



# (MAIN) 2025

**MEMORY BASED QUESTIONS & TEXT SOLUTION** 

SHIFT-1

DATE & DAY: 04<sup>nd</sup> April 2025 & Friday

PAPER-1

**Duration:** 3 Hrs Time: 09:00 \_

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SUBJECT: PHYSICS

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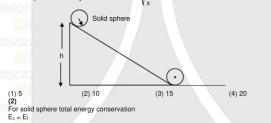
#### PART: PHYSICS

Mean free path for an ideal gas is to be observed 2 x 10<sup>-7</sup> m while average speed of molecules of gas is observed to be 600 m/s. then frequency of collision is near by (1)  $4 \times 10^7$  Hz (2)  $1.2 \times 10^7$  Hz (3)  $3 \times 10^9$  Hz (4)  $3 \times 10^{10}$  Hz (3)

liver  $\lambda = 2 \times 10^{-7}$ Sol. liver  $\lambda = 2 \times 10^{-7}$  v = 600 m/s  $\tau = \frac{2 \times 10^{-7}}{600} = \frac{1}{3} \times 10^{-9}$ 

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A ring and a solid sphere released from rest from same height on enough rough inclined surface. Ratio of their speed when they reach at bottom is  $\sqrt{\frac{7}{x}}$  m/s. Then x is :



 $mgh = \frac{1}{2}I\omega^2 + \frac{1}{2}mv^2$  $mgh = \frac{1}{2} \left( \frac{2}{5} m R^2 \right) \omega^2 + \frac{1}{2} m v^2$ 

$$gh = \frac{1}{5}R^{2}\frac{v^{2}}{R^{2}} + \frac{1}{2}v^{2}$$

$$gh = \frac{7}{10}v^{2}$$

$$\sqrt{\frac{10}{\pi}}gh = v_{s}$$
...(1)

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$$\begin{array}{lll} v_{\text{ring}} &=& gh \dots (2) \\ & v_{\text{ring}} &=& gh &=& 7 \\ v_{\text{solid}} &=& gh &=& 10 \\ gh & 7 &=& 10 \end{array}$$

Which of the following is ratio of  $5^{\text{th}}$  bohr radius of He+ and Li+2 ? (2) 3

- (1) <sup>2</sup> 3 (2) Ans.
- (3) 9
- (4) 4

 $r_n=\begin{array}{c} n^2a_0 \\ \end{array}$ 

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- Ans.

E B = C Sol.

[where, c = speed of light]

- dimension of  $-C \Rightarrow [m0L^1 T^{-2}]$ dimension of  $\begin{pmatrix} E \\ B \end{pmatrix} \Rightarrow [M^0L^1T^{-1}]$
- $\begin{array}{c} Q \Rightarrow 1 \\ R \Rightarrow -1 \end{array}$
- Distance between object and image is 30 cm by using spherical mirror of found length  $\frac{x}{4}$ ,  $m = -\frac{1}{3}$  there
- (1) 15Ans. (3)
- (2)30
- (3) 45
- (4) 75

- Sol.
  - $m = -\frac{1}{3} = -\frac{v}{u}$ |v - u| = 30

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- $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$  $v = \frac{45}{3} \Rightarrow 15$  $\frac{1}{f} = \frac{1}{15} + \frac{1}{45}$  $=\frac{3+1}{}$
- $f = \frac{45}{4}$ ,  $\frac{x}{4} = \frac{45}{4}$ , x = 45 Ans.

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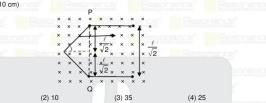
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A rods of equal length are joined as shown in the figure. Combined system is moving with speed 10 cm/s in a perpendicular magnetic field of  $\frac{1}{\sqrt{2}}$  tesla. Find emf induced between point P and Q in millivolts

(given ℓ = 10 cm)



(1) 30 **(2)** Ans.

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$$E = BV\ell = BV(\ell\sqrt{2})$$

$$\Rightarrow \frac{1}{\sqrt{2}} \times 10 \times 10^{-2} \times 10 \times 10^{-2} \times \sqrt{2} = 10 \text{ mV}$$
7. If slit width is increased to .02 to 0.4 then percentage change fringe width will be. (1) 20% (2) 25% (3) 60% (4) 50%

Ans. (4)

Sol. 
$$\frac{\Delta \beta}{\beta} = \frac{\Delta \frac{1}{d}}{1} \times 100$$

$$d$$

$$= \frac{1}{.04} - \frac{1}{.02} \times 100$$

$$0.02$$

$$= \frac{.02}{.04 \times .02} \times .02 \times 100$$

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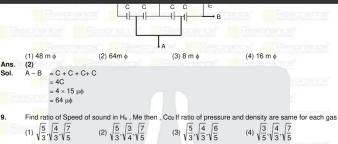
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Ans. **Sol.** Speed of sound in a gas =  $\sqrt{\frac{\gamma RT}{M}} = \sqrt{\frac{\gamma p}{p}}$ 

 $\gamma$  for H<sub>e</sub>  $\rightarrow \frac{5}{-}$ ,  $\gamma$  for  $CO_2 = \frac{7}{5}$ ,  $\gamma$  for Me then  $\frac{4}{3}$ 

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Speed of sound in He 
$$V_{He} = \sqrt{\frac{5}{3}} \frac{RT}{4}$$

$$V_{He} = \sqrt{\frac{5}{3}} \frac{RT}{4}$$

$$V_{He} = \sqrt{\frac{5}{12}} \frac{RT}{4}$$
Speed of sound in  $C_{o2} V_{Co2} = \sqrt{\frac{4}{3}} \frac{RT}{44}$ 

$$V_{Co2} = \sqrt{\frac{RT}{33}}$$
Ratio  $\frac{V_{He}}{VCO_2} = \frac{\sqrt{\frac{5}{12}} \frac{RT}{RT}}{\sqrt{\frac{RT}{33}}}$ 

$$\Rightarrow \sqrt{\frac{5 \times 33}{12}}$$

$$= \frac{\sqrt{55}}{2}$$

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RESONANCE® | JEE(Main) 2025 | DATE : 04-04-2025 (SHIFT-1) | PAPER-1 | MEMORY BASED | PHYSICS It AC current i =  $100\sqrt{2}$  sin100 $\pi$ t Find frequency & current (1) 100 A, 50 Hz (2)  $100\sqrt{2}$  A, 50 Hz (3) 100 A, 100 Hz (4)  $100\sqrt{2}$  A, 100 Hz i = 100 A

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- 11. In spherical mirror distance between RO and RI is 30 cm and magnificent is  $-\frac{1}{2}$ , how much object shift
  - so magnification become  $-\frac{1}{3}$
- (3)  $\frac{90}{3}$
- $(4) \frac{80}{3}$

Ans. (4)  
Sol. Shift = 
$$\left| \frac{80}{3} - 20 \right| = \frac{20}{3}$$

(1)  $\frac{40}{3}$ 

- Towards mirror  $m_1 = \frac{1}{2} = \frac{y}{x}$
- x = 2y x + y = 30 y = 10 x = 20
  - $\frac{1}{f} = \frac{1}{-10} + \frac{1}{-20}$

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- 3y = x  $-\frac{3}{-20} = \frac{1}{-x} - \frac{1}{y}$
- $\frac{3}{20} = \frac{4}{3y}$
- If  $\frac{1}{5}$ th of volume of closed organ pipe is filled in water. Then percentage change in frequency

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% change in frequency =  $\frac{f'-f}{f} \times 100$ 5v 4v  $\Rightarrow \frac{\frac{61}{16\ell} - \frac{1}{16\ell}}{\frac{4v}{16\ell}} \times 100$  $\Rightarrow \frac{1}{4} \times 100$ 

- An electric dipole with charges  $2\mu C$  and separation 20 cm is placed closed to an infinitely charge non-conducting sheet with surface charge density  $100 \text{ cm}^2$ . Find the torque acting on the dipole if the dipole makes an angle  $30^{\circ}$  with the formal to the sheet? (1)  $\frac{12}{\epsilon_0} \times 10^{-5} \text{ nm}$  (2)  $\frac{2}{\epsilon_0} \times 10^{-5} \text{ nm}$  (3)  $\frac{4}{\epsilon_0} \times 10^{-5} \text{ Nm}$  (4)  $\frac{1}{\epsilon_0} \times 10^{-5} \text{ Nm}$

Ans. Sol. (4)

**∠**30º

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Resonance | JEE(Main) 2025 | DATE : 04-04-2025 (SHIFT-1) | PAPER-1 | MEMORY BASED | PHYSICS **Assertion :** KE required to project body from surface of earth to infinity is mg  $\frac{R}{2}$ Reason: Highest PE is zero between surface of earth and infinity (1) (A) and (R) are correct and (R) is correct explanation of (A) (2) (A) and (R) both are correct and ® is not correct explanation of (A) (3) (A) is correct but (R) is incorrect (4) (A) is incorrect but (R) is correct Ans. (4)

Assertion: In photoelectric effect, if intensity of monochromatic light is increased then stopping potential

Reason: Increased intensity results in increment of photocurrent.

(1) Assertion is correct. Beason is correct and Beason is explanation of Assertion.

Assertion is correct, Reason is correct and Reason is not correct explanation of Ass

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In two different capillary tube  $\frac{\cos \theta_1}{\cos \theta_2} = z$  which option is correct 16.

(1) z is negative, if first meniscus is concave & second convex (2) z is negative, if first meniscus is convex & second concave (3) z is positive, if both are convex

(4) z is positive, if first meniscus is convex & second concave

Sol. (1) ⇒ convex

(2) ⇒ concave.

Two simple pendulums with angular amplitudes  $\theta_1$  and  $\theta_2$  have length of strings as  $I_1$  and  $I_2$  respectively.

Choose the correct option's if the maximum angular acceleration are same (2)  $\theta_1 \times \ell_2 = \theta_2 \times \ell_1$ 

(1)  $\theta_2 \times \ell_2 = \theta_1 \times \ell_1$ (3)  $\theta_1 \times \ell_2^2 = \theta_2 \times \ell_1^2$ 

(4)  $\theta_2 \times \ell_2^2 = \theta_1 \times \ell_1^2$ 

Ans. (2)

 $\alpha_{1\text{max}} = \alpha_{2\text{max}}$ 

 $\tau = mg\ell sin\theta = I\alpha$ 

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 $\theta_1 \times \ell_2 = \theta_2 \times \ell_1$ 

(1) E<sub>A</sub> ≠ E<sub>B</sub>

18. A block of mass m kg is connected to two strings as shown. If  $T_1 = \sqrt{3} T_2$ , then choose correct option

(1)  $Q_1 = 60^\circ$ ,  $Q_2 = 30^\circ$   $T_1 = \frac{mg}{2}$ 

(2)  $Q_1 = 60^\circ$ ,  $Q_2 = 30^\circ$   $T_2 = \frac{mg}{2}$ 

(3)  $Q_1 = 30^\circ$ ,  $Q_2 = 60^\circ$   $T_1 = \frac{3mg}{.}$ 

(4)  $Q_1 = 30^\circ$ ,  $Q_2 = 60^\circ$   $T_2 = \frac{3mg}{4}$ 

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Ans. (2)

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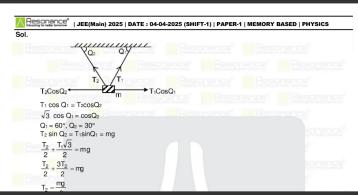
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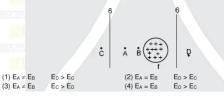
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sphere with volume charge density? choose the correct relation between the magnitude of electric field at A.B.C. and D.



Ans. (1) If current (i) = 0.02 t + 0.01, flow of charge from t = 1 to t = 220. (1) 0.04 (2) 0.02 (3) 0.01 Ans. (1) (4) 0.06 Sol.  $q = \int idt = \left(0.02 \frac{t^2}{2} 0.01t\right)_1^2$  $(0.01 \times 4 + 0.02) - (0.01 \times 2) = 0.04$  Ans

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2Eaℓ

√ mg

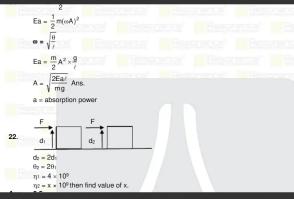
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$$\begin{split} \frac{\eta_2}{\eta_1} &= \left(\frac{d_1}{d_2}\right)^2 \times \frac{\theta_1}{\theta_2} \\ \eta_2 &= 4 \times 10^9 \times \left(\frac{1}{2}\right)^2 \times \frac{1}{2} \\ \eta_2 &= 0.5 \times 10^9 \\ x &= 0.5 \end{split}$$

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