. The resistance offered by the electrolyte of a cell to the flow of current between its electrodes is called internal resistance. A car has a fresh storage battery of emf 12V and internal resistance 5×10^{-2} Ω. , the starter motors draws a current of 90 A . After long use ,the internal resistance of battery increases to 500Ω .

1.Internal resistance does not depends on

A. Nature of electrolyte

B. Concentration of electrolyte

C. Distance between electrodes

D. Emf of cell☑

2. What will be maximum current that can be drawn from cell after long use when resistance becomes 500Ω

A. 10mA

B. 20mA

C. 24mA☑

D. 35mA

3. What is terminal potential difference of the battery when the starter is on

A. 7.5V☑

B. 0V

C. 10V

D. 5V

4. If the discharged battery is charged by an external emf source, what we can say about terminal voltage of the battery?

A. V must be equal to 12V

B. V must be less than 12V

C. V must be greater than 12V☑

D. Can't say anything.

5. What will be terminal potential difference of cell in open circuit

A. It is always less than emf

B. It is always greater than emf

C. It is equal to emf☑

D. It is always zero

5Case Study: Solenoid

A solenoid means an insulated copper wire wound closely in the form of a helix. The word solenoid comes from greek word meaning channel and was first used by Ampere. By long solenoid, we mean that the length of solenoid is very large as compared to its diameter

Answer the following for solenoid

(a) The Ratio of magnetic field at center and on the ends of long solenoid will be

(i) 1/4 (ii) 1/2

(iii) 2/1☑ (iv) 1/1

(b) The polarity of any end of the solenoid can be determine with using following rule

(i) Fleming's left hand rule

(ii) Fleming's right hand rule

(iii) Ampere's left hand rule

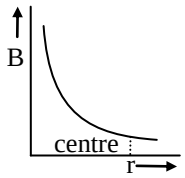
(iv) Ampere's right hand rule ☑

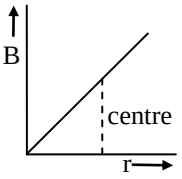
(c) At the centre of a straight solenoid the magnetic induction is B. If the length is reduced to half but to keep the number of turns same, these are wound in two layers, then the magnetic induction at the centre will be -

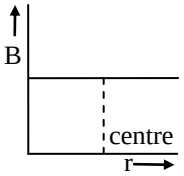
(i) B/2 (ii) B

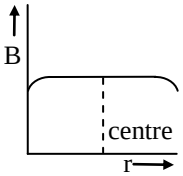
(iii) 2B (iv) 4B☑

(d) In a solenoid the magnetic induction produced due to current (B) is a function of distance x from one end -

(i) 

(ii) 

(iii) 

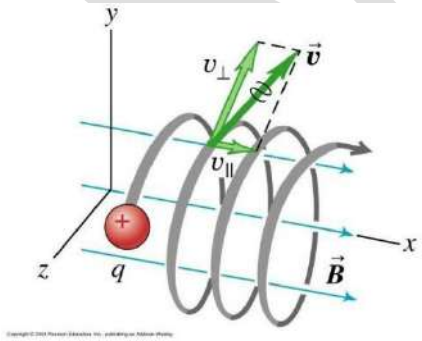
(iv)☑ 

(e). The number of turns per unit length of a solenoid is 10. If its average radius is 5 cm and it carries a current of 10A, then the ratio of flux densities obtained at the centre and at the end on the axis will be -

(i) 1 : 2 ☑(ii) 2 : 1

(iii) 1 : 1 (iv) 1 : 4

6. LORENTZ FORCE:



When a charged particle having charge q and velocity v enters a magnetic field B, it experience a force called Lorentz force. The direction of this force is perpendicular to both v and B.

(a)The work done by a magnetic force on a charged particle is always

(i) Positive (ii) Negative

(iii) zero☑ (iv) infinite

(b)When Lorentz force act on charge particle then its Kinetic energy

(i) Increases (ii) Decreases

(ii) Remain Constant☑

(iv) Can't say anything

(c) What will be path of particle when initially velocity is perpendicular to the magnetic field

(i) Straight line (ii) Circular ☑

(iii) Helical (iv) Parabolic

(d) When we apply crossed electric and magnetic field on charged particle then velocity of undeflected particle will be given as

(i) V=E×B (ii) V= E/B ☑

(ii) V= E^2B (iv) V= EB^2

(e) A charged particle is moved along a magnetic field line. The magnetic force on the particle is -

(A) along its velocity

(B) opposite to its velocity

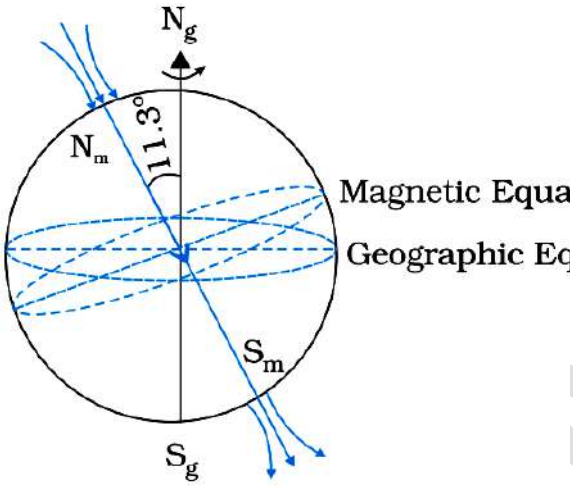
(C) perpendicular to its velocity

(D) zero ☑

Dr. Mukesh Shrimali Physics Clinic
100 Minutes ,100 Sure Shot Solved Questions
Solved CASE Study Problems of all Units

CASE STUDY 7: Magnetic field of earth

Earth is a powerful natural magnet. Its magnetic field is present everywhere near the earth's surface.The magnetic north pole of the earth lies near geographic south pole and magnetic south pole near geographic north pole.The magnitude of earth magnetic field is nearly 1 Gauss.



(I) In the above diagram , What is angle of declination

a. 11.3^0☑
b. 22.6^0
c. O^0
d. 90^0.

(ii) If angle of dip is 30^0, What will be Magnetic field at that point if horizontal component is 0.5 Gauss

a. 0.5 Gauss
b. 1.0 Gauss
c. 1/√3 Gauss☑
d. 1/2 Gauss

(iii) Dip circle is used to measure

a. Angle of inclination☑
b. Angle of declination
c. Horizontal component of earth
d. Vertical component of earth

(iv) Which one is not magnetic element of earth

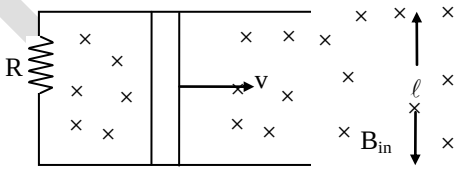
a. Angle of inclination
b. Angle of declination
c. Horizontal component of earth
d. Vertical component of earth☑

(v) Angle of dip is zero at

a. Pole
b. Equator☑
c. At London
d. At India

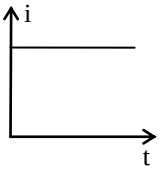
8 Electro Magnetic Induction

A conducting bar is slide at a constant velocity v along two conducting rods. The rods are separated by a distance □ and connected across a resistor R. The entire apparatus is placed in an external magnetic field B directed into the page.

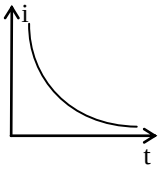


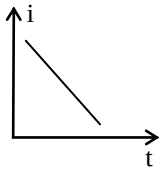
Q.1☑ Which of the following represents the current i generated by the apparatus.

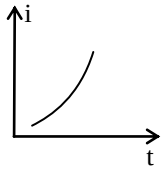
☑(A)



(B)



(C) 

(D) 

Q.2 If rod is replaced by a semicircular and conducting wire of diameter □. Then current in R -

(A) increases

(B) decreases

☑(C) remain same

(D) may increase or decrease

Q.3 The current in closed loop will be -

(A) clockwise

☑(B) anticlockwise

(C) may be clockwise or anti clockwise

(D) none of the these

9.Alternating Current:

A thermal power plant produces electric power of 600 kW at 4000 V, which is to be transported to a place 20 km away from the power plant for consumers usage. It can be transported either directly with a cable of large current carrying capacity or by using a combination of step-up and step-down transformers at the two ends. The drawback of the direct transmission is the large energy dissipation. In the method using transformers, the dissipation is much smaller. In this method, a step-up transformer is used at the plant side so that the current is reduced to a smaller value. At the consumers end, a step-down transformer is used to supply power to the consumers at the specified lower voltage. It is reasonable to assume that the power cable is purely resistive and the transformers are ideal with a power factor unity. All the currents and voltage mentioned are rms values.

Q.1 In the method using the transformers, assume that the ratio of the number of turns in the primary to that in the secondary in the step-up transformer is 1 : 10. If the power to the consumers has to be supplied at 200 V, the ratio of the number of turns in the primary to that in the secondary in the step-down transformer is-

(A) 200 : 1 (B) 150 : 1

(C) 100 : 1 (D) 50 : 1

Q.2 If the direct transmission method with a cable of resistance 0.4 □ km^{-1} is used, the power dissipation (in %) during transmission is-

(A) 20 (B) 30 (C) 40 (D) 50

Q3. What is efficiency of ideal transformer

(A) 0 (B) 1 (c) Infinity (D) 45

Q4. Why we keep long transmission at higher voltage

(A)It is Safe

(B)Energy loss/power loss is less

(C)Thin wires are needed

(D) For large voltage drop along the line

{Answer}

1[A] Using step up transpormer

V_P = 4000 V

$$\frac{N_P}{N_S} = \frac{1}{10}$$

$$\frac{4000}{V_S} = \frac{1}{10}$$

V_S = 40,000 volt

40,000 volt is converted to 200 V using step down transformer

$$\frac{40000}{200} = \frac{N_P}{N_S}$$

$$\frac{N_P}{N_S} = \frac{200}{1}$$

2[B] Direct transmission method

$$\text{Current} = \frac{600 \times 10^3}{4000} = 150 \text{ Amp.}$$

Power loss = $(150)^2 \times 0.4 \times 20$

= 225 × 100 × 8

= 180 kW

$$\% \text{ loss} = \frac{180}{600} \times 100$$

= 30 %

3[B], 4[B]

Resonance

CASE STUDY 10 : At an airport, a person is made to walk through the doorway of a metal detector, for security reasons. If she/he is carrying anything made of metal, the metal detector emits a sound. Answer following question on basis of it

1. The metal detector work on principle of

(a) Transformer

(b) Chock coil

(c) Resonance☑

(d) Kirchoff law

2. Current is observed in phase with voltage at resonance of

(a) LR circuit

(b) CR circuit

(c) LC circuit

(d) LCR circuit☑

3. Tunning of Radio and TV is based on which phenomenon

(a) LC oscillation

(b) Quality factor

(c) Resonanse

(d) All of above☑

4. Which circuit will not provide resonance

(a) LR circuit

(b) CR circuit

(c) LC circuit

(d) All of above☑

5. If V_L= 20V, V_R=40V and V_C= 20V then what will be supply voltage

(a) 20V

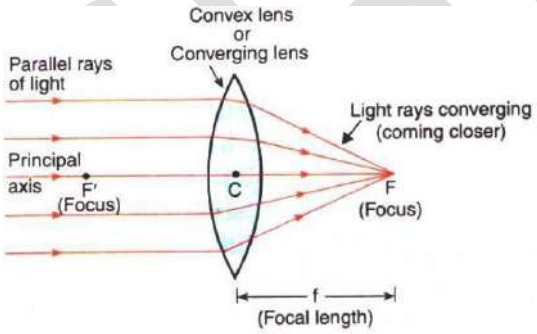
(b) 80V

(c) 40V☑

(d) 50V

Case Study 11: Ray Optics Lens

A lens is a portion of a transparent material with two refracting surfaces such that at least one is curved with refractive index of its material being different from that of the surrounding .



1. If the lens of focal length f is cut into equal parts by a vertical plane then focal length of each part will be?

a) F

b) f/2

c) 2F☑

d) infinity

2. If lens of focal length f is cut in to equal parts by horizontal plane then focal length of each part will be?

a) f☑ b) 2f

c) f/2 d) infinity

3. Focal length of lens does not depends on

a) refractive index of glass

b) wavelength (1)

c) radius of curvature

d) position of object☑

4. If half portion of a lens is covered by black paper then which of following will change

a) focal length

b) power

c) intensity of image☑

d) size of image

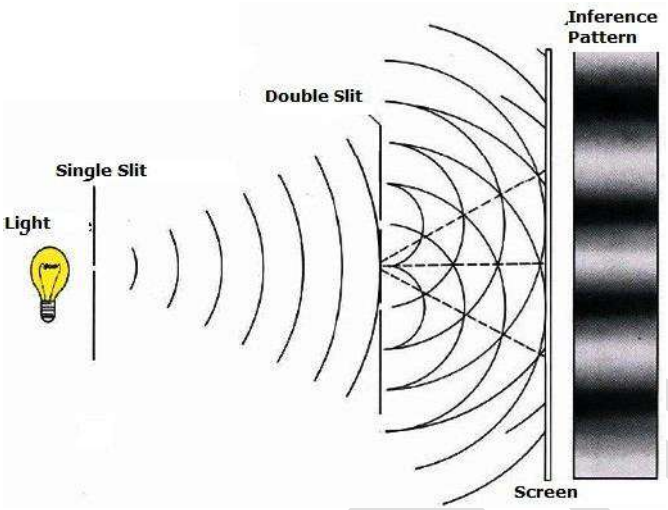
5. If convex and concave lens of equal focal length are placed in contact with each other then effective focal length of combination will be

a) Zero b) Infinite☑

c) 2f d) none of above

12. Case Study: YDSE

According to Huyghen ,light is a wave, It is proved experimentally by YDSE .In it division of wavefront takes place



If a narrow slit is illuminated by a monochromatic source of light sends out disturbance in all direction which when reach double slit they are in same phase and frequency so their superposition will give interference as they act like two coherent sources.Central fringe is always bright in this pattern.

(1) Young's experiment proves which of the following fact

(i) Light is made up of particles

(ii) Light is made up of waves☑

(iii) Light is made up of neither particles nor waves

(iv) Fringe width does not depends upon the spacing between slits

(2) In YDSE

(i) Only interference occurs☑

(ii) Only diffraction occurs

(iii) Both interference and diffraction occurs

(iv) None of above

(3) In white light interference , nearest to the central bright fringe ,will have which of the following colours

(i) Violet

(ii) Yellow

(iii) Red☑

(iv) Green

(4) In YDSE , bright fringes are of

(i) Equal widths and unequal intensities

(ii) Unequal widths and equal intensities

(iii) Equal widths and equal intensities☑

(iv) Unequal widths and unequal intensities

(5) YDSE first performed in air then performed in water , the fringe width

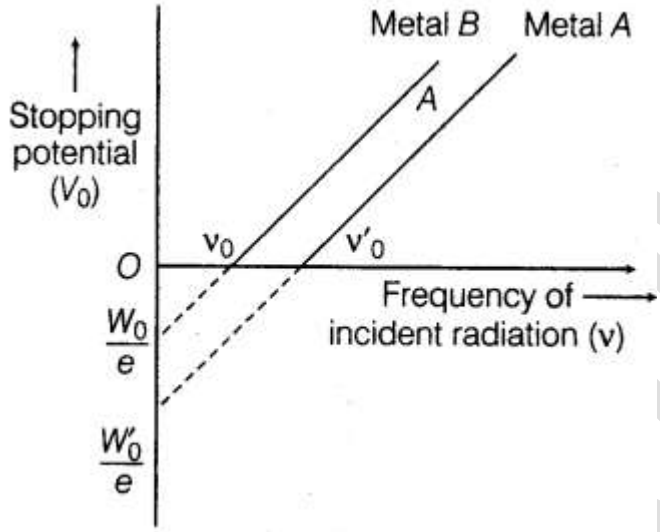
(i) Will remain same

(ii) Will decrease☑

(iii) Will Increase

(iv) Will be infinite

13. Case Study:



In study of photoelectric effect, using Einstein photoelectric equation we can determine planck's constant as well.When we draw graph between stopping potential we will find a straight line as shown in above diagram.Using the graph answer following questions

1. Which metal posses more threshold frequency

(a) Metal A☑ (b) Metal B (c) both metal posses same (d)Can't say

2. Which metal posses more threshold wavelength

(a)Metal A (b) Metal B☑ (c) both metal posses same (d)Can't say

3.Which metal posses more work function

(a)Metal A☑ (b) Metal B

(c) both metal posses same

(d)Can't say

4.Slope of above graph represent

(a)Planck's constant (b) Velocity of light

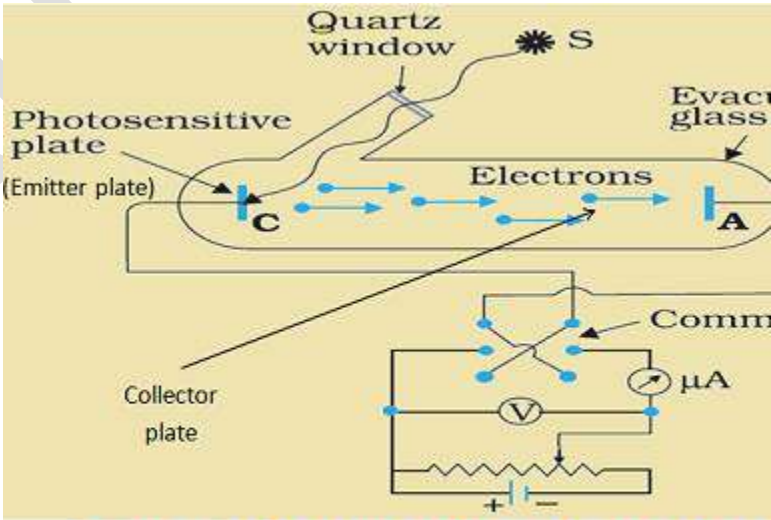
(c) h/e☑ (d) none of these

5.What we can say about two lines shown in graph

(a) Always parallel☑ (b) not always

(c) never parallel (d) none of above

Case 14: Experimental study of photoelectric effect:



Experimental Set up for PhotoElectric Effect

To study photoelectric effect, Lenard observed that when ultraviolet light allowed to fall on photosensitive plate through quartz window then

electrons emitted form it and will travel towards positive terminal anode.so a current called photoelectric current will flows in outer circuit.

1. What will happen to current when we increases intensity of light

(a) Current will increase

(b) Current will decrease

(c)Current will remain unaffected

(d) Can't say

2. What will be effect of increase of intensity on stopping potential

(a) Stopping potential increases

(b) stopping potential decreases

(c) Stopping potential remain unchanged

(d) None of above

3. What will be effect on Saturation current of increase of frequency

(a) Saturation Current remain unchanged(b) It will increase

(c) It will decrease

(d) It may increase or decrease

4. How Maximum Kinetic energy will vary with increase of frequency

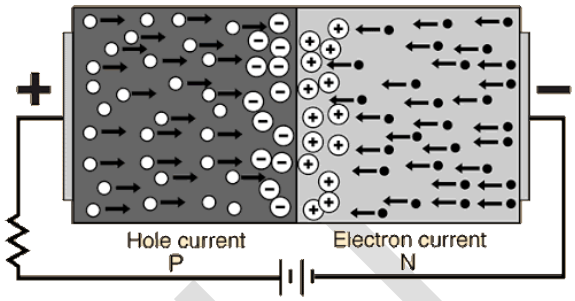
(a) Increase (b) Decrease

(c) Remain unaffected (d)Can't say

5. How maximum KE vary with increase of intensity

(b) Increase (b) Decrease

(c) Remain unaffected (d)Can't say



It is a single crystal of Ge or Si doped in such a manner that one half portion of it acts as P-type and other half acts as N-type.as soon as P-N junction is formed, the majority carrier begin to diffuse from the regions of high concentration to regions of low concentration. Electrons form N region to P and holes from P to N where they combine with the electrons and get neutralised. This process is called electron -hole recombination. The P region near the juction is left with immobile -ve ions and n regions near the junction left with +ve ions .This region of immobile ions is called the depletion region. The accumulation of opposite charges will give rise to potential difference across junction called barrier field.

1. A potential barrier of 0.50 V exists across a P-N junction. If the depletion region is 5.0×10^{-7} m wide, the intensity of the electric field in this region is -

(A) 1.0×10^6 V/m☑ (B) 1.0×10^5\ V/m

(C) 2.0×10^5 V/m (D) 2.0×10^6 V/m

2. If no external voltage is applied across P-N junction, there would be -

(A) No electric field across the junction

(B)An electric field pointing from N-type to P-type side across the junction☑

(C) An electric field pointing from P-type to N-type side across the junction

(D) A temporary electric field during formation of P-N junction that would subsequently

disappear

3. No bias is applied to a P-N junction, then the current -

(A) Is zero because the number of charge carriers flowing on both sides is same☑

(B) Is zero because the charge carriers do not move

(C) Is non-zero (D) None of these

4. Which of the following statements is correct ?

(A) The depletion region of P-N junction diode increases with forward biasing

(B) The depletion region of P-N junction diode decreases with reverse biasing

(C) The depletion region of P-N junction diode does not change with biasing

(D) The deplection region of P-N junction diode decreases with forward biasing☑

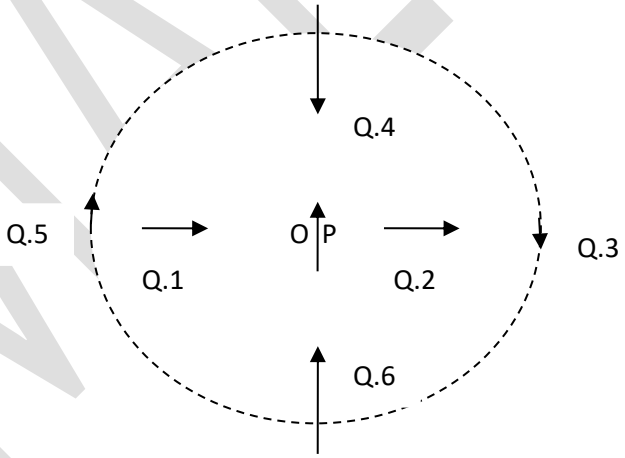
5. When reverse bias in a junction diode is increased, the width of depletion layer -

(A) increase☑ (B) decreases

(C) does not change(D) fluctuate

Case .

Figure shows a small magnetized needle P placed at a point O. The arrow shows the direction of its magnetic moment the other arrow show different positions of another identical magnetized needle Q.



(a)In which configuration the system is not in equilibrium? (Q_1 and Q_2)

(b) In which configuration is the system in Stable equilibrium (Q_3 and Q_6

(c) In which configuration is the system in Unstable equilibrium (Q_4 and Q_5))

(d) Which configuration corresponds to the lowest potential energy. Q_6