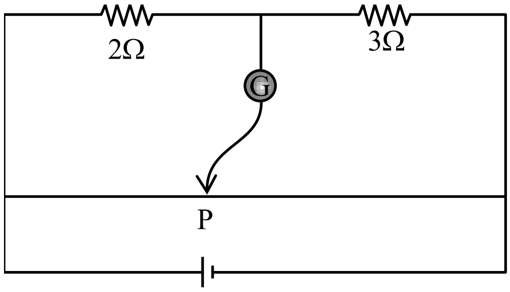
MEMORY BASED QUESTIONS JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON SATURDAY 24th JANUARY 2026) **TIME : 9:00 AM TO 12:00 NOON**

PHYSICS — TEST PAPER WITH SOLUTION

1. Figure shows a meter-bridge. Initially null point was achieved at point P as shown in the figure.



When an unknown resistance "R" is connected in parallel with 3Ω the null point was shifted by 22.5 cm. Then the value of unknown resistance is :

(1) 2Ω (2) 3Ω

(3) 2.5 Ω (4) 5Ω

Ans. (1)

Sol. Initially , $\frac{2}{3} = \frac{40}{60}$

Now when 'R' connected in parallel

$$\frac{2}{\frac{3R}{3+R}} = \frac{40+22.5}{60-22.5} = \frac{62.5}{37.5}$$

$\therefore R = 2\Omega$

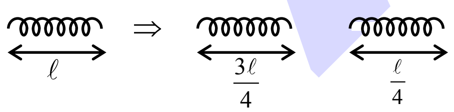
2. A spring of spring constant K = 15 N/m is cut into two parts of ratio of length 3 : 1. Find the spring constant of spring with smaller length (in N/m).

(1) 60 (2) 40

(3) 30 (4) 70

Ans. (1)

Sol.



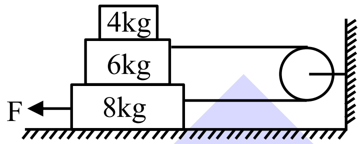
$K\ell$ = constant

$$K\ell = K'\left(\frac{\ell}{4}\right)$$

K' = 4 K

K' = 60 N/m

3. Figure shows three block with masses 8kg, 6kg and 4 kg. Friction coefficient between each surface is $\frac{1}{2}$. The maximum value of force 'F' such that 8kg block moves with constant velocity will be :

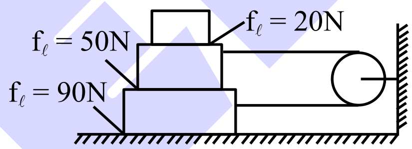


(1) 210 N (2) 400 N

(3) 110 N (4) 300 N

Ans. (1)

Sol. For 8kg to move with constant velocity $F_{net} = 0$.

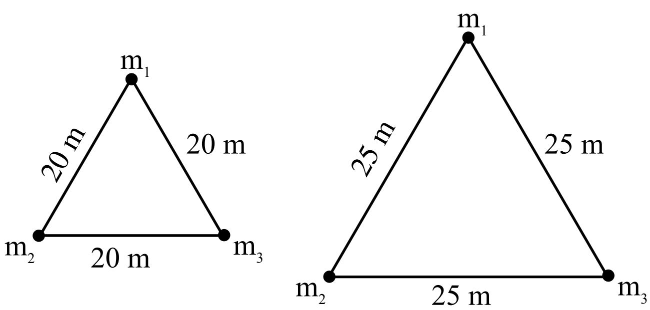


$\therefore$ F = 90 + T + 50 (for 8kg block)

T = 20 + 50 (for 6kg block)

$\therefore$ F = 210 N.

4. Three masses m_1 = 200 kg, m_2 = 300 kg and m_3 = 400 kg are kept at the vertices of on equilateral triangle of side 20 m. If the masses are shifted to new configuration such that they are at the vertices of an equilateral triangle of 25 m now. Find the work done in this process :



(1) 1.735×10^{-7} J (2) 17.35×10^{-7} J

(3) 173.5×10^{-7} J (4) 1735×10^{-7} J

Ans. (1)

Sol. Work done by external agent :

$w_{ext} = \Delta U$

$$U_i = \frac{Gm_1m_2}{r_i} + \frac{Gm_2m_3}{r_i} + \frac{Gm_1m_3}{r_i} \quad : r_i = 20 \text{ m}$$

$$U_f = \frac{Gm_1m_2}{r_f} + \frac{Gm_2m_3}{r_f} + \frac{Gm_1m_3}{r_f} \quad : r_f = 25 \text{ m}$$

$$U_i = \frac{-6.67\times10^{-11}}{20}[200\times300+300\times400+200\times400]$$

$$= \frac{-6.67\times10^{-11}}{20}\times26\times10^4 = -86.71\times10^{-8}\text{ J}$$

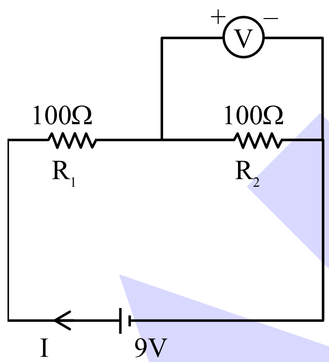
$$U_f = \frac{-6.67\times10^{-11}}{0.25}[200\times300+300\times400+200\times400]$$

$$= \frac{-6.67\times10^{-11}}{0.25}\times26\times10^4 = -693.68\times10^{-9}$$

$= -69.36\times10^{-8}$ J $\qquad W = +\Delta U = 17.35\times10^{-8}$

$= 1.735\times10^{-7}$ J

5. Two resistors of resistances $R_1 = 100\Omega$ and $R_2 = 100\Omega$ are connected in series. A voltmeter of resistance 400Ω is connected in parallel to one of the resistance. Find the reading of voltmeter. The emf of battery is 9V. :



(1) 3 V (2) 4 V
(3) 2 V (4) 5 V

Ans. **(2)**

Sol. Current in circuit.

$$I = \frac{E}{Req}$$

$$Req = 100 + \frac{400\times100}{500} = 180\Omega$$

$$\therefore I = \frac{9}{180} = \frac{1}{20}\text{A}$$

Reading of voltmeter $= V = I\times80 = \frac{1}{20}\times80 = 4V$

6. A brass rod is fixed rigidly at two ends at 27°C. If it is cooled to temperature –43°C, tension in rod becomes T_0. Find temperature (in °C) at which tension will be 1.4 T_0 :

Ans. **–71°C**

Sol. Thermal stress causes tension

$T = \alpha yA\Delta T$

–43°C $\quad T_0 = \alpha yA(43+27) \quad$ …..(i)

–t°C $\quad T_0 = \alpha yA(t+27) \quad$ …..(ii)

(ii)/(i)

$$1.4 = \frac{t+27}{70}$$

$t + 27 = 98$

$t = 71°$

$\therefore$ temp (–71°C)

7. Electric potential at a point is $V = Ar^3 + B$. Find charge enclosed in a sphere of radius 1m, centered at r = 0

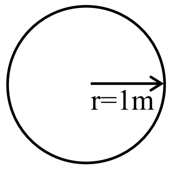
(1) $-4\varepsilon_0 A$ (2) $-8\varepsilon_0 A$
(3) $-12\varepsilon_0 A$ (4) $-16\varepsilon_0 A$

Ans. **(3)**

Sol. $E = -\frac{dv}{dr}$

$E = -3Ar^2$

Charge enclosed in 1m radius is



Applying guass law

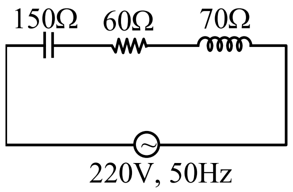
$$\oint \varepsilon.ds = \frac{q_{in}}{\varepsilon_0}$$

$$E.S = \frac{q_{in}}{\varepsilon_0}$$

$q_{in} = .\varepsilon_0 ES = -\varepsilon_0.(3Ar^2)(4\pi r^2)$

$q_{in})_{r=1m} = -12\varepsilon_0 A$

8. Figure shows a circuit consisting capacitor, inductor and a resistor connected in series with an AC source. Find the power factor of the circuit.



(1) 0.2 (2) 0.4

(3) 0.6 (4) 0.8

Ans. (3)

Sol. Power factor $= \frac{R}{Z}$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

$$= \sqrt{60^2 + (150-70)^2} = 100\Omega$$

$\therefore$ Power factor $= \frac{60}{100} = 0.6$

9. Following are two lists, list-I contains the types of electromagnetic waves and list-II contains theirs source. Match the entries from list-I to appropriate entries from list-II.

	List-I		**List-II**
(a)	x-rays	(p)	Hot bodies and molecules
(b)	Infrared rays	(q)	Oscillatory current in antennas
(c)	Microwaves	(r)	Magnetron
(d)	Radio waves	(s)	Fast moving electrons striking a metal plate

(1) (a)→(r), (b)→(q), (c)→(s), (d)→(q)

(2) (a)→(p), (b)→(s), (c)→(r), (d)→(q)

(3) (a)→(s), (b)→(p), (c)→(q), (d)→(s)

(4) (a)→(s), (b)→(p), (c)→(r), (d)→(q)

Ans. (4)

Sol.

10. Terminal velocity of drop of radius 1 cm is 10 cm/sec. 64 such balls are combined to make a large drop. Find terminal velocity of this larger drop. :

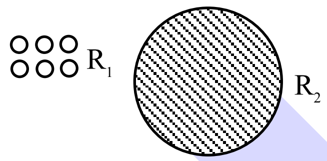
(1) 160 cm/sec (2) 140 cm/sec

(3) 180 cm/sec (4) 150 cm/sec

Ans. (1)

Sol. $V_T = \frac{2r^2 g}{9\eta}[\sigma - \rho]$

$V_T \propto r^2$



64 drop

$$64\left(\frac{4}{3}\pi R_1^3\right) = \frac{4}{3}\pi R_2^3$$

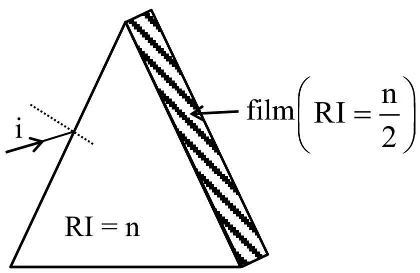
$R_2 = 4R_1$

$$\frac{(V_T)_1}{(V_T)_2} = \left(\frac{R_1}{R_2}\right)^2 = \left(\frac{1}{4}\right)^2$$

$$\frac{10}{(V_T)_2} = \frac{1}{16}$$

$(V_T)_2 = 160$ cm/sec

11. Light is incident at such an angle so that minimum deviation takes place. Now a film of refractive index $\left(RI = \frac{n}{2}\right)$ is stick on other face such that total internal reflection takes place on second surface. Find angle of prism :

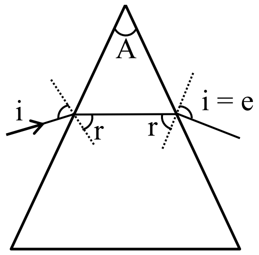


(1) 60° (2) 50°

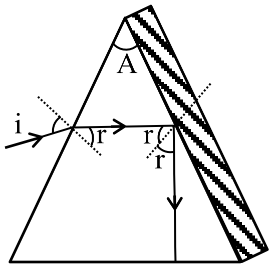
(3) 90° (4) 30°

Ans. (1)

Sol. i = e & r = A/2 for minimum deviation



For TIR ; $r > \theta_C$



$\text{Sin } r > \text{Sin } \theta_C$

$\text{Sin } r > \dfrac{n/2}{n}$

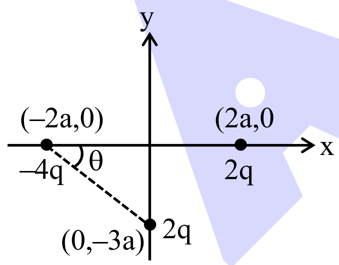
$\text{Sin } r > \dfrac{1}{2}$

$\text{Sin } \dfrac{A}{2} > \sin 30°$

$\dfrac{A}{2} > 30°$

$A > 60°$

12. In the following configuration of charges. Find the net dipole moment of the system :



(1) $\sqrt{180}\,qa$

(2) $\sqrt{150}\,qa$

(3) $\sqrt{200}\,qa$

(4) $\sqrt{140}\,qa$

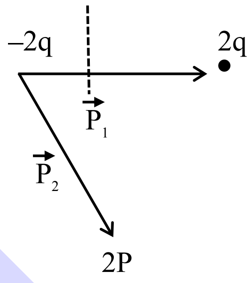
Ans. **(1)**

Sol. $\vec{P}_1 = (2q)(4a)\hat{i} = 8qa\hat{i}$

$\vec{P}_2 = (2q)(\sqrt{13}a)(\cos\theta\hat{i} - \sin\theta\hat{j})$

$= (3q)(\sqrt{3}a)(\cos\theta\hat{i} - \sin\theta\hat{j})$

$= (3q)(\sqrt{3}a)\left(\dfrac{2}{\sqrt{13}}\hat{i} - \dfrac{3}{\sqrt{3}}\hat{j}\right)$



$= 2qa(2\hat{i} - 3\hat{j})$ $\quad\cos\theta = \dfrac{2}{\sqrt{13}}$

$= 4qa\hat{i} - 6qa\hat{j}$ $\quad\sin\theta = \dfrac{3}{\sqrt{13}}$

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

$= 12qa\hat{i} - 6qa\hat{j}$

$|\vec{p}_{-net}| = \sqrt{180}\,qa$

13. Density of water at 4°C is 1000 kg/m^3 and at 20°C it is 998 kg/m^3. If 4kg of water is heated from 4°C to 20°C, the change in internal energy of water is : (Given : specific heat capacity of water = 4200 J/kg).

(1) 268799.2 J (2) 268800.8 J

(3) 268800.0 J (4) 267765.2 J

Ans. **(1)**

Sol. $Q = mS\Delta T = 4 \times 4200 \times 16\text{ J} = 268800\text{ J}$

$W = P\Delta V$

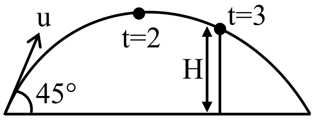
$\Delta V = \left(\dfrac{m}{\rho_f} - \dfrac{m}{\rho_i}\right) = 4\left[\dfrac{1}{998} - \dfrac{1}{1000}\right]$

$P = 10^5$ Pa.

$\therefore\ W = 10^5 \times 4 \times \left[\dfrac{1}{998} - \dfrac{1}{1000}\right] = \dfrac{8 \times 10^5}{10^3 \times 998} \approx 0.8\text{ J}$

$\Delta U = Q - W = 268799.2\text{ J}$

14. A projectile is projected with certain speed at an angle of 45° with horizontal as shown. At t = 2s, projectile is at maximum height and at t = 3s, it just touches a wall at a height H above horizontal. Find H in meters :



(1) 20 m

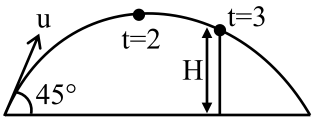
(2) 10 m

(3) 15 m

(4) 25 m

Ans. **(3)**

Sol. $T = \frac{2u_y}{g} = 4$



$\Rightarrow u_y = \frac{40}{2} = 20$ m/s

$u_x = 20$ m/s

$\Delta y = u_y \Delta t - \frac{1}{2} g (\Delta t)^2$

$\Rightarrow H = 20 \times 3 - 5 \times 9$

$= 60 - 45$

$= 15$ m

15. Column-I gives physical quantities and Column-II represent their dimensions. Choose the option representing correct matching.

Column-I		**Column-II**	
(I)	Magnetic field intensity	(P)	$MLT^{-2}A^{-2}$
(II)	Magnetic flux	(Q)	$ML^2T^{-2}A^{-2}$
(III)	Magnetic permeability	(R)	$ML^2T^{-2}A^{-1}$
(IV)	Magnetic inductance	(S)	$MT^{-2}A^{-1}$

(1) I-S, II-R, III-P, IV-Q (2) I-Q, II-R, III-P, IV-S

(3) I-R, II-S, III-P, IV-Q (4) I-S, II-P, III-R, IV-Q

Ans. **(1)**

Sol. Magnetic field intensity, B = $[MT^{-2}A^{-1}]$ – S

Magnetic Flux, $\phi = [ML^2T^{-2}A^{-1}]$ – R

Magnetic Permeability, $\mu = [MLT^{-2}A^{-2}]$ – P

Magnetic inductance, L= $[ML^2T^{-2}A^{-1}]$ – Q

16. A cylindrical body of mass m and cross section A is floating in a liquid of density ρ_L such that its axis is vertical. If body is displaced by a small displacement 'x' vertically, find the time period of oscillation of the body :

(1) $2\pi\sqrt{\frac{m}{\rho_L Ag}}$ (2) $3\pi\sqrt{\frac{m}{\rho_L Ag}}$

(3) $4\pi\sqrt{\frac{m}{\rho_L Ag}}$ (4) $5\pi\sqrt{\frac{m}{\rho_L Ag}}$

Ans. **(1)**

Sol. $\rho_L A \times hg = mg$

After displacing by x,

$F = \rho_L A\,(h + x)\,g - mg$

$F = \rho_L Ahg + \rho_L Axg - mg$

$F = \rho_L Axg$

$$a = \left(\frac{\rho_L Ag}{m}\right)x$$

comparing,

$a = \omega^2 x$

$$\omega = \sqrt{\frac{\rho_L Ag}{m}}$$

$$T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{m}{\rho_L Ag}}$$

17. A zener diode of breakdown voltage 10 V is connected to an external voltage of 15 V and a resistance R in series. If power of zener diode is 0.4 W. Find value of unknown resistance R :

(1) 125 Ω

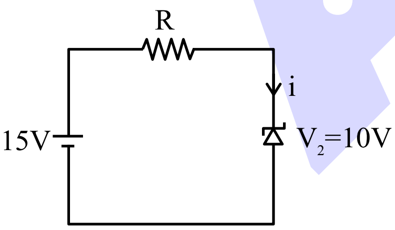
(2) 105 Ω

(3) 130 Ω

(4) 115 Ω

Ans. **(1)**

Sol.

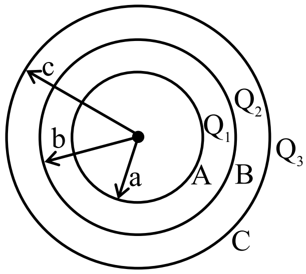


$P_D = 0.4w = 10i$

$i = 0.04A$

$$R = \frac{15-10}{0.04} = \frac{5}{0.04} = 125\ \Omega$$

18. Three uniformly charged concentric shells are kept as shown in the diagram. Charges on individual shells are as shown. Find the final potential on each shell :



(1) $V_A = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

$V_B = \frac{K(Q_1 + Q_2 + Q_3)}{c}$

$V_C = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

(2) $V_A = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

$V_B = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

$V_C = \frac{K(Q_1 + Q_2 + Q_3)}{c}$

(3) $V_A = \frac{K(Q_1 + Q_2 + Q_3)}{c}$

$V_B = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

$V_C = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

(4) $V_A = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

$V_B = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

$V_C = \frac{K(Q_1 + Q_2 + Q_3)}{c}$

Ans. **(4)**

Sol. $V_A = \frac{KQ_1}{a} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

$V_B = \frac{KQ_1}{b} + \frac{KQ_2}{b} + \frac{KQ_3}{c}$

$V_C = \frac{KQ_1}{c} + \frac{KQ_2}{c} + \frac{KQ_3}{c}$

$= \frac{K(Q_1 + Q_2 + Q_3)}{c}$

19. An ideal gas in a closed rigid container is at 50°C and pressure 3.23 kPa. If temperature is doubled, find new pressure in Pa :

(1) 3730 Pa (2) 3230 Pa

(3) 6460 Pa (4) 6430 Pa

Ans. (1)

Sol. Closed rigid container

V = constant

$P \propto T$

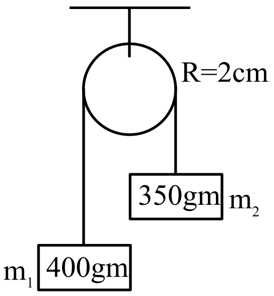
$T_i = 50°\ C = 323\ K$

$T_f = 2 \times 50°C = 100°C = 373\ K$

$$\frac{P_1}{P_2} = \frac{T_1}{T_2} \Rightarrow \frac{3.23}{P_2} = \frac{323}{373}$$

$\therefore P_2 = 3730\ Pa$

20. After release, the blocks moves 81 cm in 9 seconds. Find moment of inertia of the pulley :



(1) 97×10^{-4} Kg-m^2 (2) 100×10^{-4} Kg-m^2

(3) 21×10^{-4} Kg-m^2 (4) 87×10^{-4} Kg-m^2

Ans. (1)

Sol. $$a = \frac{(m_1 - m_2)}{m_1 + m_2 + \frac{I}{R^2}}.g$$

$$S = ut + \frac{1}{2}at^2$$

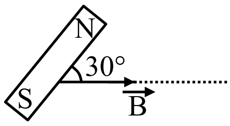
$$\frac{81}{100} = \frac{1}{2}\left(\frac{m_1 - m_2}{m_1 + m_2 + \frac{I}{R^2}}\right)g \times (81)$$

$$500(m_1 - m_2) = (m_1 + m_2) + \frac{I}{R^2}$$

$$500\left(\frac{50}{1000}\right) = \left(\frac{750}{1000}\right) + \frac{I}{R^2}$$

$I = 97 \times 10^{-4}$ Kg-m^2

21. A bar magnet is kept such that it is making an angle of 30° with the magnetic field. The torque acting on the magnet is 0.016 N-m. Find the amount of work done by external agent in rotating the magnet from most stable position to most unstable position.



(1) 0.064 J

(2) 0.020 J

(3) 0.034 J

(4) 0.055 J

Ans. (1)

Sol. $\tau = \mu B \sin\theta \quad \Rightarrow 0.016 = \mu \times B \times \frac{1}{2}$

$$\Rightarrow \mu = \frac{0.032}{B}$$

$W_{ext} = U_f - U_i = \mu B - (\mu B) = 2\mu B$

$$= 2 \times \frac{0.032}{B} \times B$$

$= 0.064$ J

22. **Statement – I :** Greater is the mass of nucleus, more will be its binding energy.

Statement – II : Nucleus with less $\frac{BE}{A}$ (Binding energy/nucleon) breaks into nucleus with higher $\frac{BE}{A}$.

Choose the correct option :

(1) Statement I is true & statement II is false

(2) Statement I is false & statement II is true

(3) Both are true

(4) Both are false

Ans. (3)

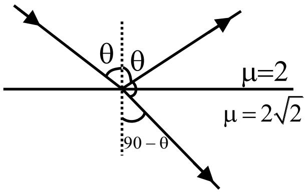
Sol. On increasing number of nucleon, BE increase but stability of nucleus depends on BE/A.

23. Light wave are incident from a medium of refractive index 2 making an angle θ with normal on to a medium of refractive index $2\sqrt{3}$. What should be the value of θ for which reflected wave and refracted wave will be perpendicular to each other.

(1) 60° (2) 30°

(3) 53° (4) 45°

Ans. (1)



Sol.

$$2\sin\theta = 2\sqrt{3}\sin(90-\theta)$$

$$\tan\theta = \sqrt{3}$$

$$\theta = 60°$$

24. In a H-like ion, ratio of speed of electron in two orbit is 3 : 2, then ratio of energies in these orbits should be :

(1) $\frac{3}{5}$ (2) $\frac{9}{4}$

(3) $\frac{1}{4}$ (4) $\frac{3}{4}$

Ans. (2)

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

$$\frac{v_1}{v_2} = \frac{z_1}{z_2}.\frac{n_2}{n_1} = \frac{3}{2}$$

$$E = -E_0\frac{z^2}{n^2}$$

$$\frac{E_1}{E_2} = \frac{\left(\frac{z_1}{n_1}\right)^2}{\left(\frac{z_2}{n_2}\right)^2} = \frac{9}{4}$$

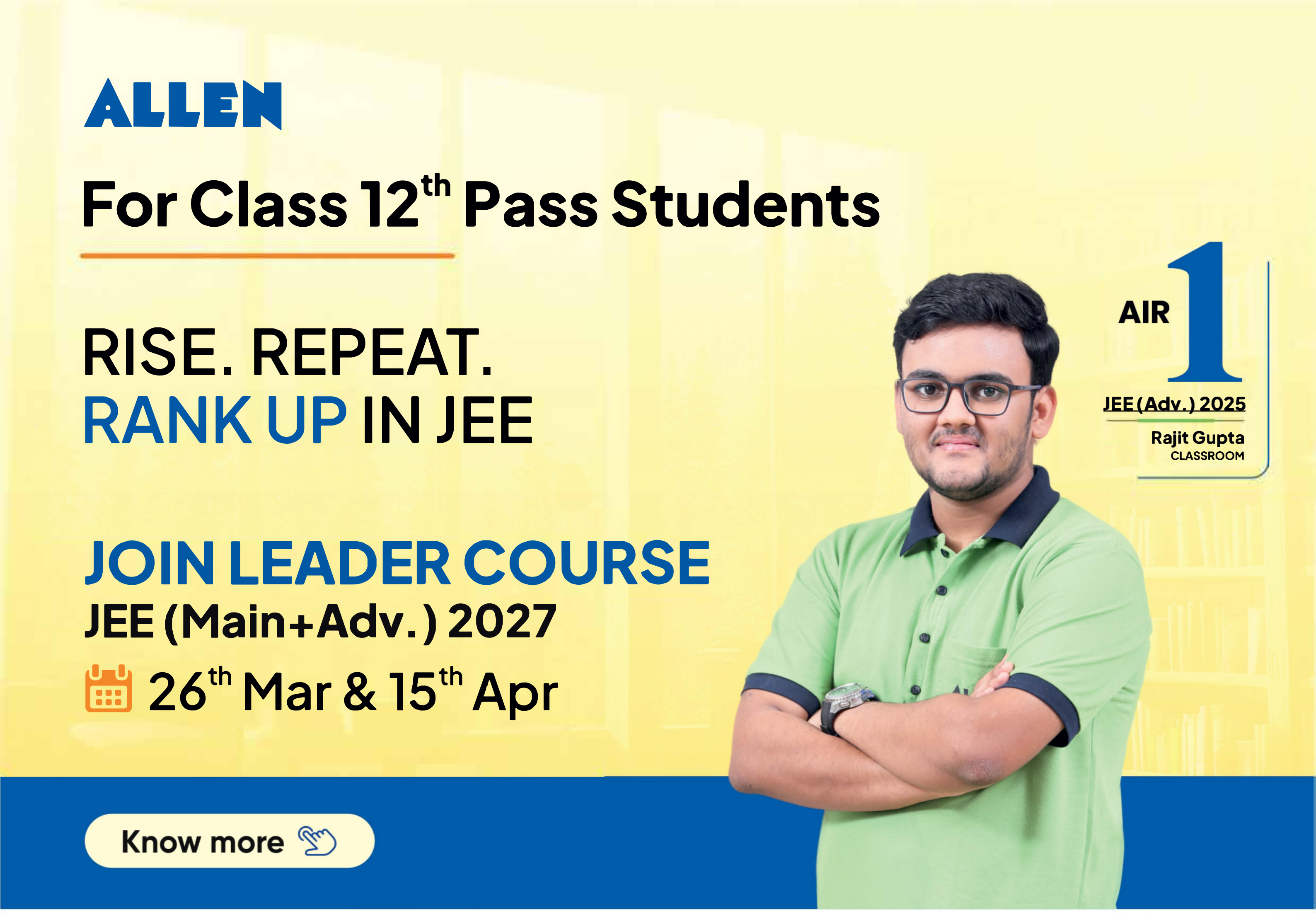
25. There is a compound microscope of lenses having focal lengths 2 cm and 5 cm and tube length 10 cm. Find magnifying power in normal adjustment. If your answer is 5^{α}, find 'α' :

Ans. (2)

Sol. $f_0 = 2$ cm, fe = 5 cm

$\ell = 10$ cm

$$M = \frac{\ell}{f_0}.\frac{D}{f_e} = 25$$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