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JEE (MAIN) 2025

MEMORY BASED QUESTIONS & TEXT SOLUTION

SHIFT-2

DATE & DAY: 03nd April 2025 & Thursday

PAPER-1

Duration: 3 Hrs.
Time: 03:00 PM – 06:00 PM

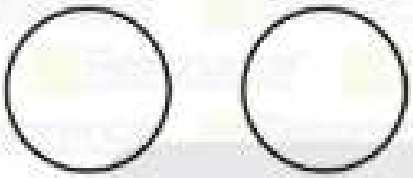
SUBJECT: PHYSICS

PART : PHYSICS

1. Excess pressure inside bubble A is half of that of bubble B. find ratio of volume of bubble A to bubble B.
(1) 8 (2) 4 (3) 27 (4) 16

Ans. (1)

Sol.



Bubble A B

we know that $\Delta P = \frac{4S}{r}$ $\therefore \Delta P_A = \frac{\Delta P_B}{2}$

$r_A = 2r_B$

$\frac{V_A}{V_B} = 8$

2. The ratio of intensities of two coherent is 1 : 9. The ratio of the maximum to the minimum intensities is
(1) 9 : 1 (2) 16 : 1 (3) 8 : 1 (4) 4 : 1

Ans. (4)

Sol. $\frac{I_{max}}{I_{min}} = \frac{\left(\sqrt{I_1}+\sqrt{I_2}\right)^2}{\left(\sqrt{I_1}-\sqrt{I_2}\right)^2} = \frac{(1+3)^2}{(1-3)^2} = \frac{16}{4}$

$\frac{I_{max}}{I_{min}} = \frac{4}{1}$

3. A magnetic dipole experience a torque of $80\sqrt{3}$ Nm when placed in uniform magnetic field in such a way that dipole moment makes an angle of 60° with magnetic field. The potential energy of the dipole is ?
(1) 80 J (2) 40 (3) –70 (4) – 80 J

Ans. (4)

Sol. Given

$\vec{\tau} = \vec{M} \times \vec{B}$

$\tau = MB\sin\theta = 80\sqrt{3}$ ...(1)

$U = -\vec{M}\vec{B}$

$U = -MB\cos\theta$

$U = -\frac{MB\sin\theta}{\sin\theta}\cos\theta$

$U = -\frac{80\sqrt{3}}{\sin\theta}\cos\theta$

$U = -\frac{80\sqrt{3}}{\tan\theta}$

$U = -\frac{80\sqrt{3}}{\tan 60^\circ}$, $U = -\frac{80\sqrt{3}}{\sqrt{3}}$

$U = -80$ J

4. Math the coloum

A	B
(a) Boltzmann's constant	(i) $ML^2T^{-2}K^{-1}$
(b) coeticient of viscosity	(ii) $ML^{-1}T^{-1}$
(c) plank constant	(iii) ML^2T^{-1}
(d) Thermal Conductivity	(iv) $MLT^{-3}K^{-1}$

(1) a(i), b(ii), c(iii), d(iv) (2) a(ii), b(i), c(iii) d(iv) (3) a(iii), b(ii), c(ii) d(iv) (4) a(i), b(iii), c(ii), d(iv)

Ans. (1)

Sol. (a) $PV = NKJ$

$$K = \frac{ML^2T^{-2}}{K} = ML^2T^{-2}K^{-1}$$

(b) $F = 6\pi\eta rv$

$$\eta = \frac{MLT^{-2}}{LLT^{-1}} = ML^{-1}T^{-1}$$

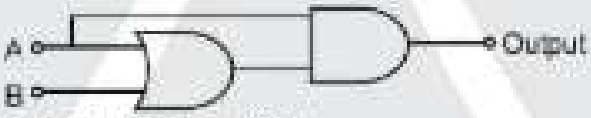
(c) $E = h\nu$

$$h = \frac{ML^2T^{-2}}{T^{-1}} = ML^2T^{-1}$$

(d) $H = KA\frac{\Delta\theta}{\ell}$

$K = MLT^{-3}K^{-1}$

5. Semiconductor



The correct truth table for the given circuit will be :-

(1)

A	B	output
0	0	0
0	1	1
1	0	0
1	1	0

(2)

A	B	output
0	0	0
0	1	0
1	0	1
1	1	1

(3)

A	B	output
0	0	1
0	1	1
1	0	0
1	1	0

(4)

A	B	output
0	0	0
0	1	0
1	0	0
1	1	1

Ans. (2)

Sol.

Output = A.(A + B)
= A.A + A.B
= A + A.B
= A(1 + B) = A.1
= A

The correct truth table will be :

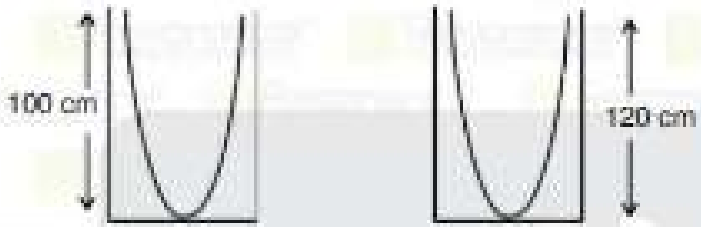
A	B	output
0	0	0
0	1	0
1	0	1
1	1	1

6. In the resonance experiment, two air column's closed at one end of 100 cm and 120 cm along, given 15 beats per second when each one is sounding in the respective fundamental nodes. The velocity of sound in the air column is

(1) 320 m/s (2) 340 m/s (3) 360 m/s (4) 380 m/s

Ans. (3)

Sol.



$$f_1 = \frac{V}{4L_1} \qquad f_2 = \frac{V}{4L_2}$$

$$f_1 - f_2 = 15$$

$$\frac{V}{4L_1} - \frac{V}{4L_2} = 15$$

$$\frac{V}{4}\left[\frac{1}{L_1} - \frac{1}{L_2}\right] = 15$$

$$V\left[\frac{1}{1} - \frac{1}{1.2}\right] = 60$$

$$V = \frac{0.2}{1.2} = 60$$

$V = 360$ m/sec

7. In a medium of refractive index 2 the frequency of light is 5×10^{14} Hz, the wavelength of the light is:

(1) 200 nm (2) 300 nm (3) 500 nm (4) 600 nm

Ans. (2)

Sol. $V = u\lambda$

$$\lambda = \frac{V}{u}$$

$$\lambda = \frac{c}{\mu u} = \frac{3\times10^8}{2\times5\times10^{14}}$$

$$\lambda = \frac{3}{10} \times \frac{10^8}{10^{14}}$$

$\lambda = 3 \times 10^{-7}$

$\lambda = 300$ nm.

8. If range is three times of maximum height than range will be $R = \frac{u^2}{25g} \times K$, value of K will be

(1) 12 (2) 24 (3) 36 (4) 40

Ans. (2)

Sol. $R = 3H$

$$\frac{H}{R} = \frac{\tan\theta}{4} = \frac{1}{3} \Rightarrow \tan\theta = \frac{4}{3}$$

$$R = \frac{u^2 \times 2\sin\theta\cos\theta}{g} = \frac{2}{g}u^2 \times \frac{4}{5} \times \frac{3}{5}$$

$K = 24$

9.

$K = 3000$, find maximum compression in spring.

(1) 0.4 cm (2) 0.2 cm (3) 0.1 cm (4) 0.6 cm

Ans. **(3)**

Sol. $\frac{1}{2}Kx^2 = \frac{1}{2}\mu u_{rel}^2$

$$3000x^2 = \frac{10 \times 5}{15} \times 3$$

$$x = \frac{1}{10}m = 0.1\ cm$$

10. $z = \frac{pq^2}{r^3\sqrt{s}}$ If percentage error are respectively p,q,r and s are 1,2,3 and 2. Find percentage error in z.

(1) 10% (2) 15% (3) 9% (4) 4%

Ans. **(2)**

Sol. $\%s = \%p + 2(\%q) + 3(\%\ r) + \frac{1}{2}(\%s)$

$$= 1 + 2 \times 2 + 3 \times 3 + \frac{1}{2} \times 2$$

$= 15\%.$

11. Displacement $(x) = \alpha(t^2 - 2) + c(t-2)^2$ initial velocity and acceleration will be :

(1) $V = +ve$ (2) $a = 2\alpha + 2c$ (3) $a = 2\alpha$ (4) $V = c$

Ans. **(2)**

Sol. $V = \alpha \times 2t + c \times 2(t-2)$

$t = 0$

$V = -4c$

$a = 2\alpha + 2c$

12. The ratio of width of the slits is 4 : 1 in YDSE, then the ratio of $\frac{(I_{max})_{max}}{(I_{min})_{min}}$ will be :-

(1) $\frac{3}{1}$ (2) $\frac{9}{1}$ (3) $\frac{6}{1}$ (4) $\frac{16}{1}$ b

Ans. **(2)**

Sol. $I_1 = 4I \Rightarrow A_1 = 2A$

$I_2 = I \Rightarrow A_2 = A$

$$\frac{(A_{eq})_{max}}{(A_{eq})_{min}} = \frac{2A + A}{2A - A} = \frac{3}{1}$$

$$\frac{(I_{eq})_{max}}{(I_{eq})_{min}} = \left(\frac{3}{1}\right)^2 = \frac{9}{1}$$

13. A bulb rated 100 W, 220 V connected to an ac supply of 220 V. Find peak current in the bulb

(1) 8 A (2) 0.64 A (3) 3.2 A (4) 2 A

Ans. (2)

Sol. $P = V_{rms} I_{rms}$

$100 = 220\, I$

$$I = \frac{10}{22} = \frac{5}{11} A$$

$$I_{rms} = \frac{I_0}{\sqrt{2}}$$

$I_0 = \sqrt{2}\, I_{rms}$

$$I_0 = \sqrt{2} \cdot \frac{5}{11}$$

$I_0 = 0.64$ A

14. A block of mass 1 kg, moving along x-axis with speed $v_i = 10$ m/s enters a rough region ranging from $x = 0.1$ m to $x = 1.9$ m. The retarding force acting on the block in this range is $F_r = -kx$ N, with $K = 10$ N/m. Then the final speed of the block as it crosses rough region is

(1) 8 m/s (2) 6 m/s (3) 10 m/s (4) 4 m/s

Ans. (1)

Sol. $m = 1$ kg

$F = -kx$

$F = -10x$

$ma = -10x$

$a = -10x$

$a = -10x$

$$\frac{vdv}{dx} = -10x$$

$$\int_{10}^{v} vdv = \int_{0.1}^{1.9} -10x dx$$

$$\left[\frac{v^2}{2}\right]_{10}^{v} = -10\left[\frac{x^2}{2}\right]_{0.1}^{1.9}$$

$v^2 - 100 = -10[1.9^2 - 0.1^2]$

$v^2 = 64$

$v = 8$ m/s

15. A capacitor of capacitance 100 PF is charged with a battery of voltage 60 volt. It is disconnected to the battery and it is connected with a second capacitor which is initially uncharged. If the final potential on the second capacitor is 20 volt, then the capacitance of the second capacitor will be :-

(1) 100 PF (2) 200 PF (3) 300 PF (4) 50 PF

Ans. **(2)**

Sol. $V_c = \frac{C_1V_1 + C_2V_2}{C_1 + C_2}$

$20 = \frac{(100P)(60) + (C_2)(0)}{(100P) + C_2} \Rightarrow 20 \times 100 + 20 \quad C_2 = 6000 \Rightarrow C_2 = 200$

16. The pressure of an ideal gas is increased by 0.4% keeping the volume constant. Find the initial temperature of the gas if there is a 1°C rise in temperature:

(1) 250 k (2) 25°C (3) 2500 k (4) 2500°C

Ans. **(1)**

Sol. $Pv = nRT$

$P = \frac{nR}{V}T$

$P = kT$

$\frac{\Delta P}{P} = \frac{\Delta T}{T}$

$\Delta P = \frac{\Delta T}{T} \times 100$

$\frac{0.4}{100} = \frac{1}{T}k$

$T = \frac{100}{0.4}$

$T = 250$ k.

17. **Statement-1:** ion O^{-2} and H^+, projected perpendicular to uniform magnetic field with same momentum than radius of curvature of path O^{-2} is less than H^+.

Statement-2: Proton and electron projected perpendicular to uniform magnetic field with same momentum than radius of curvature of path proton is less than electron.

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

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

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

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

Ans. **(2)**

Sol. $r = \frac{mv}{qB} \Rightarrow r \propto \frac{1}{q}$

$q_1 > q_2 \Rightarrow R_1 < R_2$

Statement-1 is true. **Ans.**

Statement-2 is false $q_1 = q_2 \Rightarrow R_1 = R_2$.

18. Two battery ($r_1 = 2\Omega$, V_1 1V) and ($r_2 = 1\Omega$, $V_2 = 2V$) are connected with external resistance (K = 6), first in series combination (i_1), second in parallel combination (i_2), if $\frac{i_1}{i_2} = \frac{x}{3}$ $\Rightarrow$ value of x will be.

Ans. **04.00**

Sol. (a) series $E_{eq} = 3$

$r_{eq} = 3$

$$i_1 = \frac{e_q}{r_{eq}+R} = \frac{3}{3+6} = \frac{1}{3}A$$

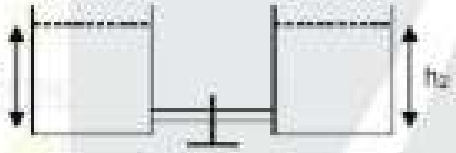
(b) parallel $e_{eq} = \frac{1\times1+2\times2}{3} = \frac{5}{3}$

$r_{eq} = \frac{2}{3}$

$$i_2 = \frac{5/3}{\frac{2}{3}+6} = \frac{5\times3}{3\times(2+18)} = \frac{1}{4}$$

$$\frac{i_1}{i_2} = \frac{1\times4}{3\times1} = \frac{x}{3} \Rightarrow x = 4$$

19.



$A_1 = A_2 = 2$

$h_1 = 6$

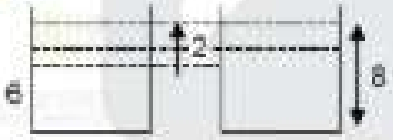
$h_2 = 8$

work done by gravity when level of water become same.

(1) 10^4 J (2) 3×10^4 J (3) 2×10^4 J (4) 5×10^4 J

Ans. **(3)**

Sol.



$W = mgh$

$m = \rho \times v$

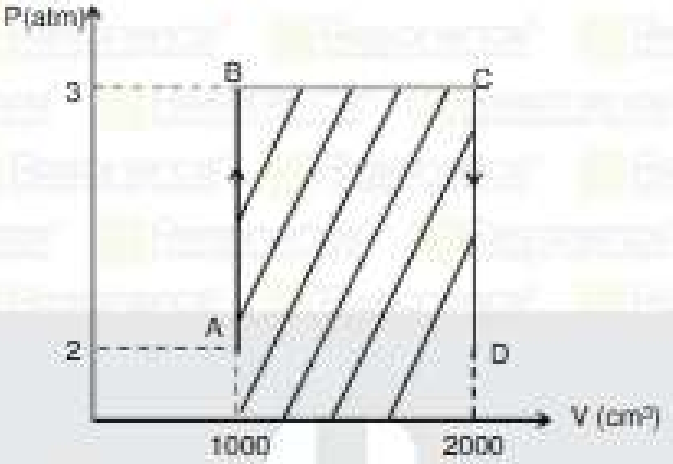
$= 10^3 \times 2 \times 1$

$h = 1$

$W = 2 \times 10^3 \times 1 \times 10$

$W = 2 \times 10^4$ J **Ans.**

20. Find out magnitude of work done in the process ABCD (in KJ) (1 atm. Lit = 101.3 J)



(1) 0.1 (2) 0.2 (3) 0.3 (4) 0.4

Ans. **(3)**

Sol. Work done = Area under the curve = $W_{AB} + W_{BC} + W_{CD}$

$W_{AB} = 0 = W_{CD}$, $W_{BC} = 3 \times 1000 \times 10^{-6} \times 10^5 = 0.3 \times 10^3$ J = 0.3 KJ

21. **Bohr modal**

Statement-1 : Bohr's modal applicable only for H-like species

Statement-2 : It is due to electron-repulsion effect

(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. **(1)**