AIPMT Sample Paper 2013

Physics

Q. 1. Dimensions of resistance in an electrical circuit, in terms of dimension of mass M, of length L, of time T and of current I, would be

a. $\left[ML^2T^{-3}I^{-2}\right]$
b. $\left[ML^2T^{-3}I^{-1}\right]$
c. $\left[ML^2T^{-2}\right]$
d. $\left[ML^2T^{-1}I^{-1}\right]$

Sol. $P = I^2\ R;\ R = PI^{-2} = \left[ML^2T^{-3}I^{-1}\right]$ Correct choice: (1)

Q. 2. A particle moving along x-axis has acceleration f, at time t, given $f = f_0\left(1-\frac{t}{T}\right),\ where\ f_o\ and\ T$ are constant. The particle at t = 0 has zero velocity. In the time interval between t = 0 and the instant when f = 0 , the particle's velocity (v_x) is

a. $\frac{1}{2}f_oT$
b. f_oT
c. $\frac{1}{2}f_oT^2$
d. f_oT^2

Sol.

$$\int_o^v dv = \int_o^t fdt \Rightarrow v = f_o\left(t-\frac{t}{2T}\right),\ \int_o^s ds = \int_o^T vdt \Rightarrow s = \frac{f_oT^3}{3}\quad v_{av} = \frac{s}{T} = \frac{f_oT}{3} \therefore \text{No alternative matches}$$

If they have asked instantaneous velocity when $f = o\ then\ v = \frac{f_0T}{2}$ Correct choice: (1)

Q. 3. A car moves from X to Y with a uniform speed vu and returns to Y with a uniform speed vd .The average speed for this round trip is

a. $\frac{v_u + v_d}{2}$

b. $\frac{2v_u + v_d}{v_d + v_u}$

c. $\sqrt{v_u v_d}$

d. $\frac{v_d + v_u}{v_d + v_u}$

Sol. In question it must be car moves from X to Y and returns to X.

$$t_1 = \text{time taken from } X \text{ to } Y = \frac{S}{v_u};\ t_2 = \text{time taken from } Y \text{ to } X = \frac{S}{v_d};\ \text{average speed} = \frac{2S}{t_1 + t_2} = \frac{2\,v_u v_d}{v_u + v_d}$$

Correct choice: (2)

Q. 4. A particle starting from the origin (0, 0) moves in a straight line in the (x, y) plane. Its co-ordinates at a later time are $\left(\sqrt{3}, 3\right)$. The path of the particle makes with the x-axis an angle of

a. 0^0

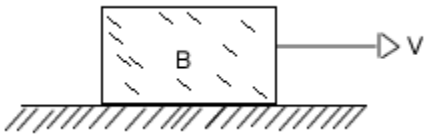
b. 30^0

c. 45^0

d. 60^0

Sol. $\tan\theta = \frac{3}{\sqrt{3}};\ \theta = 60^0$ Correct choice: (4)

Q. 5. A block B is pushed momentarily along a horizontal surface with an initial velocity V. If μ is the coefficient of sliding friction between B and the surface, block B will come to rest after a time



a. V / g

b. $V / (g\,\mu)$

c. $(g\,\mu) V /$

d. g / V

Sol. $u = V;\ a = -\mu g;\ v = 0\ ;\ v = u + at;\ 0 = V - \mu gt;\ t = V / \mu g$ Correct choice: (2)

Q. 6. A vertical spring with force constant K is fixed on a table. A ball of mass m at a height h above the free upper end of the spring falls vertically on the spring so that the spring is compressed by a distance d . The net work done in the process is

a. $mg(h-d)+\frac{1}{2}Kd^2$

b. $mg(h+d)+\frac{1}{2}Kd^2$

c. $mg(h+d)-\frac{1}{2}Kd^2$

d. $mg(h-d)-\frac{1}{2}Kd^2$

Sol. $W_{net} = work\ done\ by\ gravity + work\ done\ by\ spring \Rightarrow W_{net} = mg(h+d)-\frac{1}{2}Kd^2$
Correct choice: (3)

Q. 7. A wheel has angular acceleration of 3.0 rad/sec2 and an initial angular speed of 2.00 rad / sec. In a time of 2 sec it has rotated through an angle (in radian) of

a. 4
b. 6
c. 10
d. 12

Sol. $\alpha = 3\ rad/\sec^2;\ \varpi_0 = 2\ rad/s;\ t = 2\ \sec;\ \theta = \varpi_0 t + \frac{1}{2}\alpha t^2 = 10\ rad$ Correct choice: (3)

Q. 8.
$\vec{A}$ *and* $\vec{B}$ *are two vectors and* θ *is the angle between them, if* $\left|\vec{A}\times\vec{B}\right| = \sqrt{3}\left(\vec{A}\cdot\vec{B}\right)$ *the value of* θ *is*

a. 90^0
b. 60^0
c. 45^0
d. 30^0

Sol. $\left|\vec{A}\times\vec{B}\right| = \sqrt{3}\left(\vec{A}\,.\,\vec{B}\right),\ \left|\vec{A}\right|\left|\vec{B}\right|\sin\theta = \sqrt{3}\left|\vec{A}\right|\left|\vec{B}\right|\cos\theta \Rightarrow \tan\theta = \sqrt{3} \Rightarrow \theta = 60^0$ Correct choice: (2)

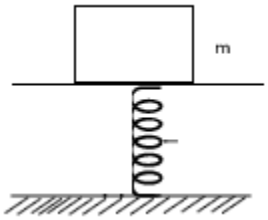
Q. 9. The position x of a particle with respect to time t along x -axis is given by $x = 9t^2 - t^3$ where x is in metres and t in second. What will be the position of this particle when it achieves maximum speed along the $+_x$ direction?

a. 24 m
b. 32 m
c. 54 m
d. 81 m

Sol. $v = \frac{dx}{dt} = 18t - 3t^2;\ \frac{dv}{dt} = 18 - 6t.\ Velocity\ is\ \max imum\ when\ \frac{dv}{dt}\ 0 \Rightarrow t = 3\ \sec,\ x = 54\ m$

Correct choice: (3)

Q. 10. A mass of 2.0 kg is put on a flat pan attached to a vertical spring fixed on the ground as shown in the figure. The mass of the spring and the pan is negligible. When pressed slightly and released the mass executes a simple harmonic motion. The spring constant is 200 N/m. What should be the minimum amplitude of the motion so that the mass gets detached from the pan? $\left[Take\ g = 10\ m/s^2\right]$

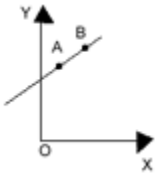


a. 4.0 cm
b. 8.0 cm
c. 10.0 cm
d. any value less than 12.0 cm

Sol. $m\,\omega^2 A = mg;\ \omega = \sqrt{\frac{K}{m}} = 10 \Rightarrow A = \frac{g}{\omega^2} = \frac{10}{10^2} = 0.1m = 10.0\ cm$

Correct choice: (3)

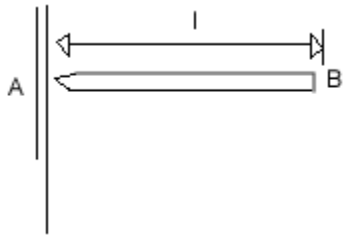
Q. 11. A particle of mass m moves in the XY plane with a velocity V along the straight line AB. If the angular momentum of the particle with respect to origin O is L_A when it is at A and L_B when it is at B, then



a. $L_A < L_B$
b. $L_A > L_B$
c. $L_A = L_B$
d. The relationship between L_A and L_B depends upon the slope of the line AB

Sol. $L = mVd\ (d = perpendicular\ distance) \Rightarrow L_A = L_B$ Correct choice: (3)

Q. 12. A uniform rod AB of length l and mass m is free to rotate about point A. The rod is released from rest in the horizontal position. Given that the moment of inertia of the rod about $A\ is\ \frac{ml^2}{3}$, the initial angular acceleration of the rod will be



a. $\frac{3g}{2l}$
b. $\frac{2g}{3l}$
c. $mg\frac{1}{2}$
d. $\frac{3}{2}gl$

Sol. $mg\frac{1}{2} = \frac{ml^2}{3}\alpha \Rightarrow \alpha = \frac{3g}{2l}$ Correct choice: (1)

Q. 13. Two satellites of earth, $S_1\ and\ S_2$ are moving in the same orbit. The mass of S_1 is four times the mass of S_2. Which one of the following statements is true?

a. The kinetic energies of the two satellites are equal.
b. The time period of is S_1 four times that of S_2.
c. The potential energies of earth and satellite in the two cases are equal.
d. $S_1\ and\ S_2$ are moving with the same speed.

Sol . As orbital velocity $v = \sqrt{\frac{GM}{R}}$ it is independent of mass of satellite Correct choice: (4)

Q. 14. Assuming the sun to have a spherical outer surface of radius r , radiating like a black body at temperature $t^0 C$, the power received by a unit surface, (normal to the incident rays) at a distance R from the center of the sun is (where σ is the Stefan's constant).

a. $r^2 \sigma (t+273)^4 / R$
b. $4\pi r^2 \sigma t^4 / R^2$
c. $r^2 \sigma (t+273)^4 / 4\pi R^2$
d. $16\pi^2 r^2 \sigma t^4 / R^2$

Sol. Power radiated

$P = \sigma 4\pi r^2 (t+273)^4; \frac{Powerreceived}{Area} = \frac{P}{4\pi R^2} = \frac{\sigma r^2}{R^2}(t+273)^4$ Correct choice: (1)

Q. 15. An engine has an efficiency of 1/6. When the temperature of sink is reduced by 62^0C, its efficiency is doubled. Temperature of the source is

a. $99^0 C$
b. $124^0 C$
c. $37^0 C$
d. $62^0 C$

Sol. $\eta = 1 - \frac{T_2}{T_1}; \frac{1}{6} = 1 - \frac{T_2}{T_1} \ldots (i) \frac{1}{3} = 1 - \frac{T_2 - 62}{T1} \ldots (ii), from\ (i)\ and\ (ii) \Rightarrow T_1 = 99^0 C$ Correct choice: (1)

Q. 16. A black body is at $727^0 C$. It emits energy at a rate which is proportional to

a. $(727)^4$
b. $(727)^2$
c. $(1000)^4$
d. $(1000)^2$

Sol. $P \propto T^4$ Correct choice: (3)

Q. 17. The frequency of a light wave in a material is $2 \times 10^{14}\ HZ$ and wavelength is 5000Å. The refractive index of material will be

a. 1.33
b. 1.40
c. 1.50
d. 3.00

Sol. $n = 2 \times 10^{14}\ HZ;\ \lambda = 5000 \times 10^{-10} m;\ v = n\,\lambda = 10^{8}\ m/s;\ \mu = \frac{c}{v} = 3$ Correct choice: (4)

Q. 18. The phase difference between the instantaneous velocity and acceleration of a particle executing simple harmonic motion is

a. (1) zero
b. $0.5\,\pi$
c. π
d. $0.707\,\pi$

Sol. $x = A \sin(\omega t + \phi),\ v = A\,\omega \cos(\omega t + \phi),\ a = -A\,\omega^2 \sin(\omega t + \phi) \therefore\ Phase\ difference = \frac{\pi}{2}$

Correct choice: (2)

Q. 19. The particle executing simple harmonic motion has a kinetic energy $K_0 \cos^2 \omega t$. The maximum values of the potential energy and the total energy are respectively

a. $K_0\ and\ K_0$
b. $0\ and\ 2K_0$
c. $\frac{K_0}{2}\ and\ K_0$
d. $K_0\ and\ 2K_0$

Sol. $P \cdot E_{max} = K \cdot E_{max} = K_0$ Correct choice: (1)

Q. 20. A particle executes simple harmonic oscillation with an amplitude a . The period of oscillation is T. The minimum time taken by the particle to travel half of the amplitude from the equilibrium position is

a. T / 2
b. T / 4

c. T / 8
d. T /12

Sol. $x = A \sin \omega t;\ \omega = \frac{2\pi}{T};\ x\ A/2\ when\ t = T/12$ Correct choice: (4)

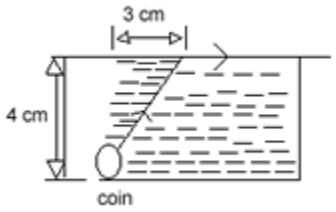
Q. 21. The electric and magnetic field of an electromagnetic wave are

a. in phase and perpendicular to each other
b. in phase and parallel to each other
c. in opposite phase and perpendicular to each other
d. in opposite phase and parallel to each other

Sol. $E_y\ (x,t) = E_o\ \sin\ (wt - kx);\ B_z\ (x,t) = B_o\ \sin\ (wt - kx)$

Correct choice: (1)

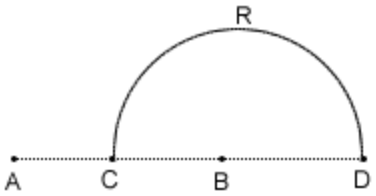
Q. 22. A small coin is resting on the bottom of a beaker filled with a liquid. A ray of light from the coin travels upto the surface of the liquid and moves along its surface (see figure). How fast is the light traveling in the liquid?



a. $1.2 \times 10^8\ m/s$
b. $1.8 \times 10^8\ m/s$
c. $1.2 \times 10^8\ m/s$
d. $3.0 \times 10^8\ m/s$

Sol . $\mu \sin\ \theta = cons\tan t \Rightarrow \mu \times \frac{3}{5} = 1 \times \sin\ 90;\ \mu = \frac{5}{3};\ v = c\ /\ \mu = 1.8 \times 10^8\ m/s$ Correct choice: (2)

Q. 23. Charges +q and -q are placed at points A and B respectively which are a distance 2L apart, C is the midpoint between A and B. The work done in moving a charge +Q along the semicircle CRD is



a. $-\frac{qQ}{6\pi\ \varepsilon_o L}$

b. $-\frac{qQ}{4\pi\ \varepsilon_o L}$

c.

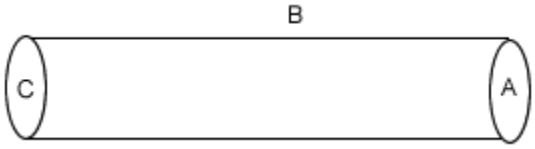
d. $-\frac{qQ}{2\pi\ \varepsilon_o L}$

Sol. At C potential

$$V_1 = 0;\ At\ D\ potential\ V_2 = \frac{kq}{3L} - \frac{kq}{L} = -\frac{2\,kq}{3L};\ W_{external} = Q\left(V_2 - V_1\right) = -\frac{Qq}{6\pi\ \varepsilon_o\ L}$$

Correct choice: (1)

Q. 24. A hollow cylinder has a charge q coulomb within it. If f is the electric flux in units of volt × meter associated with the curved surface B, the flux linked with the plane surface A in units of volt × meter will be



a. $\frac{q}{\varepsilon_o} - \phi$

b. $\frac{1}{2}\left(\frac{q}{\varepsilon_o} - \phi\right)$

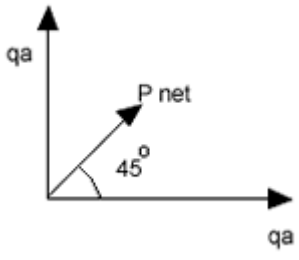
c. $\frac{q}{2\,\varepsilon_o}$

Sol. $\phi_{curved} + 2\,\phi_{plane} = \frac{q}{\varepsilon_0} \Rightarrow \phi_{plane} = \frac{q}{2\,\varepsilon_o} - \frac{\phi}{2}$ Correct choice: (2)

Q. 25. Three point charges +q, - 2q and +q are placed at points (x = 0, y = a, z = 0), (x = 0, y = 0, z = 0) and (x = a, y = 0, z = 0) respectively. The magnitude and direction of the electric dipole moment vector of this charge assembly are

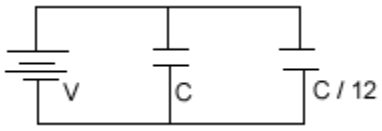
a. $\sqrt{2}\ qa\ along\ +x\ direction$
b. $\sqrt{2}\ qa\ along\ +y\ direction$
c. $\sqrt{2}\ qa\ along\ the\ line\ joining\ point\ s\left(x=0,y=0,z=0\right) and\ \left(x=a,y=a,z=0\right)$
d. $qa\ along\ the\ line\ joining\ point\ s\left(x=0,y=0,z=0\right) and\ \left(x=a,y=a,z=0\right)$

Sol .



$P_{net} = \sqrt{2}\ qa$ Correct choice: (3)

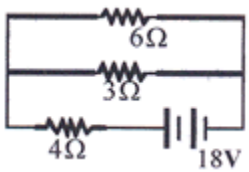
Q. 26. Two condensers, one of capacity C and the other of capacity C/2, are connected to a V-volt battery, as shown. The work done in charging fully both the condensers is



a. $\frac{1}{2}CV^2$
b. $2CV^2$
c. $\frac{1}{4}CV^2$
d. $\frac{3}{4}CV^2$

Sol. $U_i = 0; U_f = \frac{1}{2}\cdot\frac{3}{2}CV^2; W = \frac{3}{4}CV^2$ Correct choice: (4)

Q. 27. The total power dissipated in Watts in the circuit shown here is



a. 4
b. 16
c. 40
d. 54

Sol . $R_{eq} = 6\ \Omega;\ p = \frac{V^2}{R_{eq}} = \frac{18 \times 18}{6} = 54\ W$ Correct choice: (4)

Q. 28. A steady current of 1.5 amp flows through a copper voltameter for 10 minute. If the electrochemical equivalent of copper is $30 \acute{} 10^{-5}$ gm coulomb^{-1} , the mass of copper deposited on the electrode will be

a. 0.27 gm
b. 0.40 gm
c. 0.50 gm
d. 0.67 gm

Sol . m = Zit; m = 0.27gm Correct choice: (1)

Q. 29. If the cold junction of a thermo-couple is kept at 0^0C and the hot junction is kept at T^0C, then the relation between neutral temperature (Tn) and temperature of inversion (Ti) is

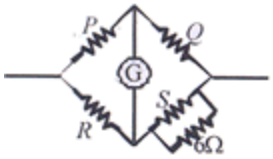
a. $T_n = T_i + T$
b. $T_n = T_i + T / 2$
c. $T_n = 2T_i$
d. $T_n = T_i - T$

Sol . $T_n = \frac{T_i}{2}$ Correct choice: (2)

Q. 30. Three resistances P, Q, R each of 2Ω and an unknown resistance S form the four arms of a Wheatstone bridge circuit. When a resistance of 6Ω is connected in parallel to S the bridge gets balanced. What is the value of S?

a. 1Ω
b. 2Ω
c. 3Ω
d. 6Ω

Sol .



$\frac{P}{Q}=\frac{R}{S\,6\,/\,(S+6)};\ P=Q=R=2\Omega;\Rightarrow S=3\Omega$ Correct choice: (3)

Q. 31. The resistance of an ammeter is 13Ω and its scale is graduated for a current upto 100 Amps. After an additional shunt has been connected to this ammeter it becomes possible to measure currents upto 750 Amperes by this meter. The value of shunt-resistance is

a. $2\,K\Omega$
b. 20Ω
c. 2Ω
d. 0.2Ω

Sol. $I_{\max}=I_{g\max}\left(\frac{G+S}{S}\right);\ I_{\max}=750\,A,\ I_{g\max}=100\,A;\ G=13\Omega\Rightarrow S=2\Omega$

Correct choice: (3)

Q. 32. Under the influence of a uniform magnetic field a charge-particle is moving in a circle of radius R with constant speed V. The time period of the motion

a. depends on R and not on V
b. depends on V and not on R
c. depends on both R and V
d. is independent of both R and V

Sol. $T=\frac{2\pi m}{Bq}$ Correct choice: (4)

Q. 33. A charged particle (charge q) is moving in a circle of radius R with uniform speed v . The associated magnetic moment μ is given by

a. qvR
b. qv R / 2
c. qv R^2
d. qvR^2 / 2

Sol. $\mu = LA;\ I = \frac{q}{2\pi R / v}, A = \pi R^2 \Rightarrow \mu = \frac{qvR}{2}$ Correct choice: (2)

Q. 33. A beam of electrons passes undeflected through mutually perpendicular electric and magnetic fields. If the electric field is switched off, and the same magnetic field is maintained, the electrons move

a. along a straight line
b. in an elliptical orbit
c. in a circular orbit
d. along a parabolic path

Sol. As velocity, magnetic field and electric field are mutually perpendicular. Correct choice: (3)

Q. 34. A beam of electrons passes undeflected through mutually perpendicular electric and magnetic fields. If the electric field is switched off, and the same magnetic field is maintained, the electrons move

a. along a straight line
b. in an elliptical orbit
c. in a circular orbit
d. along a parabolic path

Sol. As velocity, magnetic field and electric field are mutually perpendicular. Correct choice: (3)

Q. 35. The primary and secondary coils of a transformer have 50 and 1500 turns respectively. If the magnetic flu σ f linked with the primary coil is given by $\phi = \phi_o + 4t, where\ \phi is in\ webers, t is time\ in\ \sec onds\ and\ \phi_o$ is a constant, the output voltage across the secondary coil is

a. 30 volts
b. 90 volts
c. 120 volts
d. 220 volts

Sol. $e_p = -\frac{d\phi_p}{dt} = 4 Volt, N_p e_p = N_s e_s \Rightarrow e_s = 120 Volts$ Correct choice: (3)

Q. 36. What is the value of inductance L for which the current is a maximum in a series LCR circuit with $C = 10\mu F\ and\ \omega = 1000 \sec^{-1}$?

a. 10 mH
b. 100 mH
c. 1 mH

d. cannot be calculated unless R is known

Sol. $\omega = \frac{1}{\sqrt{LC}} \Rightarrow L = \frac{1}{\omega^2 C} = 100\,mH\ \left(Although\ \omega is\ written\ 1000\,\sec^{-1}\ it\ must\ be\ 1000\,rad\ /\sec.\right)$

Correct choice: (2)

Q. 37. A transformer is used to light a 100W and 110V lamp from a 220V mains. If the main current is 0.5A, the efficiency of the transformer is approximately

a. 10%
b. 30%
c. 50%
d. 90%

Sol. $\eta = \frac{out\ put}{input} \times 100; \eta = \frac{100}{0.5 \times 220} 100 = 90.9\%$ Correct choice: (4)

Q. 38. Nickel shows ferromagnetic property at room temperature. If the temperature is increased beyond Curie temperature then it will show

a. diamagnetism
b. paramagnetism
c. anti ferromagnetism
d. no magnetic property

Sol . Fact based Correct choice: (2)

Q. 39. A 5 watt source emits monochromatic light of wavelength $5000\,\overset{0}{A}$. When placed 0.5 m away, it liberates photoelectrons from a photosensitive metallic surface. When the source is moved to a distance of 1.0 m, the number of photoelectrons liberated will

a. be reduced by a factor of 2
b. be reduced by a factor of 4
c. be reduced by a factor of 8
d. be reduced by a factor of 16

Q. 40. Monochromatic light of frequency is $6.0 \times 10^{14}\ HZ$ produced by a laser. The power emitted is $2 \times 10^{-3}\ W$. The number of photons emitted, on the average, by the source per second is

a. 5×10^{14}
b. 5×10^{15}
c. 5×10^{16}

d. 5×10^{17}

Sol . $nhv = 2\times10^{-3}; n = 5\times10^{15}$ Correct choice: (2)

Q. 41. In a mass spectrometer used for measuring the masses of ions, the ions are initially accelerated by an electric potential V and then made to describe semicircular paths of radius R using a magnetic field B. If V and B are kept constant, the ratio $\left(\frac{charge\ on\ the\ ion}{mass\ of\ the\ ion}\right)$ will be proportional to

a. R
b. 1/R
c. $1/R^2$
d. R^2

Sol . Radius of path $R = \frac{mv}{qB} = \sqrt{\frac{2m\,(K\cdot E)}{qB}},\ where,\ K\cdot E = qV \Rightarrow R = \frac{\sqrt{2mqV}}{qB} \Rightarrow \frac{q}{m} = \frac{2V}{B^2R^2}$
Correct choice: (3)

Q. 42. If the nucleus $^{27}_{13}$ 13 has a nuclear radius of about 3.6 fm, then $^{125}_{52}$ Te would have its radius approximately as

a. 4.8 fm
b. 6.0 fm
c. 9.6 fm
d. 12.0 fm

Sol. $\frac{R_2}{R_1}\left(\frac{A_2}{A_1}\right)^{1/3};\ R_2 = R_1\left(\frac{125}{27}\right)^{1/3} = 3.6\times\frac{5}{3} = 6.0\ fm$ Correct choice: (2)

Q. 43. In radioactive decay process, the negatively charged emitted $\beta-$ particles are

a. the electrons orbiting around the nucleus
b. the electrons present inside the nucleus
c. the electrons produced as a result of the decay of neutrons inside the nucleus
d. the electrons produced as a result of collisions between atoms

Sol . When neutron decays as given $_0n^1 = {}_1H^1 + {}_{-1}e^0 + \bar{\nu}$ Correct choice: (3)

Q. 44. A nucleus ${}^{A}_{Z}X$ has nucleus A X
Z has mass represented by M (A, Z). If M_p and M_n denote the mass of proton and neutron respectively and B.E the binding energy in Me V then

a. $B.E = M(A,z) - ZM_p - (A-Z)M_n$
b. $B.E = \left[M(A,z) - ZM_p - (A-Z)M_n\right]c^2$
c. $B.E = \left[ZM_p + (A,z)M_n - M(A,Z)\right]c^2$
d. $B.E = \left[ZM_p + AM_n - M(A,Z)\right]c^2$

Sol. $B.E = \left[ZM_p + (A,z)M_n - M(A,Z)\right]c^2$ Correct choice: (3)

Q. 45. Two radioactive substances A and B have decay constants $5\lambda \text{ and } \lambda$ respectively. At t = 0 they have the same number of nuclei. The ratio of number of nuclei of A to those of B will be $(1/e)^2$ after a time interval

a. $\frac{1}{2\lambda}$
b. $\frac{1}{4\lambda}$
c. 4λ
d. 2λ

Sol. $\frac{N_A}{N_B} = \frac{N_0 e^{-\lambda t}}{N_0 e^{-\lambda 2t}}$ *Where* $\frac{N_A}{N_B} = \frac{1}{e^2}; \lambda_1 = 5\lambda, = \lambda_2 = \lambda$ *So,* $\frac{1}{e^2} = \frac{e^{-5\lambda t}}{e^{-\lambda t}} \Rightarrow t = \frac{1}{2\lambda}$

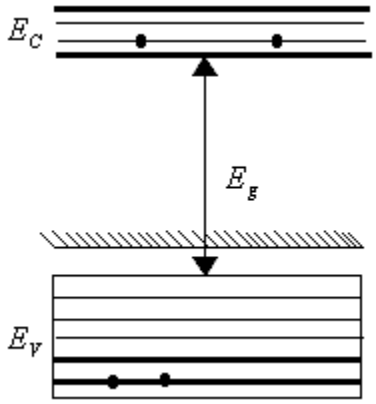
Correct choice: (1)

Q. 46. The total energy of electron in the ground state of hydrogen atom is –13.6 eV. The kinetic energy of an electron in the firstm excited state is

a. 1.7 eV
b. 3.4 eV
c. 6.8 eV
d. 13.6 eV

Sol. Total energy in 1st excited state $= -\frac{13.6}{4} = -3.4eV \text{ and } K.E = -(\text{total energy}) = 3.4eV$
Correct choice: (2)

Q. 47. In the energy band diagram of a material shown below, the open circles and filled circles denote holes and electrons respectively. The material is



a. an n-type semiconductor
b. a p-type semiconductor
c. an insulator
d. a metal

Sol. In diagram acceptor level is near valance band which will happen in p-type semiconductor.
Correct choice: (2)

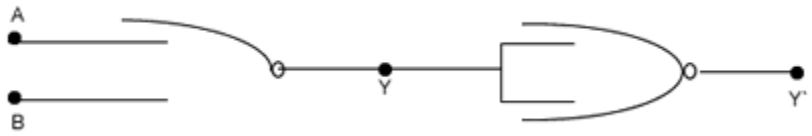
Q. 48. A common emitter amplifier has a voltage gain of 50, an input impedance of $100\,\Omega$ and an output impedance of $200\,\Omega$. The power gain of the amplifier is

a. 100
b. 500
c. 1000
d. 1250

Sol. $Voltage\ gain, A_v = 50; input\ impedance, Ri = 100\Omega; output\ impedance\ R_o = 200\Omega\ .the\ power\ gain\ of\ the\ = (A_v)^2 \times \frac{R_i}{R_0} = 1250$

Correct choice: (4)

Q. 49. In the following circuit, the output Y for all possible inputs A and B is expressed by the truth table



(i)

A	B	Y
0	0	0
0	1	1
1	1	1

(ii)

A	B	Y
0	1	0
1	0	0
1	1	1

(iii)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(iv)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

Q. 50. For a cubic crystal structure which one of the following relations indicating the cell characteristics is correct?

a. $a = b = c \ and \ \alpha = \beta = \gamma = 90^0$
b. $a \neq b \neq c \ and \ \alpha \neq \beta \neq \gamma \neq 90^0$
c. $a \neq b \neq c \ and \ \alpha = \beta = \gamma = 90^0$
d. $a = b = c \ and \ \alpha \neq \beta \neq \gamma = 90^0$

Sol. the cubic system is the most symmetric out of all seven crystal systems. All edges for the unit cell are same i.e., a = b = c and all angles are right angles i.e., $\alpha = \beta = \gamma = 90^0$

Correct choice: (1)