JEE Main January 2026

Question Paper With Text Solution

24 January | Shift-1

PHYSICS

MATRIX

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

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JEE MAIN JANUARY 2026 | 24 JANUARY SHIFT-1

SECTION – A

Question ID : 444792566

26. An unpolarised light is incident at an interface of two dielectric media having refractive indices of 2 (incident medium) and $2\sqrt{3}$ (medium) respectively. To satisfy the condition that reflected and refracted rays are perpendicular to each other, the angle of incidence is _____.

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(1) 45° (2) 60° (3) 10° (4) 30°

Ans. Official answer NTA (2)

Sol. Brewser's angle : $\theta_B = \tan^{-1}\frac{2\sqrt{3}}{2} = 60°$

Question ID : 444792557

27. Density of water at 4 °C and 20 °C are 1000 kg/m^3 and 998 kg/m^3 respectively. The increase in internal energy of 4 kg of water when it is heated from 4 °C to 20 °C is _____J.

(specific heat capacity of water = 4.2 J/kg. and 1 atmospheric pressure = 10^5 Pa)

क

(1) 234699.2 (2) 315826.2 (3) 258700.8 (4) 268799.2

Ans. Official answer NTA (4)

Sol. $\theta = \Delta u + w$

$\Delta u = m\, s\, \Delta T - P\Delta v$

$= 4 \times 4.2 \times 16 - 10^5\left[\frac{4}{998} - \frac{4}{1000}\right]$

$= 268.8 - 0.8 = 268$ J

Question ID : 444792560

28. The electrostatic potential in a charged spherical region of radius r varies as $V = ar^3 + b$, where a and b are constants. The total charge in the sphere of unit radius is $\alpha \times \pi a\varepsilon_0$. The value of α is _____.

(permittivity of vacuum is ε_0)

क

(1) –6 (2) –12 (3) –9 (4) –8

Ans. Official answer NTA (2)

Sol. $E = -\frac{dv}{dr} = -3ar^2$

$\phi = E.4\pi r^2 = -3ar^2.4\pi r^2 = \frac{q}{\varepsilon_0}$

for r = 1

$q = -12\ \pi a\varepsilon_0$

Question ID : 444792568

29. The exit surface of a prism with refractive index n is coated with a material having refractive index $\frac{n}{2}$. When this prism is set for minimum angle of deviation, it exactly meets the condition of critical angle. The prism angle is _____.

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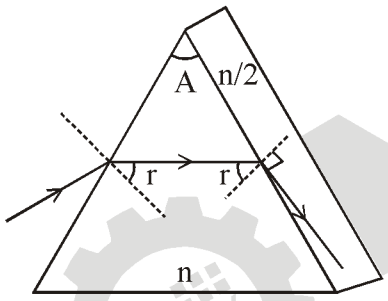
(1) 15° (2) 45° (3) 30° (4) 60°

Ans. Official answer NTA (4)

Sol.



$r = \frac{A}{2}$

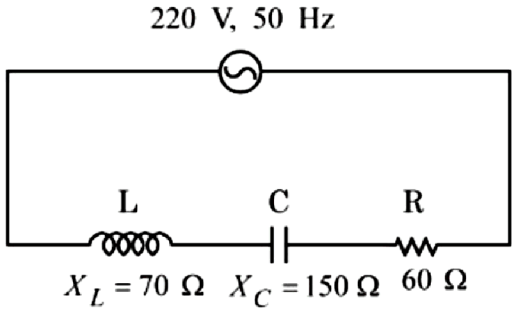
By snell's law

$n.\sin\frac{A}{2} = \frac{n}{2}\sin 90°$

$A = 60°$

Question ID : 444792562

30. For the series LCR circuit connected with 220 V, 50 Hz a.c source as shown in the figure, the power factor is $\frac{a}{10}$. The value of a is _____.



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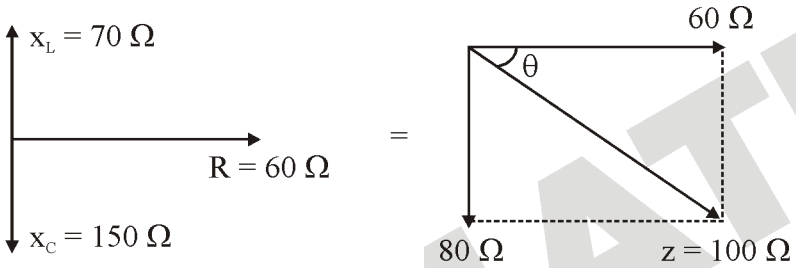
(1) 4 (2) 6 (3) 10 (4) 8

Ans. Official answer NTA (2)

Sol.



$$\cos\theta = \frac{60}{100} = \frac{6}{10}$$

Question ID : 444792570

31. Two electrons are moving in orbits of two hydrogen like atoms with speeds 3×10^5 m/s and 2.5×10^5 m/s respectively. If the radii of these orbits are nearly same then the possible order of energy states are _____ respectively.

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(1) 10 and 12 (2) 8 and 10 (3) 9 and 8 (4) 6 and 5

Ans. Official answer NTA (4)

Sol. $v \alpha \frac{z}{n}$

$$\frac{z_1}{n_1}.\frac{n_2}{z_2} = \frac{3}{2.5} = \frac{6}{5} \Rightarrow \frac{z_1}{z_2} = \frac{6}{5}\frac{n_1}{n_2}$$

$$r \alpha \frac{n^2}{z}$$

$$\frac{n_1^2}{z_1}=\frac{n_2^2}{z_2}\Rightarrow\frac{z_1}{z_2}=\frac{6}{5}\frac{n_1}{n_2}=\frac{n_1^2}{n_2^2}$$

$$\therefore\frac{n_1}{n_2}=\frac{6}{5}$$

Question ID : 444792554

32. Three masses 200 kg, 300 kg and 400 kg are placed at the vertices of an equilateral triangle with sides 20 m . They are rearranged on the vertices of a bigger triangle of side 25 m and with the same centre. The work done in this process _____J.

(Gravitational constant G = 6.7×10^{-11} N m^2/kg^2)

क

(1) 2.85×10^{-7} (2) 1.74×10^{-7} (3) 4.77×10^{-7} (4) 9.86×10^{-6}

Ans. Official answer NTA (2)

Sol. $W=\Delta u=G(m_1m_2+m_2m_3+m_1m_3)\left[\frac{1}{r_1}-\frac{1}{r_2}\right]$

$=1.74\times10^{-7}$

Question ID : 444792569

33. Given below are two statements :

Statement I : For all elements, greater the mass of the nucleus, greater is the binding energy per nucleon.

Statement II : For all elements, nuclei with less binding energy per nucleon transforms to nuclei with greater binding energy per nucleon.

In the light of the above statements, choose the correct answer from the options given below :

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(1) Both Statement I and Statement II are false

(2) Statement I is true but Statement II is false

(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are true

Ans. Official answer NTA (3)

Sol. **Statement – I :** False as Binding Energy per nucleon rises till F_e(8.8 MeV] and then fall beyond it. It is not constant.

Statement II : True as Binding Energy per nucleon indicates stability. Lighter nuclei fuse to form heavier while heavy nuclei disintegrate into lighter nuclei only to achieve higher Binding energy per nucleon.

Question ID : 444792561

34. Two resistors of 100 Ω each are connected in series with a 9 V battery. A voltmeter of 400 Ω resistance is connected to measure the voltage drop across one of the resistors. The voltmeter reading is _____V.

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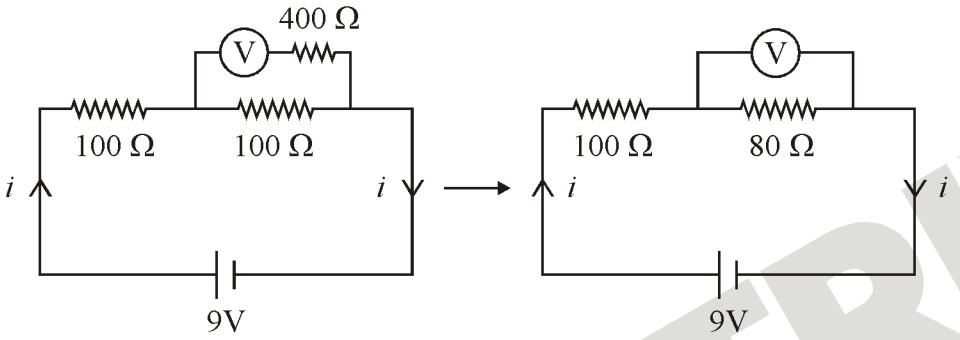
(1) 2 (2) 4.5 (3) 3 (4) 4

Ans. Official answer NTA (4)

Sol.



$$i = \frac{9}{100+80} = 0.05 \text{ A}$$

voltmeter reading = V = iR = 0.05 × 80 = 4V

Question ID : 444792563

35. There are three co-centric conducting spherical shells A, B and C of radii a, b and c respectively (c > b > a) and they are charged with charge q_1, q_2 and q_3 respectively. The potentials of the spheres A, B and C respectively, are :

क

(1) $\frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2+q_3}{a}\right), \frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_o}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right)$

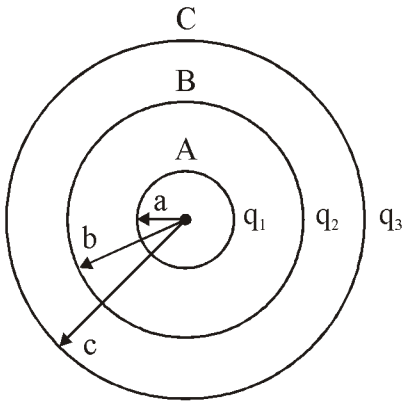
(2) $\frac{1}{4\pi\epsilon_o}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2+q_3}{c}\right)$

(3) $\frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2+q_3}{a}\right), \frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2+q_3}{b}\right), \frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2+q_3}{c}\right)$

(4) $\frac{1}{4\pi\epsilon_o}\left(\frac{q_1}{a}+\frac{q_2}{b}+\frac{q_3}{c}\right), \frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2+q_3}{b}\right), \frac{1}{4\pi\epsilon_o}\left(\frac{q_1+q_2+q_3}{c}\right)$

Ans. Official answer NTA (2)

Sol.



$$V_A = \frac{kq_1}{a} + \frac{kq_2}{b} + \frac{kq_3}{c}$$

$$V_B = \frac{kq_1}{b} + \frac{kq_2}{b} + \frac{kq_3}{c}$$

$$V_C = \frac{kq_1}{c} + \frac{kq_2}{c} + \frac{kq_3}{c}$$

Question ID : 444792558

36. A brass wire of length 2 m and radius 1 mm at 27 °C is held taut between two rigid supports. Initially it was cooled to a temperature of –43 °C creating a tension T in the wire. The temperature to which the wire has to be cooled in order to increase the tension in it to 1.4 T, is _____°C.

क

(1) –65 (2) –86 (3) –71 (4) –80

Ans. Official answer NTA (3)

Sol. $T = Y A \alpha |\Delta\theta|$

$T = Y A \alpha |27 - (-43)|$

$1.4\ T = Y A \alpha |27 - (-\theta)|$ (where θ is positive number)

$\theta = 71°C$

$\therefore$ Actual final temperature = –71°C

Question ID : 444792552

37. A spring of force constant 15 N/m is cut into two pieces. If the ratio of their length is 1 : 3, then the force constant of smaller piece is _____ N/m.

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(1) 20 (2) 45 (3) 60 (4) 15

Ans. Official answer NTA (3)

Sol. k l = constant

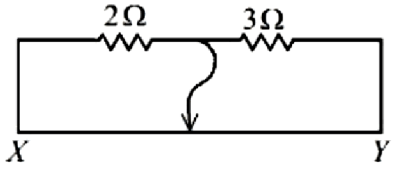
$l_1 = l_2 = 1 : 3$ & $l_1 + l_2 = l$

$\therefore l_1 = \frac{l}{4}$ & $l_2 = \frac{3l}{4}$

k l = k_1 l_1 $\Rightarrow$ k_1 = 4k

Question ID : 444792553

38. Two resistors 2 Ω and 3 Ω are connected in the gaps of bridge as shown in figure. The null point is obtained with the contact of jockey at some point on wire XY. When an unknown resistor is connected in parallel with 3 Ω resistor, the null point is shifted by 22.5 cm toward Y. The resistance of unknown resistor is _____Ω.



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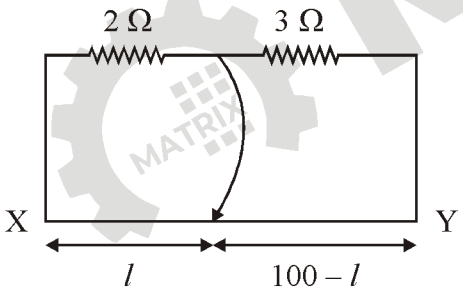
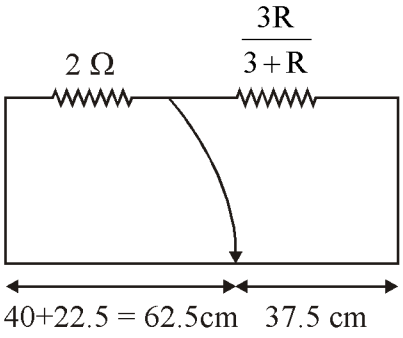
(1) 1 (2) 3 (3) 2 (4) 4

Ans. Official answer NTA (3)

Sol.





At null point

$\frac{2}{\ell} = \frac{3}{100-\ell}$

$\Rightarrow \ell = 40$ cm

At null point

$\frac{2}{62.5} = \frac{3R}{(3+R)(37.5)}$

R = 2 Ω

Question ID : 444792559

39. A cylindrical block of mass M and area of cross section A is floating in a liquid of density ρ and with its axis vertical. When depressed a little and released the block starts oscillating. The period of oscillation is _____.

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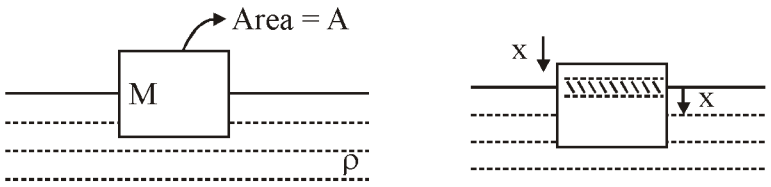
(1) $2\pi\sqrt{\frac{M}{\rho Ag}}$ (2) $\pi\sqrt{\frac{2M}{\rho Ag}}$ (3) $2\pi\sqrt{\frac{\rho A}{Mg}}$ (4) $\pi\sqrt{\frac{\rho A}{Mg}}$

Ans. Official answer NTA (1)

Sol.



Restoring force will be only due to extra submerged volume upon displaying x.

$$F = Ma \Rightarrow A.x.\rho g = Ma \Rightarrow a = \left(\frac{A\rho g}{M}\right)\times$$

$$\omega = \sqrt{\frac{A\rho g}{M}}$$

$$\text{Time period } T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{M}{A\rho g}}$$

Question ID : 444792551

40. Match the **List-I** with **List-II.**

List-I	**List-II**
A. Magnetic induction	I. $M\,L\,T^{-2}\,A^{-2}$
B. Magnetic flux	II. $M\,L^{2}\,T^{-2}\,A^{-2}$
C. Magnetic permeability	III. $M\,L^{0}\,T^{-2}\,A^{-1}$
D. Self inductance	IV. $M\,L^{2}\,T^{-2}\,A^{-1}$

Choose the correct answer from the options given below :

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(1) A-III, B-IV, C-I, D-II (2) A-IV, B-III, C-I, D-II

(3) A-I, B-III, C-IV, D-II (4) A-III, B-IV, C-II, D-I

Ans. Official answer NTA (1)

Sol. $[B] = [M^1L^0T^{-2}A^{-1}]$

$[\phi_B] = [M^1L^2T^{-2}A^{-1}]$

$[\mu_0] = [M^1L^1T^{-2}A^{-2}]$

$[L] = [M^1L^2T^{-2}A^{-2}]$

Question ID : 444792556

41. Two masses 400 g and 350 g are suspended from the ends of a light string passing over a heavy pulley of radius 2 cm. When released from rest the heavier mass is observed to fall 81 cm in 9 s. The rotational inertia of the pulley is _____ kg.m^2.

($g = 9.8$ m/s^2)

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(1) 1.86×10^{-2} (2) 9.5×10^{-3} (3) 4.75×10^{-3} (4) 8.3×10^{-3}

Ans. Official answer NTA (2)

Sol. $s = \frac{1}{2}at^2 \Rightarrow 0.81 = \frac{1}{2}a(3)^2 \Rightarrow a = 0.02 \text{ m/s}^2$

$$a = \left[\frac{m_2 - m_1}{m_2 + m_1 + \frac{I}{r^2}}\right]g$$

$I = 9.5 \times 10^{-3}$ kg

Question ID : 444792567

42. In a microscope of tube length 10 cm two convex lenses are arranged with focal length of 2 cm and 5 cm. Total magnification obtained with this system for normal adjustment is $(5)^k$. The value of k is _____.

क

(1) 5 (2) 2 (3) 4 (4) 3.5

Ans. Official answer NTA (2)

Sol. $M = \frac{LD}{f_0 f_e} = \frac{10}{2}.\frac{25}{5} = 25 = 5^2$

$\therefore k = 2$

Question ID : 444792564

43. Three charges + 2q, +3q and –4q are situated at (0, –3a), (2a, 0) and (–2a, 0) respectively in the x y plane. The resultant dipole moment about origin is _____.

क

(1) $2qa(3\hat{i} - 7\hat{j})$ (2) $2qa(7\hat{i} - 3\hat{j})$ (3) $2qa(3\hat{j} - \hat{i})$ (4) $2qa(3\hat{j} - 7\hat{i})$

Ans. Official answer NTA (2)

Sol. $\vec{p}_1 = +2q(-3a\hat{j}) = -6qa\hat{j}$

$\vec{p}_2 = +3q(2a\hat{i}) = +6qa\hat{i}$

$\vec{p}_3 = -4q(-2a\hat{i}) = +8qa\hat{i}$

$\vec{p}_{net} = \vec{p}_1 + \vec{p}_2 + \vec{p}_3$

$= 14qa\hat{i} - 6qa\hat{j} = 2qa(7\hat{i} - 3\hat{j})$

Question ID : 444792555

44. A boy throws a ball into air at 45° from the horizontal to land it on a roof of a building of height H. If the ball attains maximum height in 2 s and lands on the building in 3 s after launch, then value of H is _____ m.

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

क

(1) 10 (2) 15 (3) 25 (4) 20

Ans. Official answer NTA (2)

Sol. $\frac{T_f}{2} = 2 \Rightarrow \frac{u\sin 45°}{g} = 2$

$u = 20\sqrt{2}$

$H = u\sin\theta\ t - \frac{1}{2}gt^2 = 20\sqrt{2}.\frac{1}{\sqrt{2}}(3) - \frac{1}{2}10(3)^2 = 15\ m$

Question ID : 444792565

45. Match the **List-I** with **List-II.**

List-I	**List-II**
A. Radio-wave	I. is produced by Magnetron valve
B. Micro-wave	II. due to change in the vibrational modes of atoms
C. Infrared-wave	III. due to inner shell electrons moving from higher energy level to lower energy level
D. X-ray	IV. due to rapid acceleration of electrons

Choose the correct answer from the options given below :

क

(1) A-II, B-IV, C-III, D-I (2) A-IV, B-III, C-I, D-II

(3) A-IV, B-I, C-II, D-III (4) A-IV, B-II, C-I, D-III

Ans. Official answer NTA (3)

Sol. Theoretical

SECTION – B

Question ID : 444792574

46. A gas of certain mass filled in a closed cylinder at a pressure of 3.23 kPa has temperature 50 °C. The gas is now heated to double its temperature. The modified pressure is _____ Pa.

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Ans. Official answer NTA (3730)

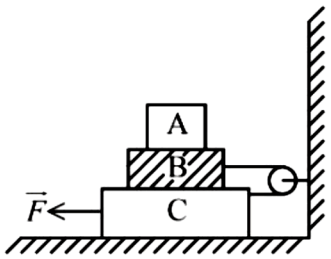
Sol. $V = \text{constant} \Rightarrow \frac{P}{T} = \text{constant}$

$$\frac{3230}{50+273} = \frac{P}{100+273}$$

$P = 3730$ Pa

Question ID : 444792572

47. In the given figure the blocks A, B and C weigh 4 kg, 6 kg and 8 kg respectively. The co-efficient of sliding friction between any two surfaces is 0.5. The force $\vec{F}$ required to slide the block C with constant speed is _____N. (Use g = 10 m/s^2)



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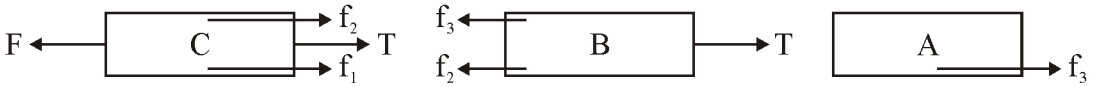
Ans. Official answer NTA (210)

Sol.



$v = \text{constant} \Rightarrow a = 0 \Rightarrow \Sigma F = 0$. Also, A will initially slip when B & C gain speed.

$F = f_2 + T + f_1$ & $T = f_2 + f_3$

$\therefore F = f_1 + 2f_2 + f_3 = \mu(m_A + m_B + m_C)\, g + 2\mu(m_A + m_B)\, g + \mu\, m_A\, g$

$= 210$ N

Question ID : 444792573

48. Sixty four rain drops of radius 1 mm each falling down with a terminal velocity of 10 cm/s coalesce to form a bigger drop. The terminal velocity of bigger drop is _____ cm/s.

क

Ans. Official answer NTA (160)

Sol. $V_T \propto r^2$

By conserving volume

$$64 \times \frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3$$

$R = 4r$

$\therefore V_T \rightarrow 16\ V_T = 160$ cm/s

Question ID : 444792571

49. A voltage regulating circuit consisting of Zener diode, having break-down voltage of 10 V and maximum power dissipation of 0.4 W, is operated at 15 V. The approximate value of protective resistance in this circuit is _____Ω.

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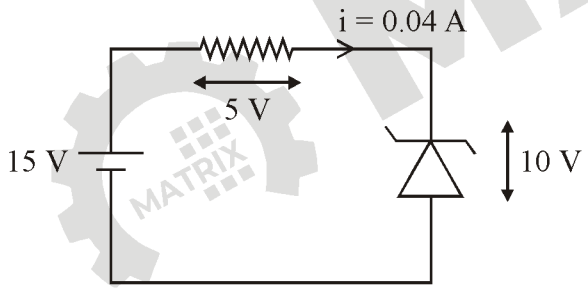
Ans. Official answer NTA (125)

Sol.



$P = 0.4 = VI$

$$I = \frac{0.4}{10} = 0.04\ A$$

$V = IR$

$5 = 0.04 \times R$

$R = 125\ \Omega$

Question ID : 444792575

50. A short bar magnet placed with its axis at 30° with an external field of 800 Gauss, experiences a torque of 0.016 N.m. The work done in moving it from most stable to most unstable position is a × 10^{-3} J. The value of a is _____.

क

Ans. Official answer NTA (64)

Sol. $I = MB \sin\theta$

$0.016 = M \times 0.08 \sin 30$

$M = 0.4\ A\ m^2$

$W = \Delta u = -MB\cos 180° - (-MB\cos\theta)$

$= 2\ MB = 2 \times 0.4 \times 0.08$

$= 64 \times 10^{-3}$ J