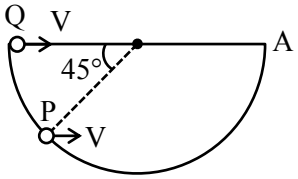
MEMORY BASED QUESTIONS JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON FRIDAY 23rd JANUARY 2026) **TIME : 3:00 PM TO 6:00 PM**

PHYSICS

TEST PAPER WITH SOLUTION

1. Two beads P & Q move along two wires straight and semi circle. At some instant both are shown in figure having same horizontal component of velocity V. Find relation of time taken to reach A by beads :

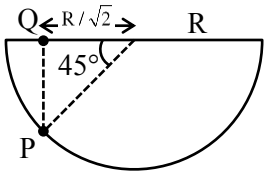


(1) $t_P > t_Q$ (2) $t_P < t_Q$

(3) $t_P = t_Q$ (4) None of these

Ans. **(2)**

Sol.



X-displacements :

$X_P < X_Q$

and average velocity in X-direction of P is > average velocity in X-direction of Q

hence

$t_P < t_Q$

2. When an object is kept at distance 8 cm and 24 cm from a convex lens, magnitude of magnification is same in both cases. Find focal length (in cm) of the lens :

(1) 18 cm (2) 16 cm

(3) 20 cm (4) 8 cm

Ans. **(2)**

Sol. $m = \frac{f}{f+u}$

$m_1 = -m_2$

$\frac{f}{f-8} = -\frac{f}{f-24}$

$f - 8 = 24 - f$

$2f = 32$

$f = 16$ cm

3. Time taken to achieve terminal velocity by a body depends on density of material (ρ), density of liquid (σ), radius of material (r) and viscosity of liquid (η) as $t = k\rho^a r^b \eta^c \sigma^d$. Find $\frac{b+c}{a+d}$?

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

(3) 3 (4) 2

Ans. **(1)**

Sol. $T = (ML^{-3})^a L^b (ML^{-1}T^{-1})^c (ML^{-3})^d$

$T = M^{a+c+d} L^{-3a-c-3d+b} T^{-c}$

on comparing

$c = -1$; $a + c + d = 0$; $-3a - c - 3d + b = 0$

$b = 2$; $a + d = 1$

4. Speed of sound at $T_1 = 0°C$ is V_0 and at $T_2 = \alpha°C$ speed becomes $2V_0$. Find α :

(1) 819°C (2)918°C

(3) 546°C (4) 1092°C

Ans. **(1)**

Sol. $V = \sqrt{\frac{\gamma RT}{M}}$

$\frac{V_1}{V_2} = \frac{\sqrt{T_1}}{\sqrt{T_2}}$

$\frac{V_0}{2V_0} = \sqrt{\frac{273}{T_2}}$

$\frac{1}{4} = \frac{273}{T_2}$

$T_2 = 4 \times 273$

$\alpha + 273$

$\alpha = 3 \times 273$

$\alpha = 819°C$

5. An air bubble inside water at depth h = 5 m rises to surface. At bottom temperature is T_1 and volume is V_1 and at surface the temperature is T_2. Find final volume (Given that number of moles remains same and $P_0 = 10^5$ Pa) :

(1) 6 cm^3 (2) 8 cm^3

(3) 2 cm^3 (4) 1 cm^3

Ans. **(3)**

Sol. $T_1 = 17°C$, $V_1 = 2.9\ cm^3$

$T_2 = 27°C$

$$\frac{10^5 \times 2.9}{290} = \frac{1.5 \times 10^5 \times V_2}{300}$$

$V_2 = 2\ cm^3$

6. A metallic sphere of diameter 2mm and density 10.5 g/cc is dropped in glycerine having viscosity 10 poise and density 1.5 g/cc. The terminal velocity attained by sphere is _____ cm/s. $\left[\pi = \frac{22}{7},\ g = 10\ m/s^2\right]$

(1) 2.0 (2) 1.0

(3) 1.5 (4) 3.0

Ans. **(1)**

Sol. $$V = \frac{2}{9}\frac{r^2 g}{\eta}(\rho_m - \rho_l)$$

$$= \frac{2}{9} \times \frac{(0.1)^2 \times 1000}{10}(10.5 - 1.5)$$

$= 2$ cm/s

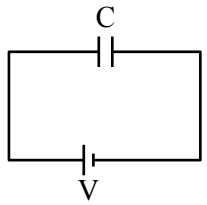
7. A parallel plate capacitor with plate separation 5 mm is charged by a battery. On introducing a mica sheet of 2 mm while battery is connected, it is found that it draws 25% more charge. The dielectric constant of mica is :

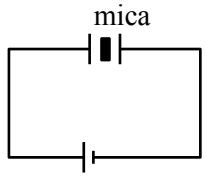
(1) 2 (2) 1.5

(3) 1 (4) 4

Ans. **(1)**

Sol.





$$C = \frac{\varepsilon_0 A}{5}$$

$Q_i = CV$

$Q_f = C_{eq}V = 1.25\ CV$

$$C_{eq} = \frac{\frac{\varepsilon_0 A}{3} \times \frac{K\varepsilon_0 A}{2}}{\frac{\varepsilon_0 A}{3} + \frac{K\varepsilon_0 A}{2}}$$

$$= \frac{\varepsilon_0 A 5K}{5(3K+2)}$$

$$= \frac{5CK}{3K+2}$$

$C_{eq} = 1.25\ C$

$$\frac{5K}{3K+2} = 1.25 = \frac{5}{4}$$

$4K = 3K + 2$

$K = 2$

8. Two point charges 7μC(–9,0,0) and –2μC(9,0,0) are placed in external electric field $\vec{E} = \frac{A}{r^2}\hat{r}$ where $A = 10^3$ SI unit. Find potential energy of system ?

(1) $-\frac{58}{9} \times 10^{-3}$ J (2) $\frac{50}{3} \times 10^{-6}$ J

(3) 40×10^{-4} J (4) 2×10^{-5} J

Ans. **(1)**

Sol. $U = U_{self} + U_{interaction}$

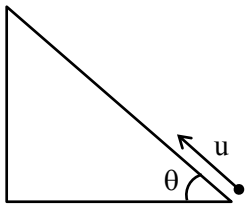
$$= q_1 V_1 + q_2 V_2 + \frac{kq_1 q_2}{r}$$

Here $V = \int_{\infty}^{r} E dr = -A\left(-\frac{1}{r}\right)_{\infty}^{r} = \frac{A}{r}$

So $U = -7 \times 10^{-3} + \frac{7 \times 10^{-6} A}{9} - \frac{2 \times 10^{-6} A}{9}$

$$= \left(\frac{5}{9} - 7\right) \times 10^{-3} = -\frac{58}{9} \times 10^{-3}\ J$$

9. A particle is projected from bottom of inclined plane with speed u find distance covered along plane before coming to rest :

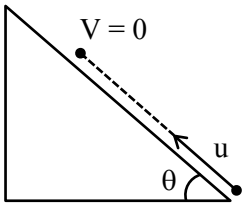


(1) $\frac{u^2}{2g\sin\theta}$ (2) $\frac{u^2}{g\sin\theta}$

(3) $\frac{u^2}{g\cos\theta}$ (4) $\frac{u^2}{2g\cos\theta}$

Ans. (1)

Sol.



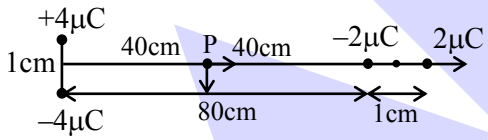
$a = -g\sin\theta$

$V^2 = U^2 + 2as$

$0 = u^2 - 2g\sin\theta \cdot s$

$s = \frac{u^2}{2g\sin\theta}$

10. Four charges are kept as shown in the figure. Find magnitude of electric field at point P. P is mid point of line AB.



(1) $625\sqrt{2}$ (2) $5625\sqrt{2}$

(3) $3625\sqrt{2}$ (4) $4525\sqrt{2}$

Ans. (2)

Sol. $E_p = -\frac{KP_1}{r^3}\hat{j} + \frac{2KP_2}{r^3}(\hat{i})$

$|\vec{E}_{net}| = \frac{\sqrt{2}\times 2\times 9\times 10^9\times 2\times 10^{-6}\times 10^{-2}}{(0.4)^3}$

$= 5625\sqrt{2}$

11. Dielectric constant of a medium is 3 and its magnetic permeability $\mu = 2\mu_0$. Find ratio of velocity of light in vacuum to velocity of light in medium :

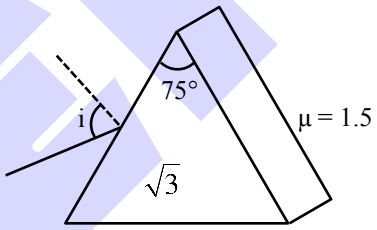
(1) $\sqrt{5}$ (2) $\sqrt{6}$

(3) 2 (4) 3

Ans. (1)

Sol. $\frac{c}{v} = \mu = \sqrt{\varepsilon_r\mu_r} = \sqrt{3\times 2} = \sqrt{6}$

12. A prism with angle of prism 75° and having refractive index $\sqrt{3}$ has a slab of refractive index 1.5 kept on one side of the prism as shown. Find angle of incidence such that TIR occurs at slab prism interface. (Given sin 15° = 0.25 and sin 25° = 0.43) :



(1) $10° < \theta < 20°$ (2) $\theta < 25°$

(3) $\theta < 15°$ (4) $15° < \theta < 25°$

Ans. (2)

Sol. For TIR at prism-slab interface,

$r_2 = \sin^{-1}\left(\frac{1.5}{\sqrt{3}}\right) = 60°$

$\therefore r_1 = 15°$

$\therefore 1\sin i = \sqrt{3}\sin 15° = 0.433 \Rightarrow i = 25°$

$\therefore \theta < 25°$

13. When an unpolarized light falls at a particular angle on a glass plate (placed in air). It is observed that reflected beam is completely polarized the angle of refracted beam with respect to the normal is :

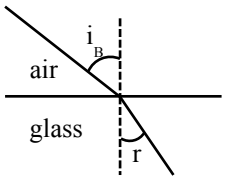
(Given : $\tan^{-1}(1.52) = 57.3°$, $\mu_{air} = 1$, $\mu_{glass} = 1.52$)

(1) 57.3 (2) 36.7

(3) 28.65 (4) 61.35

Ans. (2)

Sol.



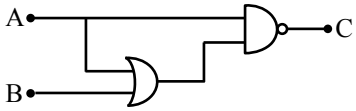
$$\tan i_B = \frac{n_2}{n_1} = \frac{n_g}{n_a}$$

$\tan i_B = 1.52$

$i_B = 57.6°$

$r = 90 - i_B = 36.7°$

14. For given logic gate circuit choose correct truth table.



(1)

A	B	C
0	0	1
1	0	1
0	1	1
1	1	0

(2)

A	B	C
0	0	1
1	0	0
0	1	1
1	1	0

(3)

A	B	C
0	0	0
1	0	0
0	1	0
1	1	1

(4)

A	B	C
0	0	0
1	0	1
0	1	0
1	1	1

Ans. (2)

Sol. $C = \overline{(A+B)\cdot A}$

$C = \overline{A\cdot A + A\cdot B} = \overline{A\cdot(1+B)} = \overline{A}$

A	B	C
0	0	1
1	0	1
0	1	1
1	1	0

15. Energy released per fission of U-235 is 190 MeV, then total energy released by 47 g of U-235 is $x \times 10^{23}$ MeV. Find the value of x.

Ans. (228)

Sol. Total numbers of U-235 atom is

$$47\text{ g} = \frac{47}{235}\text{ moles} = \frac{1}{5}\text{ moles}$$

$$\therefore \text{ Total energy released} = \frac{1}{5}\times 6\times 10^{23}\times 190\text{ MeV}$$

$= 228 \times 10^{23}$ MeV

16. A parachutist jumps from a helicopter. It falls freely for 2 sec. Then he opens parachute which produces retardation of 3 m/s^2. When his height from ground is 10 m his velocity is 5 m/s. Find his initial height from ground.

(1) 90 m (2) 82 m

(3) 92.5 m (4) 100 m

Ans. (3)

Sol. $S_1 = \frac{1}{2} \times 10 \times 2^2 = 20m$

$v_1 = 0 + g \times 2 = 20$ m/s

For 2nd part of journey :

$5^2 = 20^2 + 2(-3)S_2$

$S_2 = 62.5$ m

So, total distance $S = S_1 + S_2 + S_3$

$= 20 + 62.5 + 10 = 92.5$ m

17. One mole of diatomic gas is expanding isothermally from V to 2V at 27°C. If the magnitude of work done by gas in this case is same as the work done in adiabatic process where initial temperature is 27°C and final temperature is T°C. Find T.

(1) –37°C (2) –57°C

(3) –35°C (4) –55°C

Ans. (2)

Sol. $W_{isothermal} = 1 \times R \times (300) \ln (2)$

$W_{adiabatic} = \frac{nR(300 - T)}{\left(\frac{7}{5} - 1\right)} = \frac{5}{2} \times 1 \times R \times (300 - T)$

$W_{isothermal} = W_{adiabatic}$

$300\ell n2 = \frac{5}{2}(300 - T)$

$\frac{5}{2}T = 750 - 300\ell n2$

$T = 216.82$ K

$T = -56.17$ °C

18. A bomb at rest explodes into three pieces in the ratio of masses 2 : 2 : 3. The identical masses fly off perpendicular to each other with 18 m/s. Find speed of the third piece.

(1) $12\sqrt{2}$ m/s (2) $12/\sqrt{2}$ m/s

(3) 12 m/s (4) 18 m/s

Ans. (2)

Sol. $7m \times 0 = 2m \times 18\hat{i} + 2m \times 18\hat{j} + 3m \times \vec{v}$

$\vec{v} = -12\hat{i} - 12\hat{j}$

$|\vec{v}| = 12\sqrt{2}$ m/s

19. Choose correct option :

(A) Number of photons required for a light beam of 2000 pm wavelength and 1 Joule energy is 1.01×10^{16}.

(B) Light with wavelength 300 nm has energy E_1 and for wavelength 900 nm has energy E_2, then $\frac{E_1}{E_2} = \frac{1}{3}$.

(C) Frequency of light is 4.5×10^{16} then its wavelength is 6.7×10^{-9} m.

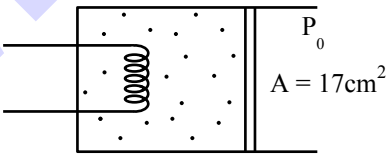
(D) If electrons and protons are accelerated by same potential diffenrece, then their de-Broglie wavelength are equal.

(1) A only (2) A & B only

(3) A & C only (4) A, B, C & D

Ans. (3)

20. Internal energy of gas is given as U = 3nRT. 1mole He gas takes 126 J heat and its temperature rise by 4°C. Atmospheric pressure is $P_0 = 10^5$ Pa and area of piston is 17 cm^2. Find distance moved by piston.



(1) 18.5 cm (2) 21.3 cm

(3) 12.3 cm (4) 10.2 cm

Ans. (1)

Sol. Piston is free to move hence

For isobaric process

$\Delta Q = \Delta U + W = 3nR\Delta T + nR\Delta T$

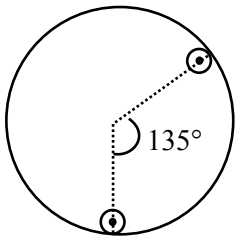
$\Delta Q = 4P\Delta V$

$126 = 4 \times 10^5 \times A(\Delta x)$

$\Delta x = \frac{126}{4 \times 10^5 \times 17 \times 10^{-4}}$

$= 0.185$ m $= 18.5$ cm

21. A disc of mass (M, R) is given. Two discs of radius $\frac{R}{4}$ are cut from this, whose center are at 135° angle. Their peripheries touch larger disc a shown. If moment of inertia of remaining disc about center is $\frac{\alpha}{256}MR^2$ find α:



Ans. **($\alpha = 109$)**

Sol. $M = \sigma\pi R^2$

$\sigma\pi R^2 = 16\ m$

$m = \frac{\sigma\pi R^2}{16}$

$I_{system} = \frac{MR^2}{2} - 2\left(\frac{mR^2}{2\times16} + \frac{9mR^2}{16}\right)$

$= \frac{MR^2}{2} - 2\times\frac{19mR^2}{32}$

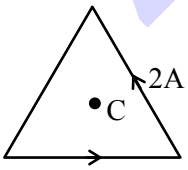
$= \frac{MR^2}{2} - \frac{19}{16}mR^2$

$= \frac{MR^2}{2} - \frac{19}{256}MR^2$ becoz $m = \frac{M}{16}$

$= \frac{(128-19)(MR^2)}{256}$

$= \frac{109MR^2}{256}$

22. The equilateral triangular frame has current 2A. The side of frame is $4\sqrt{3}$ cm. Magnetic field at center C is:

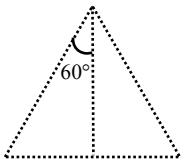


(1) $30\sqrt{3}\,\mu T$ (2) $10\sqrt{3}\,\mu T$

(3) $3\sqrt{10}\,\mu T$ (4) $10\sqrt{10}\,\mu T$

Ans. **(1)**

Sol.



$B = 3\left[\frac{\mu_0 i}{4\pi\left(\frac{a}{2\sqrt{3}}\right)}(\sin 60 + \sin 60)\right]$

$= \frac{9\mu_0 i}{2\pi a}$

$= \frac{9\times4\pi\times10^{-7}\times2}{2\pi\times(4\sqrt{3}/100)}$

$= 3\sqrt{3}\times10^{-5} = 30\sqrt{3}\,\mu T$

23. An experiment is performed for comparing EMF of two cells using a potentiometer. For 1st cell, balancing length was achieved at 200 cm and for 2nd cell it was 150 cm. If least count of measurement of length of potentiometer wire is 1cm, the percentage error in the ratio of εmf of two cells is :

(1) $\frac{8}{7}$ (2) $\frac{7}{6}$

(3) $\frac{5}{6}$ (4) $\frac{3}{2}$

Ans. **(2)**

Sol. At balancing length $\varepsilon = \lambda\ell$ [λ is potential gradient]

$\therefore\ \varepsilon_1 = \lambda \times 200$

$\varepsilon_2 = \lambda \times 150$

Let $y = \frac{\varepsilon_1}{\varepsilon_2}$

$\therefore\ \frac{\Delta y}{y} = \frac{\Delta\varepsilon_1}{\varepsilon_1} + \frac{\Delta\varepsilon_2}{\varepsilon_2} = \frac{\Delta\ell_1}{\ell_1} + \frac{\Delta\ell_2}{\ell_2} = \frac{1}{200} + \frac{1}{150} = \frac{7}{600}$

$\therefore\ \%\ \text{error} = \frac{7}{6}$

24. A small ring is given some velocity along the axis of a solenoid and it remains coaxial with solenoid. Current in solenoid i = 10 sinωt; ω = 1000 rad/s. Number of turns per unit length is 500/m. Radius of ring is 1 cm and its resistances is 10Ω. Find RMS value of induced current in the ring :

(1) $\sqrt{2}\times10^{-5}$ A (2) 3×10^{-4} A

(3) $\sqrt{2}\times10^{-4}$ A (4) 5×10^{-6} A

Ans. **(3)**

Sol. EMF induced $\varepsilon = A\dfrac{dB}{dt} = A\mu_0 n\dfrac{di}{dt}$

$\varepsilon = A\mu_0 n\, i_0\omega\cos\omega t$

current induced $i = \dfrac{\varepsilon}{R} = \dfrac{\pi r^2\mu_0 n i_0\omega}{R}\cos\omega t$

So $i = \dfrac{\pi r^2\mu_0 n i_0\omega}{\sqrt{2}R}$

$= \dfrac{\pi\times10^{-4}\times4\pi\times10^{-7}\times500\times10\times10^3}{\sqrt{2}\times10}$

$= \dfrac{20\pi^2}{\sqrt{2}}\times10^{-6}$

$= \sqrt{2}\times10^{-4}$ A

25. Which of the following is isobaric pairs :

(1) ${}^{3}_{1}C$ & ${}^{13}_{6}C$

(2) ${}^{3}_{1}H$ & ${}^{3}_{2}He$

(3) ${}^{14}_{7}N$ & ${}^{13}_{6}He$

(4) ${}^{16}_{8}O$ & ${}^{15}_{7}N$

Ans. **(2)**

Sol. Isobars are atoms having same number of nucleons

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