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JEE (MAIN) 2026

MEMORY BASED QUESTIONS & TEXT SOLUTION

SHIFT-1

DATE & DAY: 02nd April 2026 & Thursday

PAPER-1

Duration: 3 Hrs.
Time: 09:00 – 12:00 IST

SUBJECT: PHYSICS

PART : PHYSICS

1. If $\vec{r} = 10t^2\hat{i} + 5t^3\hat{j}$ and mass of object, $m = 0.1$ kg then at $t = 1\text{sec}:-$

(A) momentum $= 2\hat{i} + 1.5\hat{j}$ (B) force $= 2\hat{i} + 3\hat{j}$

(C) Angular momentum $= 5\hat{k}$ (D) Torque $= 20\hat{k}$

(1) A, B, C are correct (2) A, C, D are correct

(3) A, C are correct (4) A, B, C, D are correct

Ans. **(4)**

Sol. $\vec{v} = 20t\hat{i} + 15t^2\hat{j}$

$\vec{a} = 20\hat{i} + 30t\hat{j}$

(Force) $\vec{F}_{t=1} = 2\hat{i} + 3\hat{j}; \vec{P}_{t=1} = m\vec{v}$ (momentum)

$= 2\hat{i} + 1.5\hat{j}$

Angular momentum

$\vec{L}_{t=1} = \vec{r} \times \vec{P}$

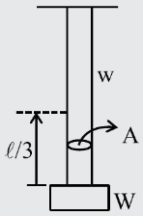
$= (10\hat{i} + 5\hat{j}) \times (2\hat{i} + 1.5\hat{j})$

$= 15\hat{k} - 10\hat{k} = 5\hat{k}$

Torque $\vec{t} = \vec{r} \times \vec{F}$ -

$= (10\hat{i} + 5\hat{j}) \times (2\hat{i} + 3\hat{j}) = 20\hat{k}$

2. If stress at $x = \ell/3$ from bottom is $\left(\frac{W}{A} + \frac{2}{\gamma} \cdot \frac{w}{A}\right)$ then find :



Ans. $(\gamma = 6)$

Sol. stress at $\frac{\ell}{3}$

$$\frac{T}{A} = \frac{W + \frac{W}{3}}{A} = \frac{W}{A} + \frac{2W}{6A}$$

$\gamma = 6$

3. A particle is moving such that its velocity vector at co-ordinate (x, y, z) is $\vec{v} = -x\hat{i} + 2y\hat{j} - z\hat{k}$. Find magnitude of acceleration at $(1,1,4)$.

Ans. $\sqrt{33}$ m/s

Sol. $\vec{v} = -x\hat{i} + 2y\hat{j} - z\hat{k}$

$$\therefore V_x = \frac{dx}{dt} = -x, V_y = \frac{dy}{dt} = 2y, V_z = \frac{dz}{dt} = -z$$

$$\vec{a} = \frac{d\vec{v}}{dt} = -\frac{dx}{dt}\hat{i} + 2\frac{dy}{dt}\hat{j} - \frac{dz}{dt}\hat{k}$$

$= +x\hat{i} + 4y\hat{j} + z\hat{k}$

$= \hat{i} + 4\hat{j} + 4\hat{k}$

$a = \sqrt{1 + 16 + 16} = \sqrt{33}$ m/s

4. The dimension of $\frac{1}{2}\in_0 E^2$ is $M^aL^bT^c$ then value of $a-2b+c=$?

(1) 1 (2) 2 (3) 3 (4) 4

Ans. **(1)**

Sol. $\frac{1}{2}\in_0 E^2 = \text{Energy density} = \frac{\text{Energy}}{\text{Volume}}$

$$= \frac{ML^2T^{-2}}{L^3}$$

$$= ML^{-1}T^{-2}$$

a = 1 b = –1 c = – 2

$\Rightarrow a-2b+C$

$= 1+2-2=1$

5. On a metal surface if light of wavelength λ falls stopping potential for emitted photoelectron is $3V_0$ and if light of wavelength 2λ falls stopping potential is V_0. Find threshold wavelength :-

Ans. **(4 λ)**

Sol. $\frac{hC}{\lambda}-\phi = 3eV_0 \ldots\ldots(1)$

$\frac{hC}{2\lambda}-\phi = eV_0 \ldots\ldots(ii)$

$\frac{hC}{\lambda}-\phi = \frac{3hC}{2\lambda}-3\phi$

$2\phi = \frac{hC}{2\lambda}$

$\phi = \frac{hC}{4\lambda} = \frac{hC}{\lambda_{th}}$

$\therefore \lambda_{th} = 4\lambda$

6. The equation of a plane progressive wave is given by $y = 5\cos\pi\left(200t-\frac{x}{150}\right)$ where x and y are in cm and t is in seconds. Find the wave velocity :

Ans. $(\mathbf{300\ m/s})$

Sol. $\omega = 200\pi$

$k = \frac{\pi}{150}$

$v = \frac{\omega}{k} = \frac{200}{\left(\frac{1}{150}\right)} = 200\times150$

$= 3\times10^4\ cm/s = 300\ m/s$

7. Consider two arrangement of wires. Find out ratio of magnetic field at center of semi-circular part :

(1) $\frac{2+\pi}{1+\pi}$ (2) $\frac{1+\pi}{2+\pi}$ (3) $\frac{2+\pi}{2+\pi}$ (4) $\frac{2+\pi}{3+\pi}$

Ans. **(1)**

Sol. $B_1 = \frac{\mu_0 I}{2\pi R} + \frac{\mu_0 I}{4R}$

$$B_2 = \frac{\mu_0 I}{4\pi R} + \frac{\mu_0 I}{4R}$$

$$\frac{B_1}{B_2} = \left(\frac{2+\pi}{1+\pi}\right)$$

8. If power dissipated in a coil having total number of turns ' N ', cross-section area ' A ' and radius of coil ' R ' when kept in a time varying magnetic field is P. Now if another coil having total number of turns ' 2 N ', cross-section area ' 2 A ' and radius of coil ' 3 R ' is placed is same time varying magnetic field power dissipated is αP, then value of α is :

(1) 108 (2) 324 (3) 216 (4) 432

Ans. **(1)**

Sol. $P = \frac{\varepsilon^2}{R} = \frac{\left[N\pi R^2 \frac{dB}{dt}\right]^2}{\rho \frac{2\pi RN}{A}}$

$$\alpha P = \frac{\varepsilon'^2}{R'} = \frac{\left[2\,N\pi(3R)^2 \frac{dB}{dt}\right]^2}{\rho \frac{2\pi(3R)}{2\,A} \cdot 2\,N} = 108P$$

9. A wooden cubical block of relative density 0.4 is floating is water. Side of cubical block is 10 cm . When a coin is placed on the block, it dips by 0.3 cm , weight of coin is:

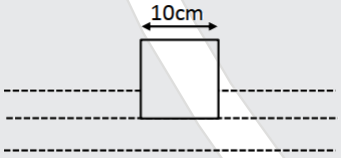
(1) 0.1 N (2) 0.2 N (3) 0.3 N (4) 0.4 N

Ans. **(3)**

Sol. $\frac{V_{submerged}}{V_{Total}} = \rho_{Rel} = \frac{4}{10}$

$\therefore$ height in liquid $= 4$ cm

$\therefore$ Density of block $= 400\ kg/m^3$



weight $= \rho\, V\, g$

$= (1000) \times \frac{0.3}{100} \times 100 \times 10^{-4} \times 10 = .3$ N

10. A container of initial volume $0.15\ m^3$ is expanded adiabatically from pressure 8 bar to final pressure 1 bar. If initial temperature is 140 K, then find work done by the gas :- $(C_p = 3R, C_v = 2R)$:-

Ans. **(120 KJ)**

Sol. $P_1 V_1^{\gamma} = P_2 V_L^{\gamma}$

$$\gamma = \frac{C_P}{C_V} = \frac{3}{2}$$

$$V_2 = \left(\frac{P_1}{P_2}\right)^{1/\gamma} \cdot V_1$$

$$V_2 = (8)^{2/3} \times 0.15 = 4 \times 0.15 = 0.6$$

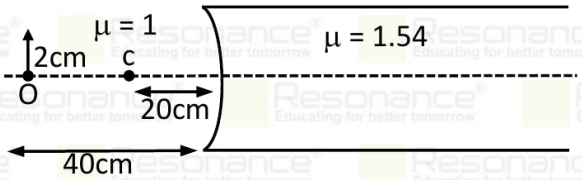
$$\omega = \frac{P_2V_2 - P_1V_1}{1-\gamma} \Rightarrow \left\{\frac{1 \times 0.6 - 8 \times 0.15}{1 - \frac{3}{2}}\right\} \times 10^5$$

$$= \left\{\frac{0.6 - 1.2}{-0.5}\right\} \times 10^5 = \frac{0.6}{0.5} \times 10^5$$

$$\Rightarrow 1.2 \times 10^5$$

$$\Rightarrow 120\text{KJ}$$

11. Object is placed at 40 cm from spherical surface whose radius of curvature is 20 cm . Find height of image formed.



(1) 2 cm (2) 4 cm (3) 0.96 cm (4) 1.96 cm

Ans. **(3)**

Sol. $\frac{\mu_2}{v}-\frac{\mu_1}{u}=\frac{\mu_2-\mu_1}{R}$

$$\frac{1.54}{v}-\frac{1}{(-40)}=\frac{1.54-1}{-20}$$

$$\frac{1.54}{v}=-\frac{1.54}{20}-\frac{1}{40}$$

$$\frac{1.54}{v}=-\frac{2.08}{40}$$

$$v=-29.61\ \text{cm}$$

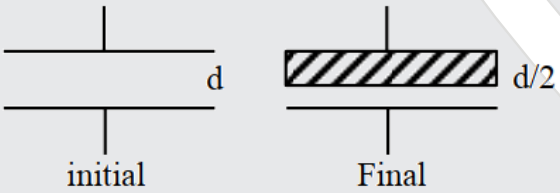
$$\frac{hi}{h_0}=\frac{\mu_1 v}{\mu_2 u}$$

$$=\frac{1\times(-29.61)}{1.54\times(-40)}$$

$$\frac{hi}{h_0}=0.48$$

$$hi=0.48\times 2=0.96\ \text{cm}$$

12. There is a parallel plate capacitor of capacitance C. If half of the space is filled with dielectric of dielectric constant $k=5$ as in the figure. Find percentage increase in capacitance.



Ans. **(66.67%)**

Sol. $C_i=\frac{A\epsilon_0}{d}$

$$\frac{1}{C_f}=\frac{d/2}{A\epsilon_0}+\frac{d/2}{A\epsilon_0 5}=\frac{d}{2A\epsilon_0}+\frac{d}{10A\epsilon_0}$$

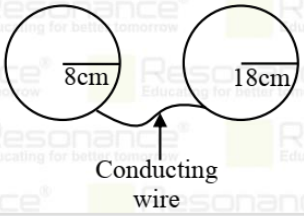
$$=\frac{6\,d}{10\,A\epsilon_0}=\frac{3\,d}{5\,A\epsilon_0}$$

$$C_f=\frac{5A\,\epsilon_0}{3d}$$

$$\Delta C=C_f-C_i=\frac{2}{3}\frac{A\,\epsilon_0}{d}$$

$$\%\ \text{increase}=\frac{\Delta C}{C}\times 100=\frac{2}{3}\times 100=66.67\%$$

13. Two sphere are connected with a conducting wire. E_{S_1} & E_{S_2} are electric field at surface of sphere at equilibrium, find $\frac{E_{S_1}}{E_{S_2}}$



(1) 4.5 (2) 1.125 (3) 2.25 (4) 7.5

Ans. **(3)**

Sol. $V_1 = V_2$

$$\frac{kq_1}{r_1} = \frac{kq_2}{r_2}$$

$$\frac{q_1}{q_2} = \frac{r_1}{r_2}$$

$$\frac{E_1}{E_2} = \frac{q_1}{q_2}\frac{r_2^2}{r_1^2} = \frac{r_2}{r_1} = \frac{18}{8} = \frac{9}{4} = 2.25$$

14. In Searl's experiment diameter of wire is measured with screw gauge of least count 0.001 cm and its value is 0.08 cm . Length of wire is 150 cm with least count 0.1 cm and elongation 0.5 cm with least count 0.001 cm . Weight suspended is 100 N then absolute error in Young's modulus is $N \times 10^9$ N/m^2. Then N is :

(1) 1.64 (2) 1.65 (3) 1.63 (4) 1.66

Ans. **(2)**

Sol. $Y = \frac{4WL}{\pi d^2 \ell} = 5.97 \times 10^{10}$ N/m^2

$$\frac{\Delta Y}{Y} = \frac{\Delta L}{L} + \frac{2\Delta d}{d} + \frac{\Delta \ell}{\ell}$$

$$\frac{\Delta Y}{5.97 \times 10^{10}} = \frac{0.1}{150} + \frac{2(0.001)}{0.08} + \frac{0.001}{0.5}$$

$$\Rightarrow \Delta Y = 1.65 \times 10^9 \text{ N/m}^2$$

15. Thin symmetric prism of $\mu = 1.5$. Find ratio of incident angle and minimum deviation.:

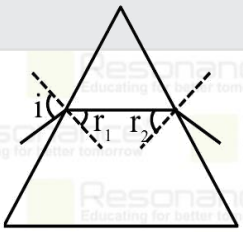
Ans. **(3/2)**

Sol. For small angle

$$10\mu_1 \sin(i) = \mu_2 \sin(r)$$

$$(1)i = (\mu)(r)$$

and $r_1 = r_2 = \frac{A}{2}$



$$i = (\mu)\left(\frac{A}{2}\right)$$

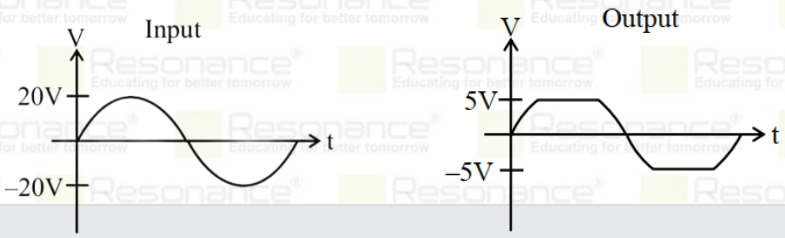
$$\delta_{min} = (\mu - 1)A$$

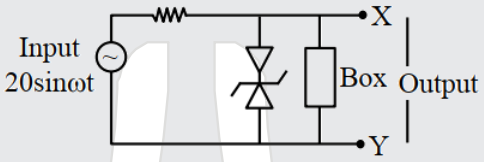
$$\frac{i}{\delta_{min}} = \frac{(\mu)(A/2)}{(\mu - 1)A} = \frac{\mu}{2(\mu - 1)} = \frac{1.5}{2(0.5)}$$

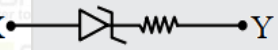
$$= 3/2$$

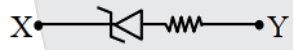
$$\frac{i}{\delta_{min}} = \frac{3}{2}$$

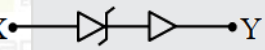
16. Diagram shows a circuit consisting of some elements. The input and output of the circuit is shown. Choose the correct option that shows the component in box. (Zener diode has a breakdown potential of 5 V)

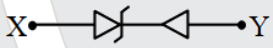




(1) 

(2) 

(3) 

(4) 

Ans. **(4)**

17. For diatomic gas, find the ratio Q: ΔU: W for isobaric process :-

(1) 2: 5: 7 (2) 2: 3: 5 (3) 2: 7: 3 (4) 7: 5: 2

Ans. **(4)**

Sol. $W = P\Delta V = nR\Delta T$

$$\Delta U = nC_v\Delta T = n\frac{f}{2}R\Delta T = n\frac{5}{2}R\Delta T$$

$$Q = \Delta U + W = nR\Delta T + \frac{5}{2}nR\Delta T$$

$$Q = \frac{7}{2}nR\Delta T$$

$$\frac{Q}{W} = \frac{7}{2}$$

$$\frac{\Delta U}{W} = \frac{5}{2}$$

Q: ΔU: W is 7: 5: 2

18. Angular momentum of the electron in a hydrogen atom is $\frac{3h}{2\pi}$, then find the energy of the electron in the orbit :-

(1) -13.6 eV (2) -3.4 eV (3) -1.51 eV (4) -0.85 eV

Ans. **(3)**

Sol. According to Bohar's model, $L = \frac{nh}{2\pi}$

$\therefore$ Electron is present in 3rd orbit.

$$E = \frac{-13.6}{n^2} = \frac{-13.6}{9}eV = -1.51eV$$

19. A satellite is revolving around planet of mass 2 M in orbit of radius R with time period is T_1. Another satellite is revolving around planet of mass 4 M in orbit of radius 2 R , with time period T_2. Find $\frac{T_1}{T_2}$.

(1) $\frac{1}{\sqrt{2}}$ (2) $\sqrt{2}$ (3) $\frac{1}{2}$ (4) $\frac{1}{2\sqrt{2}}$

Ans. **(3)**

Sol. $T = \frac{2\pi}{\sqrt{GM_s}} r^{\frac{3}{2}}$

$$\frac{T_1}{T_2} = \sqrt{\frac{M_{s_2}}{M_{s_1}}}\left(\frac{r_1}{r_2}\right)^{\frac{3}{2}}$$

$$= \sqrt{\frac{4M}{2M}}\left(\frac{R}{2R}\right)^{\frac{3}{2}}$$

$$= \sqrt{2}\left(\frac{1}{2}\right)^{\frac{3}{2}} = \sqrt{2}\frac{1}{\sqrt{8}}$$

$$= \frac{1}{2}$$

$$\frac{T_1}{T_2} = \frac{1}{2}$$

20. $Li^{+2} \longrightarrow Li^{+3} + e^-$:

Energy required for this process.

Given ionisation energy for ground state of hydrogen atom is 2.17×10^{-18} J.

(1) 19.53×10^{-18} J (2) 19.54×10^{-18} J (3) 19.56×10^{-18} J (4) 19.55×10^{-18} J

Ans. **(1)**

Sol. $E \propto \frac{Z^2}{n^2}$

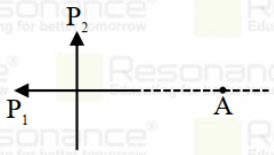
$$\frac{E_1}{E_2} = \left(\frac{Z_1}{Z_2}\right)^2 \times \left(\frac{n_2}{n_1}\right)^2$$

$$\frac{2.17 \times 10^{-18}}{E_2} = \left(\frac{1}{3}\right)^2 \times \left(\frac{1}{1}\right)^2$$

$$E_2 = 9 \times 2.17 \times 10^{-18}$$

$$= 19.53 \times 10^{-18}$$

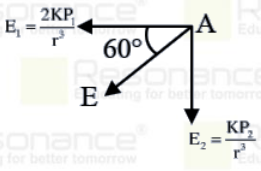
21. Net electric field at point A as shown in figure is at an angle of $60°$ with x -axis then, find $\frac{P_2}{P_1} = ?$



(1) $\frac{1}{\sqrt{3}}$ (2) $2\sqrt{3}$ (3) $\sqrt{3}$ (4) $\sqrt{3}/2$

Ans. **(2)**

Sol.



$$\tan 60^\circ = \frac{E_2}{E_1} = \frac{P_2}{2P_1}$$

$$\sqrt{3} = \frac{P_2}{2P_1}$$

$$\frac{P_2}{P_1} = 2\sqrt{3}$$

22. A liquid drop having diameter 2 mm and surface tension $0.08\ \mathrm{N/m}$. This drop splits into 512 identical small drops. Find change in surface energy ?

(1) 4.034 (2) 5 (3) 7.034×10^{-6} (4) 9.03

Ans. **(3)**

Sol. Vol ^{m} constant

$$V_1 = V_2$$

$$R = n^{1/3} \cdot r$$

$$1 = (512)^{1/3} \cdot r$$

$$r = \frac{1}{8}\ \mathrm{mm}$$

$$\Rightarrow \Delta SE = SE_2 - SE_1$$

$$= T \times 4\pi r^2 \times n - T \times 4\pi R^2$$

$$= T \times 4\pi\{nr^2 - R^2\}$$

$$= 0.08 \times 4\pi\left\{512 \times \left(\frac{1}{8}\right)^2 - 1^2\right\} \times 10^{-6}$$

$$= 0.08 \times 4\pi\{7\} \times 10^{-6} = 7.034 \times 10^{-6}$$

23. If angular position of a particle is given by $\theta = \frac{t^4}{4} + t^2$. Find angular acceleration at $t = 1$ s :

(1) $6\mathrm{rad/s^2}$ (2) $5\mathrm{rad/s^2}$ (3) $10\mathrm{rad/s^2}$ (4) $6\mathrm{rad/s^2}$

Ans. **(2)**

Sol. $\theta = \frac{t^4}{4} + t^2$

$$\omega = \frac{d\theta}{dt} = 4\frac{t^3}{4} + 2t$$

$$\omega = t^3 + 2t$$

$$\alpha = \frac{d\omega}{dt} = 3t^2 + 2$$

at $t = 1$ s

$$\alpha = 3(1)^2 + 2$$

$$= 5\mathrm{rad/s^2}$$

24. Wavelength used in single slit diffraction is 628 nm. Width of slit is 0.2 mm. Find the angular width of central maxima in degree:

(1) 0.36° (2) 0.38° (3) 0.45° (4) 0.40°

Ans. **(1)**

Sol. angular of width of central maxima $= \frac{2\lambda}{d}$

$$= \frac{2 \times 628 \times 10^{-9}}{0.2 \times 10^{-3}}$$

$$= 628 \times 10^{-5}$$

$$= 628 \times 10^{-5} \times \frac{180}{\pi}$$

$$= 35981.74 \times 10^{-5} = 0.36^\circ$$

25. Electric field of electromagnetic wave is $E = 800\sin\pi\left(10^8 t + \frac{x}{150}\right) V/m$. Where x in cm and ' t ' in sec. A charged particle is moving with speed of 1.5×10^6 m/s. Find the ratio of magnetic force to electric force on charge particle.

(1) 10^{+2} (2) 10^{-2} (3) 2×10^2 (4) 2×10^{-2}

Ans. **(2)**

Sol. $E = 800\sin\left(\pi\left(10^8 t + \frac{x}{150}\right)\right)$

$$V_{wave} = \frac{w}{k} = \frac{\frac{10^8\pi}{\pi}\ cm}{\frac{150}{s}} = 1.5 \times \frac{10^8\ m}{s}$$

$$\frac{F_{Magnetic}}{F_{Electric}} = \frac{qVB}{qE} = \frac{VB}{BV_{wave}} = \frac{V}{V_{wave}}$$

$$= \frac{1.5 \times 10^6}{1.5 \times 10^8} = \frac{1}{100} = 10^{-2}$$