JEE Main April 2026

Question Paper With Text Solution

06 April | Shift-1

PHYSICS

MATRIX

JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

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JEE MAIN APRIL 2026 | 06 APRIL SHIFT-1

SECTION – A

Question ID : 6952782161

26. The density ρ of a uniform cylinder is determined by measuring its mass m, length l and diameter d. The measured values of m, l and d are 97.42 ± 0.02 g, 8.35 ± 0.05 mm and 20.20 ± 0.02 mm, respectively. Calculated percentage fractional error in ρ is _________.

(1) 0.63% (2) 0.82% (3) 0.72% (4) 0.25%

Ans. (2)

Sol. $\rho = \frac{m}{\pi \frac{d^2}{4} l} = \frac{4m}{\pi d^2 l}$

$$\frac{\Delta\rho}{\rho} = \frac{\Delta m}{m} + 2\frac{\Delta d}{d} + \frac{\Delta d}{l}$$

$$\Rightarrow \frac{\Delta\rho}{\rho} = \frac{0.02}{97.42} + \left(\frac{0.02}{20.20}\times 2\right) + \left(\frac{0.05}{8.35}\right)$$

= 0.82%

Question ID : 6952782162

27. The potential energy of a particle changes with distance x from a fixed origin as $V = \frac{A\sqrt{x}}{x+B}$, where A and B are constant with appropriate dimensions. The dimensions of AB are ________.

(1) $[M^1L^{5/2}T^{-2}]$ (2) $[M^{3/2}L^{5/2}T^{-2}]$ (3) $[M^1L^2T^{-2}]$ (4) $[M^1L^{7/2}T^{-2}]$

Ans. (4)

Sol. $[V] = \frac{[A]\left[\sqrt{x}\right]}{[x+B]}$

$$\left[ML^2T^{-2}\right] = \frac{[A]\left[L^{1/2}\right]}{[L]} \qquad [\because [x] = [B] = [L]]$$

$\Rightarrow [A] = [ML^{5/2}T^{-2}]$

So, $[AB] = [ML^{5/2}T^{-2}]\,[L] = [M^1L^{7/2}T^{-2}]$

Question ID : 6952782163

28. The rain drop of mass 1 g , starts with zero velocity from a height of 1 km . It hits the ground with a speed of 5 m/s. The work done by the unknown resistive force is __________ J.

(take $g = 10\ m/s^2$)

(1) – 8.75 (2) – 8.35 (3) – 9.55 (4) – 9.98

Ans. (4)

Sol. Using work energy theorem

$$mgh + W_{res} = \frac{1}{2}mv^2 - \frac{1}{2}m(0)^2$$

$$\Rightarrow (1\times10^{-3})(10)(10^3) + W_{res} = \frac{1}{2}(1\times10^{-3})(5)^2 - 0$$

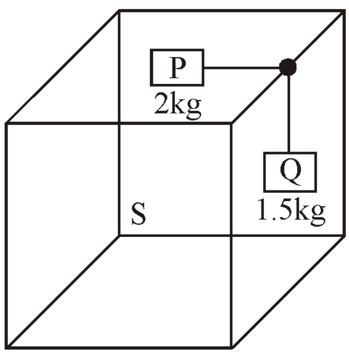
$$\Rightarrow W_{res} = 0.0125 - 10$$

$$= -9.9875\ J$$

Question ID : 6952782164

29. Two blocks (P and Q) with respectively masses 2 kg and 1.5 kg are joined by a massless thread. These blocks are mounted on a frictionless pully which is fixed on the edge of a cube (S), as shown in the figure below. Block P is positioned on the top surface which has no friction and block Q is in contact with side-surface, having coefficient friction μ. The cube (S) moves towards the right with acceleration of $\frac{g}{2}$, where g is gravitational acceleration. During this movement the block P and Q remain stationary. The value of μ is _______.

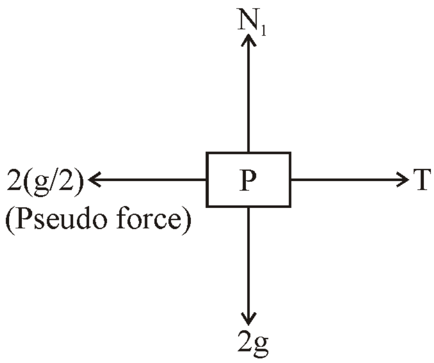
(take $g = 10\ m/s^2$)



(1) 0.3 (2) 0.67 (3) 1 (4) 0.5

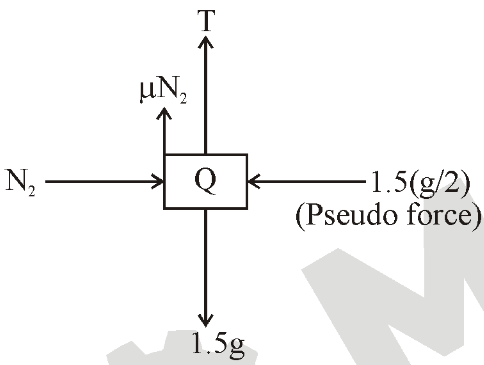
Ans. (2)

Sol. Solving with respect to cube [Both blocks are at rest with respect to cube]



$N_1 = 2g = 20N$

$T = 2(g/2) = 10\ N$



$\therefore\ N_2 = 1.5\ (g/2) = 7.5\ N$

$1.5g = T + \mu N_2$

$\Rightarrow 15 = 10 + \mu(7.5)$

$\Rightarrow \mu = \frac{5}{7.5} = \frac{2}{3} = 0.67$

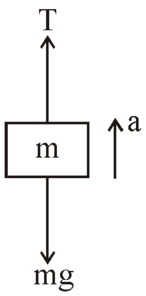
Question ID : 6952782165

30. A lift of mass 1600 kg is supported by thick iron wire. If the maximum stress which the wire can withstand is $4 \times 10^8\ N/m^2$ and its radius is 4 mm , then maximum acceleration the lift can take is ________ m/s^2.

(take $g = 10\ m/s^2$ and $\pi = 3.14$)

(1) 2.56 (2) 3.89 (3) 4.32 (4) 5.16

Ans. (1)

Sol. 

$\therefore$ T – mg = ma

$\Rightarrow$ T = m(g + a)

$\therefore$ Breaking stree$(\sigma) = \dfrac{F}{A}$

here F = T

$\Rightarrow \sigma = \dfrac{T}{A}$

$\Rightarrow T = \sigma A$

$\Rightarrow m(g+a) = \sigma A$

$\Rightarrow a = \dfrac{\sigma A}{m} - g = \dfrac{(4\times10^{8})\left(\pi(4\times10^{-3})^{2}\right)}{1600} - 10$

= 2.56 m/s^2

Question ID : 6952782166

31. A solid sphere of radius 4 cm and mass 5 kg is rotating (rotation axis is passing through the centre of the sphere) with an angular velocity of 1200 rpm . It is brought to rest in 10 s by applying a constant torque. The torque applied and the number of rotations it made before it comes to rest are ________ and ________ respectively.

(1) 0.128 π Nm, 100 (2) 0.128 π Nm, 50 (3) 0.128 π Nm, 50 (4) 0.0128 π Nm, 100

Ans. (4)

Sol. $\because \omega = \omega_0 + \alpha t$

$0 = \left(1200 \times \dfrac{2\pi}{60}\right) + \alpha(10)$ $\left[\because 1\text{rpm} = \dfrac{2\pi}{60}\text{rad}\right]$

$\Rightarrow \alpha = -4\pi$ rad/sec^2

$\because I = \dfrac{2}{5}mR^2 = \dfrac{2}{5}(5)(4\times10^{-2})^2$

$\Rightarrow I = 32 \times 10^{-4}$ kgm^2

$\therefore$ Torque $\tau = I\alpha$

$= -(32 \times 10^{-4})(4\pi)$ Nm

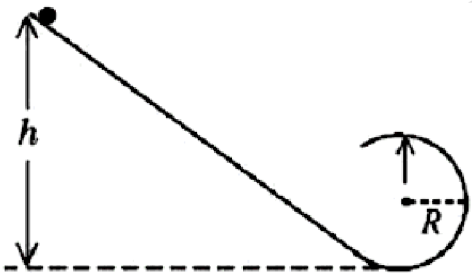
$= -0.0128\pi$ Nm

$\because 0 = \left(\frac{\omega_0 + \omega}{2}\right)t$

$= \left(\frac{0+1200}{20}\right)\left(\frac{10}{60}\right) = 100\text{rot}$ $\left[\because 10\,\text{sec} = \frac{10}{60}\,\text{min}\right]$

Question ID : 6952782167

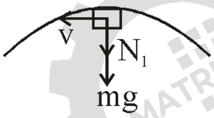
32. A smooth inclined plane ends in a vertical circular loop, as shown in the figure. A small body is released from height h as shown. If the body exerts a force of three times its weight on the plane at the highest point of circle then the height h = αR. The value of α is _________.



(1) 2 (2) 4 (3) 3 (4) 6

Ans. (3)

Sol.



$\because N_1 + mg = \frac{mv_1^2}{R}$

$3mg + mg = \frac{mv_1^2}{R}$

$\Rightarrow v_1^2 = 4gR$

Using mechanical energy conservation b/w top of inclined plane and top of circular part.

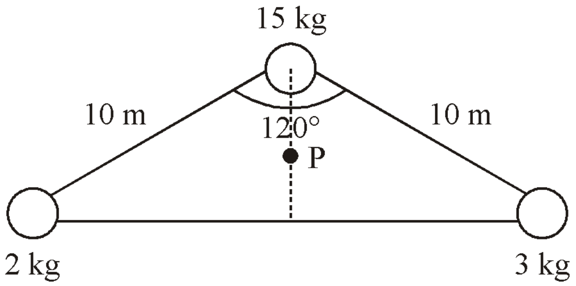
$mgh + 0 = \frac{1}{2}mv_1^2 + mgR$

$mgh = \frac{m}{2}(4gR) + mgR$

$\Rightarrow h = 3R$

Question ID : 6952782168

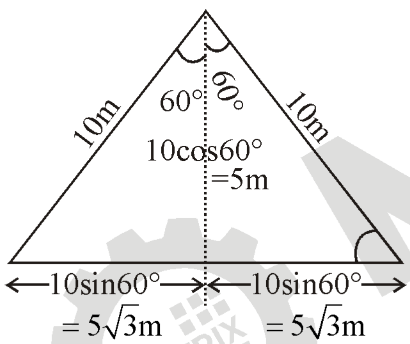
33. The position of center of mass of three masses 2 kg, 3 kg and 15 kg placed with respect to mid point (p) of normal bisector, as shown in the figure is _________.

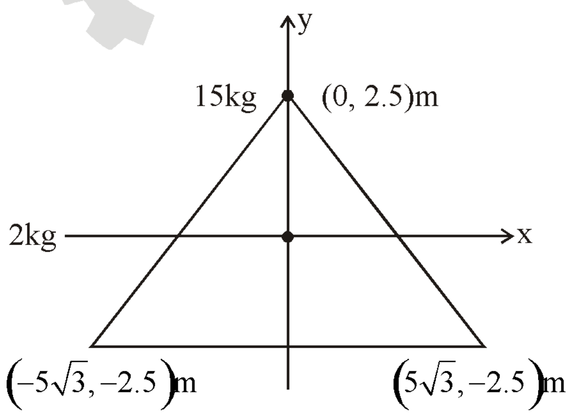


(1) $\left(\frac{\sqrt{3}}{4}, 1.25\right)$ (2) $\left(\frac{\sqrt{3}}{4}, 1.0\right)$ (3) (0, 0) (4) (1.25, 0)

Ans. (1)

Sol.





$$\vec{r}_{cm} = \frac{m_1\vec{r}_1 + m_2\vec{r}_2 + m_3\vec{r}_3}{m_1 + m_2 + m_3}$$

$$=\frac{15\left(2.5\hat{j}\right)+3\left(5\sqrt{3}\hat{i}-2.5\hat{j}\right)+2\left(-5\sqrt{3}\hat{i}-2.5\hat{j}\right)}{15+3+2}$$

$$=\frac{\sqrt{3}}{4}\hat{i}+1.25\hat{j}$$

Question ID : 6952782169

34. The two wires A and B of equal cross-section but of different materials are joined together. The ratio of Young's modulus of wire A and wire B is 20/11. When the joined wire is kept under certain tension the elongations in the wires A and B are equal. If the length of wire A is 2.2 m , then the length of wire B is _________ m .

(1) 1.1 (2) 2.22 (3) 1.21 (4) 4.44

Ans. (3)

Sol. Given that $\frac{Y_A}{Y_B}=\frac{20}{11}, \frac{A_A}{A_B}=1, \frac{\Delta L_A}{\Delta L_B}=1, L_A=2.2\text{m}$

When both are joined under certain tension, $T_A = T_B$

$\Delta L_A = \Delta L_B$

$$\frac{T_A L_A}{A_A Y_A}=\frac{T_B L_B}{A_B Y_B}$$

$$\Rightarrow L_B=\left(\frac{T_A}{T_B}\right)\left(\frac{A_B}{A_A}\right)\left(\frac{Y_B}{Y_A}\right)L_A$$

$$=(1)(1)\left(\frac{11}{20}\right)(2.2)=1.21\text{m}$$

Question ID : 6952782170

35. Two closed vessels of same volume are joined through a narrow tube and both vessels are filled with air of pressure 90 kPa and temperature 400 K . Keeping the temperature of one vessel constant at 400 K the second vessel temperature is raised to 500 K . The final pressure in the vessels is ________ kPa .

(1) 100 (2) 120 (3) 90 (4) 105

Ans. (1)

Sol. Since total no. of moles will be constant.

$(n_1 + n_2)_i = (n_1 + n_2)_f$

$$\left[\because n=\frac{PV}{RT}\right]$$

$$\frac{90V}{R(400)}+\frac{90V}{R(400)}=\frac{P_f V}{R(400)}+\frac{P_f V}{R(500)}$$

$\Rightarrow P_f = 100$ kPa

Question ID : 6952782171

36. In interference experiment the path difference between two interfering waves at a point A on the screen is $\lambda/3$, where λ is the wavelength of these waves, and at another point B the path difference is $\lambda/6$. The ratio of intensities at points A and B is __________.

(1) 3 (2) 4 (3) 1/3 (4) 1/4

Ans. (3)

Sol. $\because \Delta\phi = \frac{2\pi}{\lambda}\Delta x$ Considering $I_1 = I_2 = I$

At point A,

$$\Delta\phi_A = \frac{2\pi}{\lambda}\left(\frac{\lambda}{3}\right) = \frac{2\pi}{3}$$

$$I_A = I_1 + I_2 + 2\sqrt{I_1 I_2}\cos(\Delta\phi_A)$$

$$= I + I + 2\sqrt{II}\cos(2\pi/3)$$

$$I_A = I$$

At point B,

$$\Delta\phi_B = \frac{2\pi}{\lambda}\left(\frac{\lambda}{6}\right) = \frac{\pi}{3}$$

$$I_B = I + I + 2\sqrt{II}\cos(\pi/3)$$

$$= 3I$$

$$I_A/I_B = 1/3$$

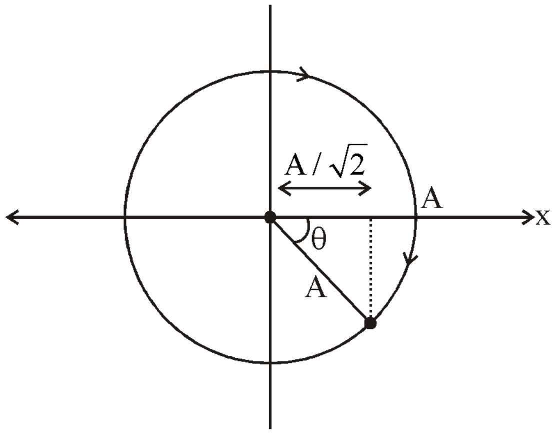
Question ID : 6952782172

37. A particle is executing simple harmonic motion. Its amplitude is A and time period is 5 sec . The time required by it to move from x = A to $x = \frac{A}{\sqrt{2}}$ is _________ sec.

(1) 1/4 (2) 5/4 (3) 5/8 (4) 3/8

Ans. (3)

Sol.



Using phasor

$$\cos\theta = \frac{A/\sqrt{2}}{A}$$

$$\Rightarrow \theta = \frac{\pi}{4}$$

$$\because \theta = \omega t$$

$$\frac{\pi}{4} = \left(\frac{2\pi}{T}\right)t \Rightarrow t = \frac{T}{8} = 5/8\,\text{sec}$$

Question ID : 6952782173

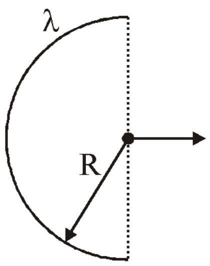
38. A thin half ring of radius 35 cm is uniformly charged with a total charge of Q coulomb. If the magnitude of the electric field at centre of the half ring is 100 V/m, then the value of Q is ___________ nC .

($\in_0$ = 8.85 × 10^{-12} C^2/Nm^2 and π =3.14)

(1) 2.14 (2) 2.44 (3) 3.25 (4) 0.7

Ans. (1)

Sol.



Electric field $E = \frac{2k\lambda}{R}$

Here $\lambda = \frac{Q}{l} = \frac{Q}{\pi R}$

So $E = \frac{2kQ}{\pi R^2}$

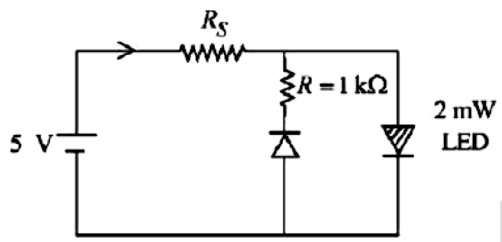
$100 = \frac{2(9\times10^9)(Q)}{(3.14)(35\times10^{-2})^2}$

$\Rightarrow Q = 2.14 \times 10^{-9}$ C

Question ID : 6952782174

39. The maximum rated power of the LED is 2 mW and it is used in the circuit with input voltage of 5 V as shown in the figure below. The current through resistance R_S is 0.5 mA.

The minimum value of the resistance of R_S, to ensure that the LED is not damaged is _________ kΩ.



(1) 6 (2) 2 (3) 4 (4) 5

Ans. (2)

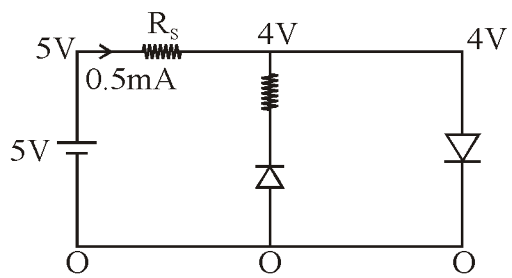
Sol. We have to keep the value of R_S such that even if whole current of battery passes through the LED, it doesn't get damaged.

Power of LED = iV

2 × 10–3 = i(V)

$\Rightarrow 2 \times 10^{-3} = (0.5 \times 10^{-3})V$

$\Rightarrow V = 4$ volt



$R_S = \frac{5-4}{0.5\times10^{-3}}$

$R_S = 2000\ \Omega$

$\Rightarrow R_S = 2\ k\Omega$

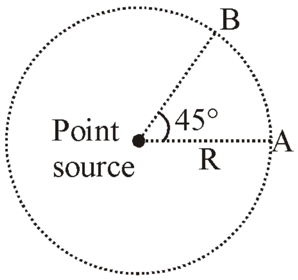
Question ID : 6952782175

40. A point light source emits E.M. waves in free space. A detector, placed at a distance of L m, measures the intensity as I_0. The detector is now shifted to another location on the same spherical surface ensuring the angle between original location and new location as 45°. The measured intensity at new location will be __________.

(1) $\frac{I_0}{4}$ (2) I_0 (3) $\frac{I_0}{\sqrt{2}}$ (4) $\frac{I_0}{2}$

Ans. (2)

Sol.

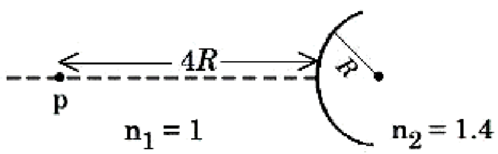


$\because$ Intensity $I = \frac{\text{Power}(P)}{4\pi R^2}$

& It will be same at both points A and B.

Question ID : 6952782176

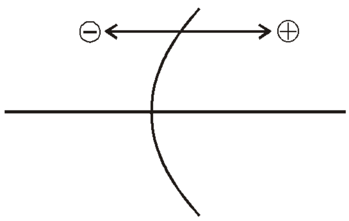
41. A spherical interface lens of radius R separates two media of refractive indices 1 and 1.4 respectively as shown in the figure below. A point source is placed at a distance of 4R in front of spherical interface. The magnitude of the magnification of point source image is ________ .



(1) 1.66 (2) 2.33 (3) 2.66 (4) 1.33

Ans. (1)

Sol.



$u = -4R,\ R = +R,\ n_i = 1,\ n_r = 1.4$

$$\because \frac{n_r}{v} - \frac{n_i}{u} = \frac{n_r - n_i}{R}$$

$$\Rightarrow \frac{1.4}{v} - \frac{1}{(-4R)} = \frac{1.4-1}{R}$$

$$\Rightarrow \frac{1.4}{v} + \frac{1}{4R} = \frac{4}{10R}$$

$$\Rightarrow \frac{1.4}{v} = \frac{4}{10R} - \frac{1}{4R} = \frac{6}{40R}$$

$$\Rightarrow v = \frac{40R(1.4)}{60} = \frac{56R}{6}$$

$$\text{Magnification } m = \frac{\left(\frac{v}{n_r}\right)}{\left(\frac{u}{n_i}\right)} = \frac{v}{u} \times \frac{n_i}{n_r}$$

$$= \left(\frac{56R}{6}\right)\left(\frac{1}{-4R}\right) \times \frac{1}{1.4}$$

$= -1.66$

Question ID : 6952782177

42. A small cube of side 1 mm is placed at the centre of a circular loop of radius 10 cm carrying a current of 2 A . The magnetic energy stored inside the cube is $\alpha \times 10^{-14}$ J. The value of α is ______ .

($\mu_o = 4\pi \times 10^{-7}$ Tm / A, $\pi = 3.14$)

(1) 6.28 (2) 6.28×10^{-6} (3) 628 (4) 6.28×10^{-4}

Ans. (1)

Sol. Magnetic energy = (energy density) volume

$$= \left(\frac{B^2}{2\mu_0}\right)(a^3)$$

$$\because B = \frac{\mu_0 i}{2R} = \frac{(4\pi \times 10^{-7})(2)}{2(10 \times 10^{-2})} T$$

$B = 4\pi \times 10^{-6}$ T

$a = 1\text{mm} = 1 \times 10^{-3}$

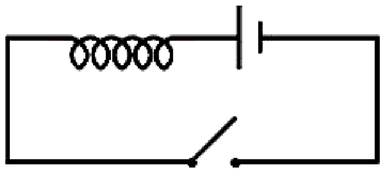
So magnetic energy

$$= \frac{(4\pi\times10^{-6})^2}{2(4\pi\times10^{-7})}(1\times10^{-3})^3$$

$= 6.28 \times 10^{-14}$ J

Question ID : 6952782178

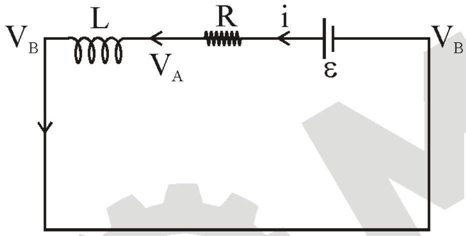
43. An inductor of inductance 10 mH having resistance of 100 Ω is connected to battery of E.M.F. 1.0 V through a switch as shown in the figure below. After switch is closed, the ratio of instantaneous voltages across the inductor when the current passing through it is 2 mA and 4 mA is _________ .



(1) 4/3 (2) 3/4 (3) 5/3 (4) 3/5

Ans. (1)

Sol.



voltage across inductor is $V_A - V_B = \varepsilon - iR$

Ratio of voltages $= \frac{\varepsilon - i_1R}{\varepsilon - i_2R}$

$$= \frac{(1)-(2\times10^{-3})(100)}{1-(4\times10^{-3})(100)}$$

$$= \frac{0.8}{0.6} = 4/3$$

Question ID : 6952782179

44. The ratio of momentum of the photons of the 1st and 2nd line of Balmer series of Hydrogen atoms is α/β. The possible values of α and β are :

(1) 27 and 20 (2) 3 and 16 (3) 5 and 36 (4) 20 and 27

Ans. (4)

Sol. $\because \frac{1}{\lambda} = Rz^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

and momentum of photon $p = \frac{h}{\lambda}$

So $p = \frac{h}{\lambda} = Rhz^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

For 1st line of polmer series

$n_1 = 2, n_2 = 3$

For 2nd line of polmer series

$n_1 = 2, n_2 = 4$

$$\frac{p_1}{p_2} = \frac{Rhz^2\left(\frac{1}{2^2} - \frac{1}{3^2}\right)}{Rhz^2\left(\frac{1}{2^2} - \frac{1}{4^2}\right)}$$

$$\Rightarrow \frac{p_1}{p_2} = \left(\frac{5}{36}\right) \times \left(\frac{16}{3}\right) = \frac{20}{27} = \frac{\alpha}{\beta}$$

$\alpha = 20, \beta = 27$

Question ID : 6952782180

45. A LCR series circuit driven with E_{rms} = 90 V at frequency f_d = 30 Hz has resistance R = 80 Ω, an inductance with inductive reactance X_L = 20.0 Ω and capacitance with capacitive reactance X_C = 80.0 Ω. The power factor of the circuit is _________.

(1) 0.8 (2) 0.64 (3) 0.9 (4) 0.5

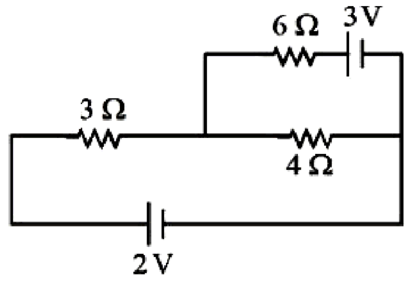
Ans. (1)

Sol. Power factor $\cos\phi = \frac{R}{\sqrt{R^2 + (x_C - x_L)^2}}$

$$= \frac{80}{\sqrt{(80)^2 + (80-20)^2}} = 0.8$$

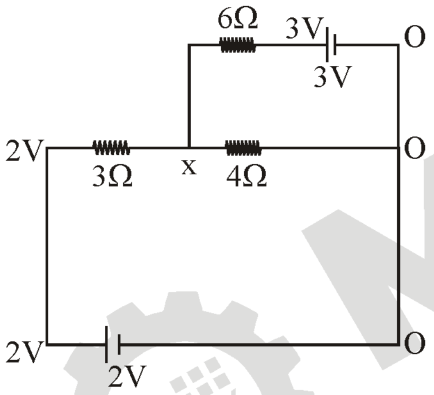
Question ID : 6952782181

46. Refer to the circuit diagram given below. The heat generated across the 6 Ω resistance in 100 second is $\frac{\alpha}{100}$J . The value of α is _______. (Nearest integer)



Ans. (3477)

Sol.



Net outgoing current is zero from x

$$\frac{x-2}{3}+\frac{x-0}{4}+\frac{x-3}{6}=0$$

$$\Rightarrow 4x-8+3x+2x-6=0 \Rightarrow x=\frac{14}{9}V$$

Potenteal difference across 6Ω is $\left(3-\frac{14}{9}\right)V=\frac{13}{9}V$

So heat generated $H=\frac{V^2}{R}t$

$$H=\left(\frac{13}{9}\right)^2\left(\frac{1}{6}\right)(100)=\frac{\alpha}{100}$$

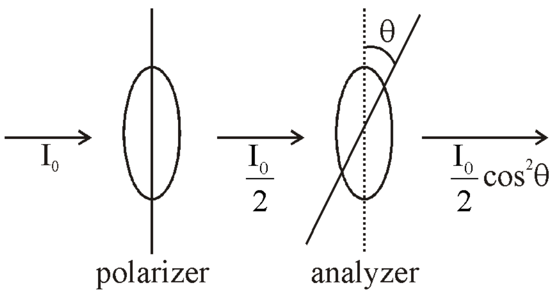
$$\Rightarrow \alpha = 3477$$

Question ID : 6952782182

47. An unpolarized light of intensity I_0 passes through polarizer and then through a certain optically active solution and finally it goes to analyser. If the angle between analyser and polariser is 0° and intensity of light emerged from analyser is $\frac{3}{8}I_0$, the angle of rotation of the light by the solution with respect to analyser is ________ degrees.

Ans. (30)

Sol.



Given that

$$\frac{I_0}{2}\cos^2\theta = \frac{3I_0}{8}$$

$$\Rightarrow \cos\theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = 30^\circ$$

Question ID : 6952782183

48. The energy released when $\frac{7}{17.13}$ kg of ${}^7_3\text{Li}$ is converted into ${}^4_2\text{He}$ by proton bombardment is $\alpha \times 10^{32}$ eV. The value of α is _________ . (Nearest integer)

(Mass of ${}^7_3\text{Li} = 7.0183\text{u}$, mass of ${}^4_2\text{He} = 4.004\text{u}$, mass of proton $= 1.008\text{u}$ and $1\text{u} = 931\text{MeV}/c^2$ and Avogadro number = 6.0×10^{23})

Ans. (6)

Sol. ${}^7_3\text{Li} + \text{proton} \rightarrow 2\,{}^4_2\text{He}$

Energy released for one lithium atom is Q

$\Rightarrow Q = (\Delta m)c^2$

$= (m_{Li} + m_{proton} - 2m_{He})c^2$

$= [7.0183 + 1.008 - 2(4.004)]931\text{MeV}$

$Q = (17.031 \times 10^6 \text{ eV})$

Total no. of lithium atoms

$= \frac{7}{17.13} \times \frac{1}{7 \times 10^{-3}} \times 6 \times 10^{23}$

$= \frac{6 \times 10^{23}}{17.13}$

So total energy released

$(17.037 \times 10^{6})\left(\frac{6}{17.13} \times 10^{26}\right)$ eV

$= 5.96 \times 10^{26}$ eV

Question ID : 6952782184

49. A three coulomb charge moves from the point (0, –2, –5) to the point (5, 1, 2) in an electric field expressed as $\vec{E} = 2x\hat{i} + 3y^2\hat{j} + 4\hat{k}\,N/C$. The work done in moving the charge is ________ J.

Ans. (186)

Sol. $W = \int \bar{F}.d\bar{r}$

$= \int Q\bar{E}.d\bar{r}$

$= \int_{(0,-2,-5)}^{(5,1,2)} 3(2x\hat{i} + 3y^2\hat{j} + 4\hat{k}).(dx\hat{i} + dy\hat{j} + dz\hat{k})$

$= 3\left[x^2 + y^3 + 4z\right]_{(0,-2,-5)}^{(5,1,2)}$

$= 3[\{(5)^2 + (1)^3 + 4(2)\} - \{(10)^2 + (-2)^3 + 4(-5)\}]$

= 186 J

Question ID : 6952782185

50. A certain gas is isothermally compressed to $\left(\frac{1}{3}\right)^{rd}$ of its initial volume (V_0 = 3 litre) by applying required pressure. If the bulk modulus of the gas is 3×10^5 N/m^2, the magnitude of work done on the gas is _______ J.

Ans. Matrix Answer (989)

Sol. Work done by gas in isothermal process is

$W = nRT \ln\left(\frac{V_F}{V_i}\right)$ or $P_i V_i \ln\left(\frac{V_f}{V_i}\right)$

$\because P_i$ = Bulk modulus (for isothermal process)

$= 3 \times 10^5$ N/m^2

$V_i = 3$ ltr $= 3 \times 10^{-3}$ m^3

$$V_f = \left(\frac{1}{3}\right)V_i = 1\text{ltr} = 1\times10^{-3}\,m^3$$

So $W = \left(3\times10^{5}\right)\left(3\times10^{-3}\right)\ln\left(\frac{1}{3}\right)$

= – 900 ln (3) = – 900 (1.0986)

= – 988.74 J

As asked in question, work done on the gas is negative of work done by the gas so that will be equal to 988.74 J

So Answer is 989 J (Closest integer)