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JEE (MAIN) 2025

MEMORY BASED QUESTIONS & TEXT SOLUTION

SHIFT-2

DATE & DAY: 04th April 2025 & Friday

PAPER-1

Duration: 3 Hrs.

Time: 03:00 PM – 06:00 PM

SUBJECT: PHYSICS

Selections in JEE (Advanced)/
IIT-JEE Since 2002

52395

Selections in JEE (Main)/
AIEEE Since 2009

257576

Selections in NEET (UG)/
AIPMT/AIIMS Since 2012

22494

Admission Open for 2025-26

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100% Scholarship on the basis of Class 10th & 12th
& JEE (Main) 2025 %ile/ AIR

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PART : PHYSICS

1. A particle of mass m is at a distance $3R$ from the centre of earth. Find minimum kinetic energy of particle to leave earth field. (R = Radius of earth)

(1) $\frac{mgR}{3}$

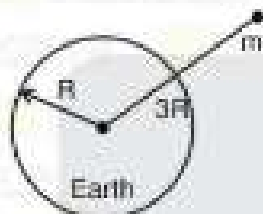
(2) $3mgR$

(3) $\frac{1}{3}mgR$

(4) $\frac{mgR}{2}$

Ans. (1)

Sol.



Energy conservation:

$$E_i = E_f$$

$$\text{K.E.} + \text{P.E.} = 0 + 0$$

$$\text{K.E.} + \frac{-GmM}{3R} = 0$$

$$\text{K.E.} = \frac{GmM}{3R}$$

$$= \frac{GMmR}{3R^2}$$

$$\text{K.E.} = \frac{mgR}{3}$$

2. In a YDSE setup, the slits are separated by 1.5 mm and the distance between slits and screen is 2 m . On using light of wavelength 400 nm , it is observed that 20 maximum of double slit experiment lie inside the central maxima of single slit diffraction. The width of each slit is _____ μm .

(1) $100 \mu\text{m}$

(2) $150 \mu\text{m}$

(3) $200 \mu\text{m}$

(4) $250 \mu\text{m}$

Ans. (2)

Sol. $20 \times \frac{\lambda D}{d} = \frac{2\lambda D}{b}$

$$\frac{10}{d} = \frac{1}{b}$$

$$b = \frac{d}{10}$$

$$b = 0.15 \text{ mm} = 150 \mu\text{m}$$

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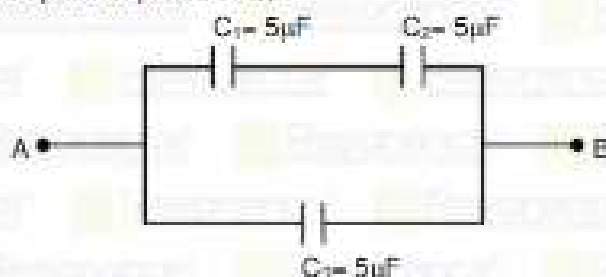
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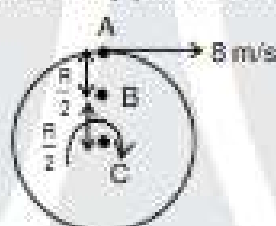
3. Find equivalent capacitance between A and B after dielectric of dielectric constant $K = 4$ is filled completely between the space of plates of C_1



- Ans. (1) $5\mu F$ (2) $4\mu F$ (3) $9\mu F$ (4) $8\mu F$

Sol. $C_{eq} = \frac{(4 \times 5) \times 5}{(4 \times 5) + 5} + 5 = 9\mu F$

4. A disc is performing pure rolling if speed of top point is 8 m/s . Find speed of point B.



- Ans. (1) 2 m/s (2) 4 m/s (3) 6 m/s (4) 8 m/s

Sol. Vel. at point (A) $\rightarrow 2V = 8$
 $V = 4\text{ m/sec}$

$$v = \omega R$$

$$4 = \omega R$$

$$\omega = \frac{4}{R}$$

Vel at point (B) $\rightarrow V_B \rightarrow V + \frac{R}{2}\omega$
 $\Rightarrow V + \frac{R}{2} \times \frac{4}{R}$
 $= 4 + 2$
 $= 6\text{ m/s}$

5. A block of mass 25 kg is pulled along a horizontal surface by a force at an angle 45° with the horizontal. The friction coefficient between the block and the surface is 0.25 . The block travels at a uniform velocity, the work done by the applied force during a displacement of 5 m of block is :

- Ans. (1) 735 J (2) 490 J (3) 245 J (4) 970 J

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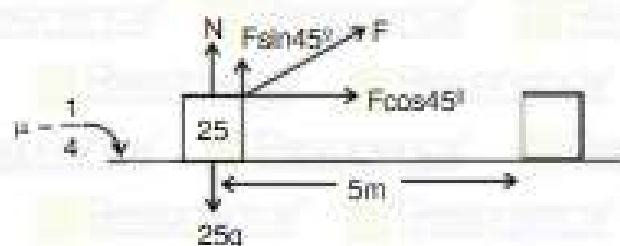
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Sol.



$$F \cos 45^\circ = \mu_k (25g - F \sin 45^\circ)$$

$$F = \frac{\mu_k \times 25g}{\cos 45^\circ + \mu_k \sin 45^\circ} \Rightarrow \frac{\frac{1}{4} \times 25 \times 10}{\frac{1}{\sqrt{2}} + \frac{1}{4} \times \frac{1}{\sqrt{2}}}$$

$$\text{work done} \Rightarrow 69.3 \times \cos 45^\circ \times 5 \quad F = 69.3\text{N}$$

$$69.3 \times \frac{1}{\sqrt{2}} \times 5 \Rightarrow 245\text{J}$$

6. For N type semiconductor which of the following options are correct

(1) Pentavalent impurity is mixed in intrinsic semiconductor

(2) hole is majority charge carrier

(3) $n_{\text{inh}} \geq n_i^2$

(4) trivalent impurity is mixed in intrinsic semiconductor

Ans. (1)

7. **Statement-1:** angular momentum and Planck constant have the same dimension

Statement-2: Planck constant depends on angular momentum integrally

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

Ans. (3)

8. Two polarises P_1 & P_2 are aligned in such a way that intensity is zero. P_3 polarises is inserted between P_1 and P_2 such that final transmitted ray will have the maximum intensity. Find angle between P_1 and P_3 .

(1) $\frac{\pi}{4}$

(2) $\frac{\pi}{2}$

(3) $\frac{\pi}{3}$

(4) $\frac{\pi}{8}$

Ans. (1)

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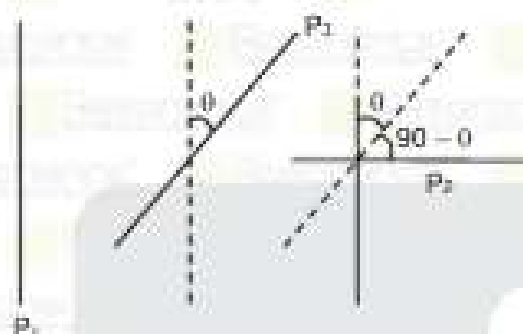
Sol. Malus Law

$$I_1 = I_0 \cos^2 \theta \quad \dots (1)$$

$$I_2 = (I_0 \cos^2 \theta) \cos^2 (90 - \theta)$$

$$I_2 = I_0 \cos^2 \theta \sin^2 \theta$$

Pass axis



$$I_2 = \frac{I_0}{4} \sin^2 2\theta$$

for maximum

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

9. Ratio of dimension of electric dipole and magnetic dipole moment is $M^p L^q T^r$, then value of p and q

(1) 0, -1

(2) 1, -1

(3) 1, 0

(4) -1, 1

Ans. (1)

Sol. $\frac{p}{M} = \frac{q \times d \times B}{\tau}$

$$\tau = MB$$

$$F = qvB$$

$$\frac{p}{M} = \frac{q \times d \times F}{F \times r \times q}$$

$$= \frac{1}{LT^{-1}} = \frac{T}{L}$$

$$= M^0 L^1 T^{-1}$$

$$p = 0$$

$$q = -1$$

10. In vernier scale 300 division in 15 cm and 25 vernier scale division is equal to 24 main scale division, then least count will be

(1) $\frac{1}{240}$ cm

(2) $\frac{1}{120}$ cm

(3) $\frac{1}{360}$ cm

(4) $\frac{1}{480}$ cm

Ans. (4)

Sol. $300 \times VS = 15$

$$VS = \frac{1}{20}$$

$$25 VS = 24 MS$$

$$MS = \frac{25}{24} VS$$

$$LC = MS - VS$$

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$$= \left(\frac{25}{24} - 1 \right) \times VS$$

$$= \frac{1}{24} + \frac{1}{20} \text{ cm}$$

$$LC = \frac{1}{490} \text{ cm}$$

11. Which velocity we provide a thing so that we throw it up and it does not come back on the earth.

(1) $\sqrt{\frac{GM}{R}}$

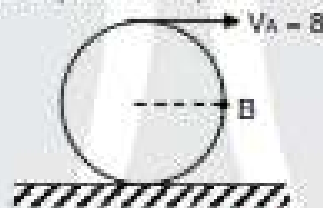
(2) ZGM

(3) $\frac{GM}{3R}$

(4) $\sqrt{\frac{GM}{2R}}$

Ans. (2)

12. Wheel is in pure rolling find speed of point B, if speed of A is 8 m/s



(1) $2\sqrt{2}$

(2) $2\sqrt{4}$

(3) $2\sqrt{3}$

(d) $4\sqrt{2}$

Ans. (4)

Sol. $V_2 = V_1 \sqrt{2}$

$$= \frac{8}{3}\sqrt{2} - 4\sqrt{2}$$

13. A medium has relative permittivity $\frac{1}{0.085}$ and relative permeability is $\frac{10}{\pi}$. Find ratio of speed of light in vacuum to the medium.

(1) 6.12

(2) 3.14

(3) 2.20

(4) 1.27

Ans. (1)

Sol. $\alpha = \frac{1}{0.085}$

$$\mu_r = \frac{10}{\pi}$$

$$\text{Speed of light in vacuum } c = \frac{1}{\sqrt{\mu_0 \epsilon_0}} = \frac{1}{\sqrt{\mu_0 \epsilon_0 \epsilon_r \mu_r}}$$

$$Y = \frac{C}{\sqrt{H_1 L_1}} \quad \dots(2)$$

$$\text{Ratio} = \sqrt{\mu_{\text{LC}}}$$

$$\Rightarrow \sqrt{\frac{1}{0.085} \times \frac{10}{\pi}}$$

$$\Rightarrow \sqrt{37.48}$$

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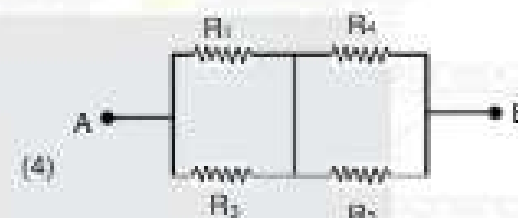
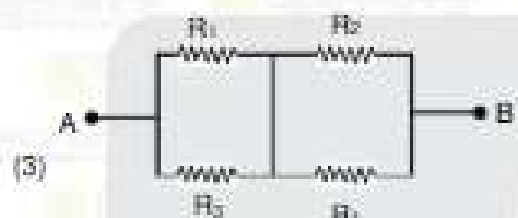
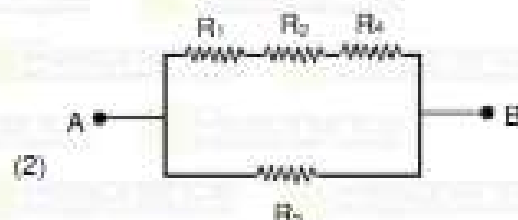
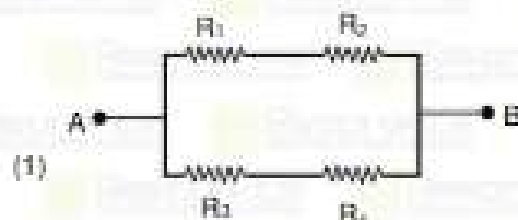
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14. Four resistances R_1, R_2, R_3 are of 5Ω each and R_4 is of 10Ω . In which of the following combination equivalent resistance will be 6Ω :



Ans. (1)
Sol.



$$\Rightarrow R_{eq} = \frac{(5 + 5) \times (5 + 10)}{5 + 5 + 5 + 10} = 6\Omega$$

15. Match the following (Where the letters dQ, dU and dW have usual meaning)

Column I

- (A) Isochoric process
(B) Adiabatic process
(C) Isothermal process
(D) Isobaric process

Column II

- (P) $dQ = W$
(Q) $dQ = dU$
(R) $dQ = 0$
(S) $dQ = dU + PdV$

- (1) A-Q, B-R, C-P, D-S
(3) A-R, B-Q, C-P, D-S

- (2) A-S, B-R, C-P, D-Q
(4) A-P, B-R, C-Q, D-S

Ans. (1)

16. Charge and mass are q and m respectively. Magnetic field is perpendicular to the motion of charge. Find time when the charge will again come at it's own position i.e. its initial position.

$\otimes B$



(m, q)

Sol. $T = 2\pi \frac{m}{qB}$

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17. Find final pressure after connecting two vessels.



Ans. $\left(\frac{2P_1}{T_1} + \frac{P_2}{T_2}\right) \times \frac{T_3}{3} = P_3$

Sol. $n = \frac{PV}{RT}$

$$n_1 + n_2 = n_3$$

$$\frac{P_1 \times 2V}{T_1} + \frac{P_2 \times V}{T_2} = \frac{P_3 \times 3V}{T_3}$$

$$\left(\frac{2P_1}{T_1} + \frac{P_2}{T_2}\right) \times \frac{T_3}{3} = P_3$$

18. Mass sphere is decreasing at a constant rate. Find final ω when its radius becomes $\left(\frac{R}{2}\right)$



- Ans. (1) 16ω (2) 32ω (3) 64ω (4) 36ω

Sol. $L = I\omega = \frac{2}{5}mR^2\omega$

$$= \frac{2}{5}\rho \times \frac{4}{3}\pi R^3 \times R^2 \times \omega$$

$$L = \text{constant} \quad \therefore \frac{L}{I} = 0$$

$$\Rightarrow R^2\omega = \text{constant}$$

$$\omega_f = \omega \times 2^2 = 32\omega$$

19. n identical bulbs each takes power P when connected with main supply separately. If n bulbs are connected in series with same main supply. Then total power developed will be

- (1) nP (2) $\frac{P}{n^2}$ (3) $\frac{P}{n}$ (4) n^2P

- Ans. (3)

Sol. $P = \frac{V^2}{R}$

$$P' = \frac{V^2}{nR}$$

$$P' = \frac{P}{n}$$

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