Solved Sample Paper

CUET UG (Physics)

Time : 45 min. **M.M. : 200**

IMPORTANT INSTRUCTIONS:

1. The test is of 45 Minutes duration.
2. The test contains 50 Questions out of which 40 questions need to be attempted.
3. Marking Scheme of the test:
    a. Correct answer or the most appropriate answer: Five marks (+5)
    b. Any incorrect option marked will be given minus one mark (–1).
    c. Unanswered/Marked for Review will be given no mark (0).

Choose the correct answer :

Question ID: 102001

During the formation of depletion layer around the imaginary pn-junction, electrons diffuse from n-region to p-region because.

(A) Electron concentration in n-segment is higher than electron concentration in p-segment.

(B) Holes of p-segment attract the electrons

(C) Electrons are lighter and have higher drift velocity

(D) Hole concentration in n-segment is higher than the electron concentration in p-segment

Answer (A)

Sol. During the formation of depletion layer around the imaginary pn-junction, electron diffuses from n-region to p-region because electron concentration in n-segment is higher than electron concentration in p-segment.

Question ID: 102002

The most exotic diamagnetic materials are super conductors. They exhibit perfect diamagnetism and perfect conductivity. The values of magnetic susceptibility (χ) and relative permeability of such materials have values

(A) $\chi = 1, \quad \mu_r = 0$

(B) $\chi = -1, \quad \mu_r = 0$

(C) $\chi = 0, \quad \mu_r = 1$

(D) $\chi = -1, \quad \mu_r = 1$

Answer (B)

Sol. Relation between susceptibility (χ) and relative permeability (μ_r)

$\mu_r = \chi + 1$

If diamagnetic martial behave like

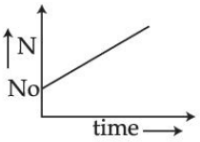
super conductor $\mu_r = 0$

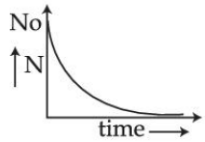
$0 = \chi + 1$

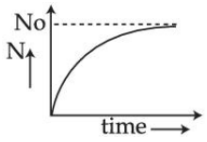
$\chi = -1$

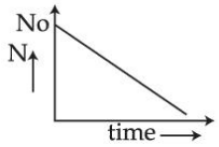
Question ID: 102003

The variation of number of undecayed nuclei with

(A) 

(B) 

(C) 

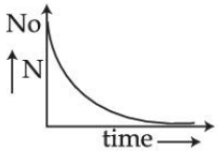
(D) 

Answer (B)

Sol. $N = N_0 e^{-\lambda t}$

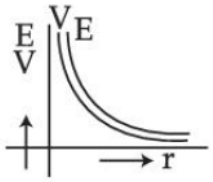
N is the number of undecayed nuclei at any time t

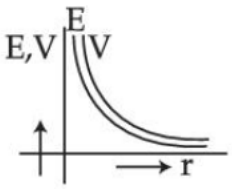
N_0 is the number of nuclei at $t = 0$

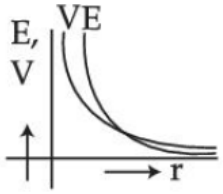


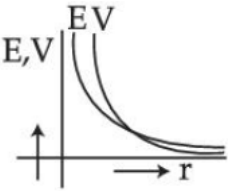
Question ID: 102004

Which one of the following correctly represent the variation of electric field and electric potential with a distance r from a point charge?

(A) 

(B) 

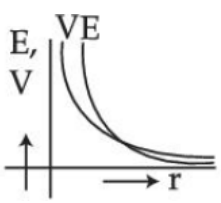
(C) 

(D) 

Answer (C)

Sol. Variation of electric field (E) of point change(s) with the distance (r) is $E = \frac{kq}{r^2} \Rightarrow E \propto \frac{1}{r^2}$

Variation of electric potential (V) of point charge (q) with distance (r) $V = \frac{kq}{r} \Rightarrow V \propto \frac{1}{r}$



time is best represented by

(Where N_0-initial number of atoms)

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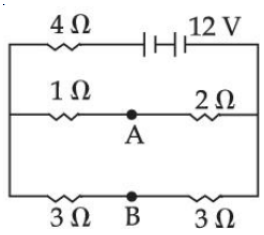
Question ID: 102005



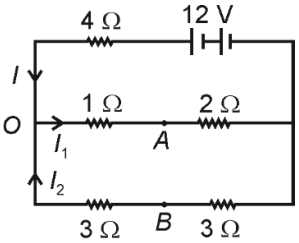
The above circuit potential difference between point A and B ($V_A - V_B$) =

(A) $\frac{4}{3}V$ (B) $\frac{2}{3}V$

(C) $\frac{1}{3}V$ (D) $\frac{5}{3}V$

Answer (B)

Sol.



$$R_{eff} = 4 + \frac{3\times 6}{9} = 6\ \Omega$$

$$I = \frac{V}{R_{\text{eff}}}$$

$$= \frac{12}{6} = 2\ \text{A}$$

K.V.L in loop ...(1)

$12 - 4 \times 2 - I_1 \times 3 = 0$

$I = \frac{4}{3}$ A

K.V.L in loop ...(2)

$12 - 4 \times 2 - 6I_2 = 0$

$I = \frac{2}{3}$ A

$V_0 - V_A = 1\times\frac{4}{3}$

$V_0 - V_A = \frac{4}{3}$ ...(i)

Question ID: 102006

A circular lamina of radius 'R' is having surface charge density σ cm^{-2}. Electric field at axial distance '$2R$' is

(A) $\frac{\sigma}{4\pi\varepsilon_0 R^2}$ (B) $\frac{\sigma}{\varepsilon_0}$

(C) $\frac{\sigma}{2\varepsilon_0}$ (D) $\frac{\sigma}{4\varepsilon_0}$

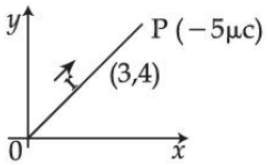
Answer (NA)

Sol. $E = \frac{\sigma}{2\varepsilon_0}(1-\cos\phi)$, where $\cos\phi = \frac{2R}{\sqrt{4R^2+R^2}}$

$$E = \frac{\sigma}{2\varepsilon_0}\left(1-\frac{2}{\sqrt{5}}\right)$$

Question ID: 102007

Two point charges +5 μC and –5 μC are placed at O (0 mm, 0 mm) and P(3 mm, 4 mm) respectively force on +5 μC is



(A) $1.8\left(3\hat{i}-4\hat{j}\right)\times 10^{+3}$ N

(B) $-1.8\left(3\hat{i}+4\hat{j}\right)\times 10^{+3}$ N

(C) $1.8\left(3\hat{i}+4\hat{j}\right)\times 10^{3}$ N

(D) $1.8\left(-3\hat{i}+4\hat{j}\right)\times 10^{3}$ N

Answer (C)

Sol. Force between two point charge q_1 and q_2

$$\vec{F} = \frac{kq_1q_2(\vec{r}_2-\vec{r}_1)}{}$$

$$V_0 - V_B = \frac{2}{3} \times 3$$

$V_0 - V_B = 2V$ ...(ii)

(ii) – (i)

$$V_A - V_B = 2 - \frac{4}{3} = \frac{2}{3}V$$

$$|r_2 - r_1|^3$$

$$\rightarrow \quad 9 \times 10^9 \times 5 \times 5 \times 10^{-12}(4\hat{j} + 3\hat{i}) \times 10^{-3}$$

$$F = \frac{}{\left(\sqrt{4^2 + 3^2}\right) \times 10^{-9}}$$

$$F = 1.8(3\hat{i} + 4\hat{j}) \times 10^3 \text{ N}$$

Question ID: 102008

Which of the following statements is true for a *p*-type semiconductor?

(A) Holes are minority carries and pentavalent atoms are the dopant

(B) Electrons are minority carries and pentavalent atoms are dopant

(C) Holes are majority carriers and trivalent atoms are the dopant

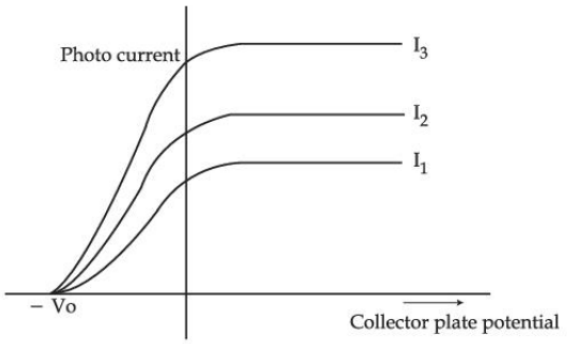
(D) Electrons are majority carriers and trivalent atoms are the dopant

Answer (C)

Sol. In *p*-type semiconductor holes are majority carrier and trivalent atom are dopant.

Question ID: 102009

A graph for variation of photo current with anode potential is given for different intensities of incident radiation:



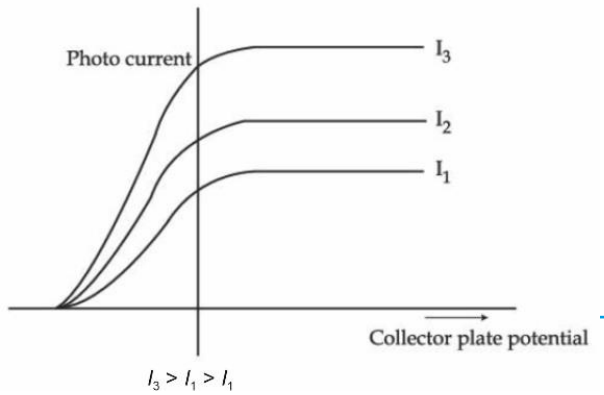
Choose the correct order of anode intensities.

(A) $I_1 > I_2 > I_3$ (B) $I_1 = I_2 = I_3$

(C) $I_1 < I_2 < I_3$ (D) $I_1 < I_2 > I_3$

Answer (C)

Sol. Photo current is directly proportional to intensity of incident light.



$I_3 > I_1 > I_1$

Question ID: 102010

NPN transistor is set up as amplifier in common emitter mode, output signal voltage obtained across the load resistance of 4 kΩ is 1 volt. Calculate input signal voltage. Assume current amplification fevelar = 250 and base resistance = 1 kΩ:

(A) 4 mV (B) 2.5 mV

(C) 1 mV (D) Insufficient data

Answer (C)

Sol. $I_c = \frac{V_c}{R_c} = \frac{1}{4\times10^3} = 0.25 \text{ mA}$

$I_B = \frac{I_c}{B} = \frac{0.25\times10^{-3}}{250} = 10^{-6} \text{ A}$

$V_i = I_B R_B$

$= 10^{-6} \times 10^3 = 1 \text{ mV}$

Question ID: 102011

Distance of ray optics as a good approximation, when the aperture is 5 mm wide and thewavelength is 600 nm is nearly :

(A) 18 m (B) 15 m

(C) 4.43 m (D) 8.34 m

Answer (NA)

Sol. Fresnel distance $(Z) = \frac{a^2}{\lambda}$

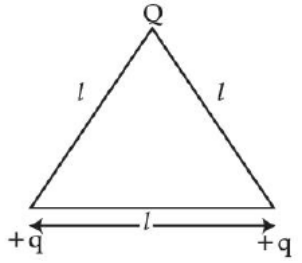
Here a is aperture width λ is wavelength of light

$Z = \frac{(5\times10^{-3})^2}{600\times10^{-9}}$

$= \frac{25}{6}\times10 \approx 41.67 \text{ m}$

Question ID: 102012

Three charges Q, $+q$ and $+q$ are placed at the vertices of an equilateral triangle of side l, as shown in the figure. If the net electrostatic energy of the system is zero, the Q is equal to:



(A) $+\frac{q}{2}$

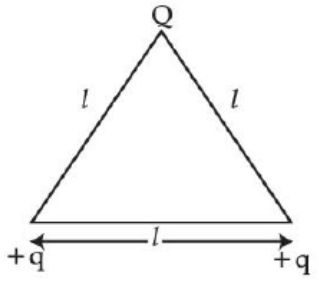
) $-\frac{q}{2}$

(B) Zero

(D) $-q$

Answer (C)

Sol.



$$U = \frac{kq^2}{l} + \frac{kqQ}{l} + \frac{kqQ}{l}$$

Given, $U = 0$

$$= \frac{kq^2}{l} + \frac{2kqQ}{l} = 0$$

$$Q = \frac{-q}{2}$$

Question ID: 102013

If the ratio of maximum to minimum resultant intensity in interference pattern of two waves is 25 : 4, then, ratio of amplitudes two waves is :

(A) 5 : 2

(B) 2 : 5

(C) 7 : 3

(D) 49 : 9

Answer (C)

Sol.

$$\frac{I_{max}}{I_{min}} = \frac{\left(\sqrt{I_1} + \sqrt{I_2}\right)^2}{\left(\sqrt{I_1} - \sqrt{I_2}\right)^2}$$

$$\frac{25}{4} = \left(\frac{\sqrt{I_1} + \sqrt{I_2}}{\sqrt{I_1} - \sqrt{I_2}}\right)^2$$

$$\frac{5}{2} = \left(\frac{\sqrt{I_1} + \sqrt{I_2}}{\sqrt{I_1} - \sqrt{I_2}}\right)$$

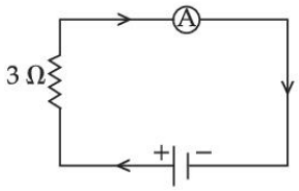
$$3\sqrt{I_1} = 7\sqrt{I_2} \Rightarrow \frac{I_1}{I_2} = \frac{49}{9}$$

$I \propto A^2$

$\Rightarrow A \propto$

Question ID: 102014

In the circuit given below the current is to be measured. If the ammeter shown is a galvanometer with a resistance R_G = 60 Ω but converted to an ammeter by a shunt resistance r_s = 0.02 Ω, then the flow of current is nearly :



(1) 0.5 A (2) 3.02 A

(3) 0.99 A (4) 1.5 A

(A) 1 (B) 2

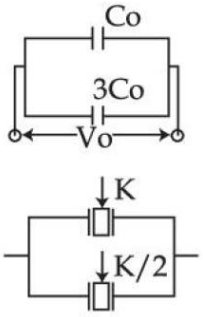
(C) 3 (D) 4

Answer (NA)

Sol. Emf of battery is not given Data is insufficient

Question ID:102015

Consider a capacitor circuit charged by a battery to a potential difference V_O as shown in the figure.



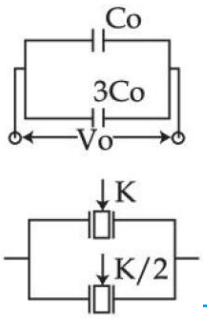
When a dielectric slab is inserted into both the capacitors, new potential difference will be

(A) V_o (B) $\frac{V_0}{K}$

(C) $\frac{8V_0}{5K}$ (D) $\frac{8V_0}{K}$

Answer (C)

Sol.



$\sqrt{I}$

$$\Rightarrow \quad \frac{A_1}{A_2} = \sqrt{\frac{I_1}{I_2}} = \sqrt{\frac{49}{9}} = \frac{7}{3}$$

On inserting dielectric charge on the combination of capacitor remains same $q = cV$

$$4C_0V_0 = \left(KC_0 + \frac{3C_0K}{2}\right)V_1$$

$$V_1 = \frac{8V_0}{5K}$$

Question ID:102016

An intrinsic semiconductor has 5×10^{28} atoms/m^3. It is doped by 0.01 ppm. concentration of arsenic. If $n_i = 1.5 \times 10^{16}$ m^3, then number of holes in the *n*-type semiconductor will be

(A) 5×10^{28}/m^3 (B) 5×10^{11}/m^3

(C) 3.0×10^{11}/m^3 (D) 4.5×10^{11}/m^3

Answer (D)

Sol. 0.01 atom of Si doped out of 10^6 atom 1 ppm.

In 5×10^{28} atom number of doped $= \frac{5 \times 10^{28}}{\frac{10^6}{0.01}}$

$= 5 \times 10^{20}$

1 as atom creates $1e^-$ excess so number of excess electron = $5 \times 10^{20} = n_e$

also $n_e n_h = n_1^2$

$$n_h = \frac{n^2}{n_e} = \frac{(1.5 \times 10^{16})^2}{5 \times 10^{20}}$$

$= 0.45 \times 10^{12}$

$= 4.5 \times 10^{11}$/m^3

Question ID:102017

In the block diagram of a simple modulator, a square law device generates DC and sinusoidal of frequencies ω_m, $2\omega_m$, ω_c, $2\omega_c$, $\omega_c - \omega_m$ and $\omega_c + \omega_m$.

The device which rejects dc and unwanted frequencies and retains frequencies, ω_c, $\omega_c - \omega_m$ and $\omega_c + \omega_m$ is called

(A) Envelope detector (B) Band pass filter

(C) Rectifier (D) Amplifier

Answer (B)

Sol. The device which reject dc and unwanted frequencies and retains frequencies, ω_c, $\omega_c - \omega_m$ and $\omega_c + \omega_m$ is called Band pass filter

Question ID:102018

An expression for the frequency of revolution of the electron in the Bohr's orbit is :

Answer (A)

Sol. In Bohr's orbit

$$mvr = \frac{nh}{2\pi} \quad \ldots(i)$$

$$\frac{e^2z}{4\pi\varepsilon_0 r^2} = \frac{mv^2}{r}$$

$$mv^2r = \frac{e^2z}{4\pi\varepsilon_0} \quad \ldots(ii)$$

On putting the value of *mvr* from equation (i)

$$v \times \frac{nh}{2\pi} = \frac{e^2z}{4\pi\varepsilon_0}$$

$$v = \left(\frac{e^2z}{2nh}\right)$$

$$\frac{m \times e^2z}{2nh} r = \frac{nh}{2\pi}$$

$$r = \frac{n^2h^2}{\pi me^2z}$$

$$v$$

Now, $f = \frac{}{2\pi r}$

$$= \frac{\frac{e^2z}{2nh}}{\frac{2\pi n^2h^2}{\pi me^2z}}$$

$$= \frac{me^4z^2}{4\varepsilon_0^2h^3} \times \frac{1}{n^3}$$

Question ID:102019

Current in an alternating circuit is ahead of voltage by a phase difference of $\frac{\pi}{3}$. The alternating circuit is

(A) C circuit

(A) $\frac{me^4}{4\varepsilon_0^2 h^3} \times \frac{1}{n^3}$

(B) $\frac{me^4}{8\varepsilon_0^2 h^2} \times \frac{1}{n^3}$

(C) $\frac{me^4}{4\varepsilon_0^2 ch^3} \times \frac{1}{n^3}$

(D) $\frac{me^4}{8\varepsilon_0^2 ch^2} \times \frac{1}{n^3}$

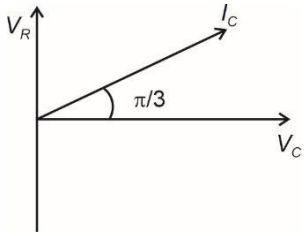
(B) LC circuit

(C) LR circuit

(D) L circuit

Answer (NA)

Sol.



Current lead voltage by $\frac{\pi}{3}$ therefore alternating circuit will be RC. No option is correct.

Question ID:102020

A particle moves in a closed orbit around the origin, due to a force which is directed towards the origin. The de-Broglie wavelength of particle varies cyclically between two values (λ_1), (λ_2) with ($\lambda_1 > \lambda_2$) then, the correct statement from the following are:

(a) The particle could be moving in a circular orbit with origin as centre

(b) The particle could be moving in an elliptical orbit with origin as its focus.

(c) When the de-Broglie wave length is λ_1, the particle is nearer to origin then when its value is λ_2.

(d) When the de Broglie wavelength is λ_2, the particle is nearer to the origin than when its value is λ_1.

(A) (a) and (d) only (B) (b) and (d) only

(C) (b) and (c) only (D) (c) and (a) only

Answer (B)

Sol. de-Broglie wavelength of a moving particle $\lambda = \frac{h}{mv}$

$\lambda_1 > \lambda_2$ it means $v_1 > v_2$ velocity of the particle will be greater at nearer point on a elliptical orbit.

Question ID: 102021

A circular coil made up of copper, is placed on a table top. Magnetic field is normally outwards. Now, the magnetic field is gradually decrease. The direction of induced current as seen from the top side is

(A) Clock wise

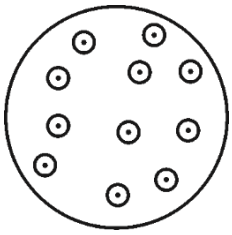
(B) Anti clock wise

(C) Current will not be induced

(D) Information is insufficient

Answer (B)

Sol.



Magnetic field increasing outwards gradually. As per Lenz's law current will flow anticlockwise so that outward flex is supported.

Question ID: 102022

In case of Bohr's model of atoms, which of the following statement is incorrect?

(A) Bohr's model is applicable only for one electron atom/

(B) Bohr's model correctly predicts the frequencies of light emitted by one electron atoms/ions.

(C) Bohr's model correctly predicts the intensity variations in the light of different frequencies emitted by one-electron atoms, ions

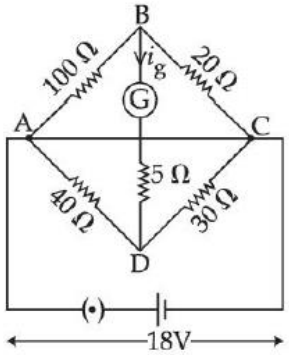
(D) Bohr's model does not consider the electron-electron interaction in an atom

Answer (C)

Sol. Bohr's model correctly predicts the frequencies of light emitted by one electron atom/ions and not the intensity variation in the light of different frequencies of emitted by one-electron atoms, ion

Question ID: 102023

Current through the galvanometer in the circuit given below is



(A) 6.13 mA (B) 33.9 mA

(C) 6.69 mA (D) 51.7 mA

Answer (NA)

Sol. As A and C is shorted, no current will flow through galvanometer

Question ID: 102024

During the process of Beta decay the ratio of neutron to proton:

(A) increases

(B) decreases

(C) remain unchanged

(D) first increases and then decreases

Answer (B)

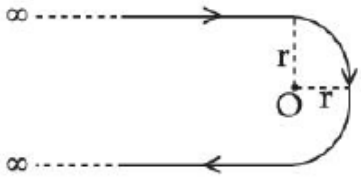
Sol. Neutron to proton ratio of an atom nucleus is the ratio of the number of neutrons to its number of proton. This ratio generally increases with increase in atomic number in stable nuclei. Beta decay decreases the ratio of neutron to proton eq.

$10(^{23}Ne) \rightarrow 11(^{23}Na) + {}_{-1}e^{\circ}$

It is clearly visible that the neutron proton ratio decreases in Beta decay

Question ID: 102025

The resultant magnetic field at point *O*, due to current I in the conductor shown in figure is

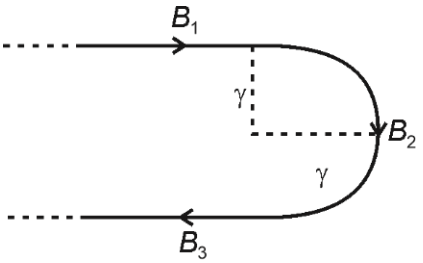


(A) $\vec{B} = \frac{\mu_0 I}{4r}\left[\frac{1}{\pi} + 1\right]$ (B) $\vec{B} = \frac{\mu_0 I}{4r}\left[\frac{2}{\pi} + 1\right]$

(C) $\vec{B} = \frac{\mu_0 I}{4r}\left[\frac{2}{\pi} - 1\right]$ (D) $\vec{B} = \frac{\mu_0 I}{4r}\left[\frac{1}{\pi} - 1\right]$

Answer (B)

Sol.



$\vec{B}_1 = \frac{\mu_0 I}{4\pi\gamma}(-\hat{k})$

$\vec{B}_2 = \frac{\mu_0 I}{4\pi}(\hat{k})$

$B_3 = \frac{\mu_0 I}{4\pi}(-\hat{k})$

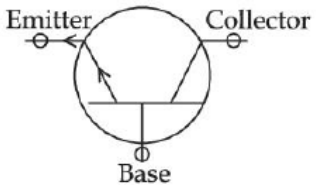
$B = B_1 + B_2 + B_3$

$= \left(\frac{\mu_0 I}{} + \frac{\mu_0 I}{} + \frac{\mu_0 I}{}\right) = \frac{\mu_0 I}{}\left(\frac{2}{} + \right)\hat{k}$

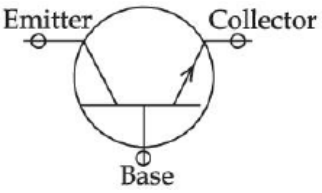
Question ID: 102026

Correct symbol of NPN transistor is :

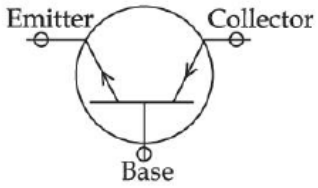
(A)



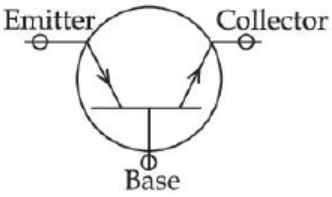
(B)



(C)

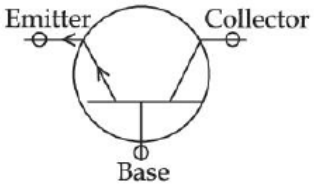


(D)



Answer (A)

Sol. Symbol of NPN transistor



Question ID: 102027

In a typical set-up of photo electric effect, the original source of blue light is replaced with a source of red light of testy. Which of the following phenomenon is observed?

(A) Photoelectric current increases

(B) Photoelectric current decreases

(C) Stopping potential increases

(D) Stopping potential decreases

Answer (D)

Sol. Frequency of red light is less than frequency of blue light therefore kinetic energy of emitted electron

$$\left| \frac{4\pi\gamma}{4\gamma} \frac{4\pi\gamma}{4\gamma} \right| \left| \frac{\pi}{1} (-) \right|$$

decreases and stopping potential decreases.

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Question ID: 102028

A cycle wheel is rotated with a speed of 240 rpm in a plane normal to horizontal component of earth's magnetic field of 0.36 G. Find the value of induced current between the rim and axle of the wheel given, there are 16 spokes, each 70 cm long. The resistance of each spoke is 2 Ω.

(A) 1.76×10^{1} A (B) 1.76×10^{-3} A

(C) 1.10×10^{-5} A (D) 1.10×10^{-4} A

Answer (B*)

Sol. Induced emf (z) = $\frac{\beta\omega l^2}{2}$

$$= \frac{0.36 \times 10^{-4} \times 2\pi f \times \left(70 \times 10^{-2}\right)^2}{2}$$

$$= \frac{36 \times 10^{-6} \times 8\pi \times 4900 \times 10^{-4}}{2}$$

$$= 18 \times 8 \times 6.28 \times 49 \times 10^{-8}$$

$$R_{\text{eff}} = \frac{2}{16} = \frac{1}{8}$$

$$I = R_{eff} = \frac{18 \times 8 \times 6.28 \times 49 \times 10^{-8}}{\frac{1}{8}}$$

$\approx 1.76 \times 10^{-3}$ A

Question ID: 102029

Electron is accelerated by 100 volt potential difference. Its wavelength will be comparable to that of :

(A) Infrared radiator (B) Microwave

(C) X-rays (D) Radio waves

Answer (C)

Sol. de-Broglie wavelength of electron = $\frac{1.227}{\sqrt{V}}$ nm

$$= \frac{1.227}{\sqrt{100}}$$

$$= 0.1227 \text{ nm}$$

Range of X-rays (0.01 – 10) nm

Question ID: 102030

Superconductors show :

(A) Perfect diamagnetism

(B) Perfect paramagnetic

(C) Perfect ferromagnetism

Question ID: 102031

Two coils have a mutual inductance of 0.005 H. The current changes in the first coil according to the equation $I = I_0 \sin\omega t$, where $I_0 = 10$ A and $\omega = 100\ \pi$ rad/s.

The maximum value of emf in the second coil is :

(A) 2π (B) 5π

(C) 6π (D) 12π

Answer (B)

Sol. emf induced in the second coil (ε_s)

$$\varepsilon_s = -L\frac{di_f}{dt}$$

$$\Rightarrow |\varepsilon_s| = L\frac{di_s}{dt}$$

$$= L\frac{d}{dt}\left(I_0 \sin\omega t\right)$$

$$= L\, I_0\, \omega \cos\omega t$$

$$\Rightarrow |\varepsilon_s|_{max} = L\, I_0 \omega$$

$$= 0.005 \times 10 \times 100\pi$$

$$= 5\pi$$

Question ID: 102032

Bohr model of atom is valid for :

(A) Only hydrogen atom

(B) Only one electron atom

(C) Only one electron atoms and ions

(D) All the atoms

Answer (C)

Sol. Bohr's model is valid only for the single electronic system or only one electron atoms or ions.

Question ID: 102033

An ac source of emf $V(t) = V_0 \sin\omega t$ is put across a pure capacitor. The value of angular frequency of instantaneous power is:

(A) 0 (B) ω

(D) Perfect anti ferromagnetism

Answer (A)

Sol. Superconductor show perfect diamagnetism.

(C) 2ω (D) $\frac{\omega}{2}$

Answer (C)

Sol. $V(t) = V_0 \sin\omega t$

In a capacitor $I(t) = I_0 \sin\left(\omega t + \frac{\pi}{2}\right)$

$= I_0 \cot\omega t$

$P_{inf} = V(t) I(t)$

$= V_0 \sin\omega t \; I_0 \cos\omega t$

$= \frac{V_0 I_0}{3} \sin 2\omega t$

Angular frequency = 2ω

Question ID: 102034

How does voltage sensitivity of a galvanometer will change as number of turns of its coil are doubled?

(A) Halved

(B) Doubled

(C) Remains same

(D) Insufficient information

Answer (C)

Sol. $\frac{\phi}{v} = \frac{NBA}{R}$

As number of tums is doubled, Resistance *R* will also get doubled. Hence voltage sensitivity remains same.

Question ID: 102035

The Brewster's angle for air to glass interface then an unpolarised light is incident on a glass (n = 1.5), such that reflected and refracted rays are perpendicular to each other, is nearly:

(A) $i_B = 30°$ (B) $i_B = 45°$

(C) $i_B = 57°$ (D) $i_B = 47°$

Answer (C)

Sol. From Brewster's law

$\tan(i_B) = \mu$

$i_B = \tan^{-1}(1.5) \approx 57°$

Question ID: 102036

Which of the following is correct for nuclear forces?

(A) Nuclear forces are much weaker than coulomb force

(B) The nuclear force between two nuclears falls rapidly to zero as their distance is more than a few femtonte

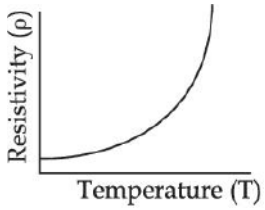
(C) Nuclear forces are charge dependent

(D) Nuclear forces are long range forces

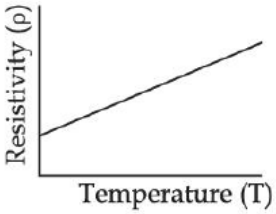
Question ID: 102037

Resistivity (ρ) vs temperature graphs of some materials are given below. The graph corresponds to a semiconductor is:

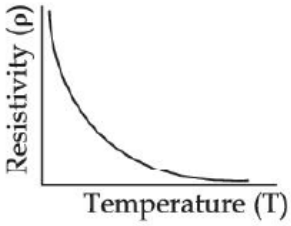
(A)



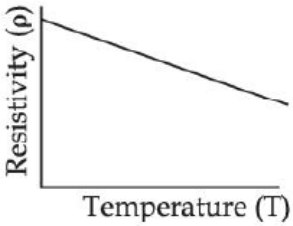
(B)



(C)



(D)



Answer (C)

Sol. For semiconductor, resistivity decreases with increase in, temperature.

Question ID: 102038

The length of antenna for trans mitting a signal of 30 kHz is:

(A) l = km

(B) l = 500 m

(C) l = 2.5 km

(D) l = 10 km

Answer (C)

Sol. $\lambda = \frac{c}{} = \frac{3 \times 10^8}{}$

Answer (B)

Sol. Nuclear forces are strongest, charge independent and very small ranged force.

$l_{min} = \frac{}{4} = \frac{}{4f} = 4 \times 3 \times 10^4$

= 2500 m

= 2.5 km

Question ID: 102039

A conducting 1 rod of mass '*m*' and length '*l*' is changed horizontally with the help of two insulating threads such that the rod is along east-west direction. Now current I is set up form west to east direction. What should be magnitude and direction of magnetic field. So that tension in the threads becomes zero?

(A) $B = \frac{mg}{Il}$, towards north

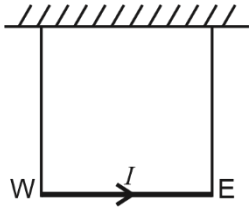
(B) $B = \frac{mg}{Il}$, towards south

(C) $B = \frac{mg}{Il}$, upwards

(D) $B = \frac{mg}{Il}$, downwards

Answer (A)

Sol.

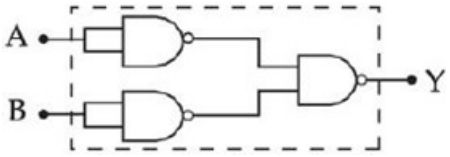


$mg = B/L$

$B = \frac{mg}{IL}$, towards north to ensure that magnetic force upwards.

Question ID: 102040

The logic circuit given below will acts like



(A) NOT gate

(B) AND gate

(C) OR gate

(D) XOR gate

Answer (C)

Sol. $Y = \overline{\overline{A}\cdot\overline{B}} = \overline{\overline{A+B}} = A+B$

$\Rightarrow$ OR gate

Question ID: 102041

Read the information given below.

The basic principle of a microwave oven is to generate microwave radiation of appropriate frequency in the working space of the oven where we keep food. This way energy is not wasted in heating up the vessel. In the conventional heating method, the vessel on the burner gets heated first and then the food inside gets heated because of transfer of energy from the vessel. In the microwave oven, on the other hand, energy is directly delivered to water molecules which is shared by the entire food.

The basic principle of a microwave oven is

(A) Heating effect of current

(B) Magnetic effect of current

(C) Resonant frequency of water molecule

(D) Heat transfer

Answer (C)

Sol. The basic principle of microwave oven is the resonant frequency of water molecules.

Question ID: 102042

Read the information given below.

The basic principle of a microwave oven is to generate microwave radiation of appropriate frequency in the working space of the oven where we keep food. This way energy is not wasted in heating up the vessel. In the conventional heating method, the vessel on the burner gets heated first and then the food inside gets heated because of transfer of energy from the vessel. In the microwave oven, on the other hand, energy is directly delivered to water molecules which is shared by the entire food.

Which type of vessel should be used in a microwave overs?

(A) Metal container

(B) Plastic container

(C) Porcelain container

(D) Porcelain and metal both

Answer (C)

Sol. In microwave ovens we prefer porcelain container

a
s
t
h
e
y
a
r
e
m
i
c
r
o
w
a
v
e
s
a
f
e
.

Question ID: 102043

Read the information given below.

The basic principle of a microwave oven is to generate microwave radiation of appropriate frequency in the working space of the oven where we keep food. This way energy is not wasted in heating up the vessel. In the conventional heating method, the vessel on the burner gets heated first and then the food inside gets heated because of transfer of energy from the vessel. In the microwave oven, on the other hand, energy is directly delivered to water molecules which is shared by the entire food.

The frequency range of microwave is

(A) 10^7 Hz to 10^{19} Hz (B) 10^9 Hz to 10^{12} Hz

(C) 10^{12} Hz to 10^{15} Hz (D) 10^{15} Hz to 10^{18} Hz

Answer (B)

Sol. The approximate frequency range of microwave is 10^9 Hz to 10^{12} Hz.

Question ID: 102044

Read the information given below.

The basic principle of a microwave oven is to generate microwave radiation of appropriate frequency in the working space of the oven where we keep food. This way energy is not wasted in heating up the vessel. In the conventional heating method, the vessel on the burner gets heated first and then the food inside gets heated because of transfer of energy from the vessel. In the microwave oven, on the other hand, energy is directly delivered to water molecules which is shared by the entire food.

Microwaves are used in

(A) Cellular phones (B) Radar system

(C) Remote switches (D) Eye surgery

Answer (B)

Sol. Microwaves are used in Radar system.

Question ID: 102045

Read the information given below.

The basic principle of a microwave oven is to generate microwave radiation of appropriate frequency in the working space of the oven where we keep food. This way energy is not wasted in heating up the vessel. In the conventional heating method, the vessel on the burner gets heated first and then the food inside gets heated because of transfer of energy from the vessel. In the microwave oven, on the other hand, energy is directly delivered to waler molecules which is shared by the entire food.

Microwaves are detected by:

Answer (A)

Sol. Microwaves are detected by point contact diodes.

Question ID: 102046

Read the information given below.

It is useful to design lenses of derived focal length using surface of suitable radii of curvature. Lens maker formula helps in finding various unknowns and is widely applied.

The radii of curvature of faces of a double concave lens are 20 cm and 30 cm. If refractive index of glass is $\frac{3}{2}$, than the focal length of the lens will be:

(A) 24 cm (B) –24 cm

(C) 120 cm (D) –120 cm

Answer (B)

Sol. From lens maker's formula

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$= \left(\frac{3}{2} - 1\right)\left(\frac{1}{-20} - \frac{1}{30}\right)$$

$$= \frac{1}{2}\left(\frac{-3-2}{60}\right) = -\frac{1}{24}$$

f = – 24 cm

Question ID: 102047

Read the information given below.

It is useful to design lenses of derived focal length using surface of suitable radii of curvature. Lens maker formula helps in finding various unknowns and is widely applied.

Find the focal length of an equi convex lens whose each face has radius of curvature 12 cm. Given refractive index of glass is $\frac{3}{2}$.

(A) 0 (B) Infinite ∞

(C) –12 cm (D) 12 cm

Answer (D)

Sol. From lens maker's formula

$$\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$

$$= \left(\frac{3}{2} - 1\right)\left[\frac{1}{12} - \left(\frac{1}{-12}\right)\right] = \frac{1}{2} \times \frac{2}{12}$$

(A) Point contact diodes (B) Photographic film
(C) Photo cells (D) Ionisation chamber

$$\left|\frac{2}{1}\right|\left|\frac{}{12}\right|\left|\frac{-}{12}\right|\left|\frac{2}{12}\right|$$

$\Rightarrow$ $f = 12$ cm

CUET UG

Question ID: 102048

Read the information given below.

It is useful to design lenses of derived focal length using surface of suitable radii of curvature. Lens maker formula helps in finding various unknowns and is widely applied.

A convex lens has 30 cm focal length in air. What is its focal length is a liquid whose refractive index is $\frac{4}{3}$? (Given refractive index glass is $\frac{3}{2}$)

(A) –120 cm (B) +120 cm

(C) 60 cm (D) –60 cm

Answer (B)

Sol. $\frac{1}{f_{air}} = (\mu_g - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

$\frac{f}{f_{liquid}} = \frac{\left(\frac{\mu_g}{\mu_l} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)}{}$

$\frac{f_{liq.}}{f_{air}} = \frac{\frac{1}{2}}{\frac{1}{8}} = 4\left(\mu_g = \frac{3}{2} \text{ and } \mu_l = \frac{4}{3}\right)$

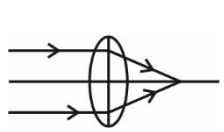
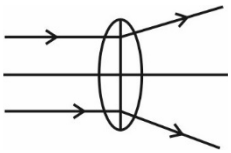
$f_{liq.} = 4 \times 30 = 120$ cm

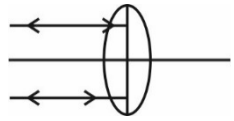
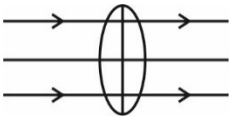
Question ID: 102049

Read the information given below.

It is useful to design lenses of derived focal length using surface of suitable radii of curvature. Lens maker formula helps in finding various unknowns and is widely applied.

If a convex lens made of a material of refractive index n_2 is immersed in a liquid of refractive index n_1 such that $n_1 = n_2$, the incident beam of light will emerge as shown

(A)  (B) 

(C)  (D) 

Answer (D)

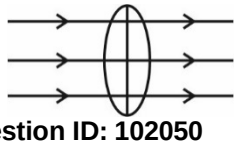
Sol. From lens marker's formula

$\frac{1}{f} = \left(\frac{\mu_l}{\mu_g} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

If $\mu_l = \mu_g$, then $\frac{1}{f} = 0$

$\Rightarrow f = \infty$

Hence ray diagram will be



Question ID: 102050

Read the information given below.

It is useful to design lenses of derived focal length using surf ace of suitable radii of curvature. Lens maker formula helps in finding various unknowns and is widely applied.

Find the power of a concave lens whose focallength is 40 cm

(A) –2.5 D (B) +2.5 D

(C) $+2.5 \times 10^{-2}$ D (D) -2.5×10^{-2} D

Answer (A)

Sol. $P = \frac{1}{f(m)} = \frac{1}{(-0.4)}$

$= -2.5$ D