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JEE (MAIN) 2026

MEMORY BASED QUESTIONS & TEXT SOLUTION

SHIFT-1

DATE & DAY: 04th April 2026 & Saturday

PAPER-1

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

SUBJECT: PHYSICS

REGISTERED & CORPORATE OFFICE (CIN: U80302RJ2007PLC024029):
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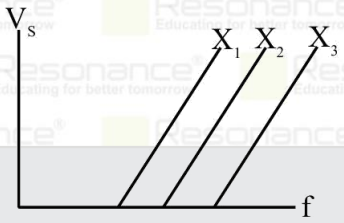
PART : PHYSICS

1. Graph shows stopping potential vs frequency of light incident. Choose the metal which will eject photoelectron with maximum kinetic energy for given frequency.



(1) X_1 (2) X_2 (3) X_3 (4) can't be predicted

Ans. **(1)**

Sol. $K_m = eVs = E - \phi = hf - \phi$

The metal with highest stopping potential i.e. lowest threshold frequency will give maximum K.E. i.e, X_1.

2. A particle is moving along x -axis where speed varies as $v^2 = 100 - x^2$. Determine time period :

(1) 4π (2) 8π (3) 2π (4) π

Ans. **(3)**

Sol. $v^2 = 100 - x^2$

$v = \sqrt{100 - x^2}$

Comparing with

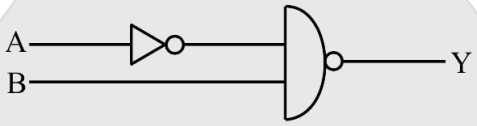
$v = \omega\sqrt{A^2 - x^2}$

$\omega = 1$

$A = 10$

Time period $(T) = \frac{2\pi}{\omega} = 2\pi$

3. Two 4 bits binary numbers $A = 1101$ and $B = 1010$ are given in input logic. Find output y.



(1) 1000 (2) 1101 (3) 0010 (4) 0111

Ans. **(2)**

Sol. $Y = \overline{\overline{A} \cdot B} = A + \overline{B}$

$A = 1101$

$B = 1010$

$\overline{B} = 0101$

$A + \overline{B} = 1101$

4. There is a spiral which has

$r_i = 3\ cm, r_{ext} = 6\ cm, I = 20\ mA$ and $N = 200$ where,

r_i : internal radius

r_{ext} : external radius

N : number of turns

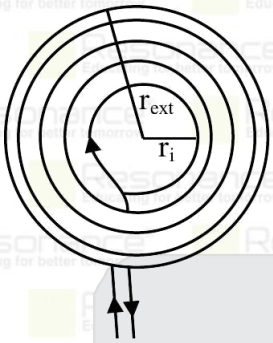
I : current

Find magnetic moment of the spiral :-

(1) $2.64 \times 10^{-2} Am^2$ (2) $4.87 \times 10^{-2} Am^2$ (3) $3.65 \times 10^{-2} Am^2$ (4) $6.67 \times 10^{-2} Am^2$

Ans. **(1)**

Sol.



$$dM = (dI)\pi r^2$$
$$= (IdN)\pi r^2$$
$$M = \int_i^f I\left(\frac{N}{r_{ex} - r_i}\right) dr\pi r^2$$
$$M = \frac{I\pi N}{r_{ex} - r_i}\left[\frac{r^3}{3}\right]_{ri}^{r_{ex}}$$
$$M = \frac{I\pi N}{3(r_{ex} - r_{in})}(r_{ex}{}^3 - r_i{}^3)$$
$$M = \frac{20 \times 10^{-3} \times 3.14 \times 200[6^3 - 3^3]10^{-6}}{3[3] \times 10^{-2}}$$
$$M = \frac{2373.84 \times 10^{-6}}{9 \times 10^{-2}}$$
$$M = 263.76 \times 10^{-4}$$
$$M = 2.64 \times 10^{-2} Am^2$$

5. A solid sphere of mass ' M ' and radius ' R ' is split into 2 pieces of masses $\frac{7M}{8}$ and $\frac{M}{8}$. Sphere of mass $\frac{7M}{8}$ is converted into a disc of radius 2 R and thickness ' t '. Its MOI becomes I_1 other piece is made into a solid sphere and its MOI becomes I_2. Find $\frac{I_1}{I_2}$:

(1) 150 (2) 140 (3) 130 (4) 120

Ans. **(2)**

Sol. Volume of $\frac{7M}{8}$

$$\frac{7M}{8} = \rho \times \pi(2R)^2 \times t$$
$$\frac{7M}{8} = \frac{3M}{4\pi R^3} \times \pi(4R^2)t$$
$$t = \frac{7R}{24}$$
$$I_1 = \frac{1}{2}\left(\frac{7M}{8}\right)(2R)^2$$
$$M = \frac{4}{3}\pi R^3 \rho$$
$$\rho = \frac{3M}{4\pi R^3}$$
$$\frac{M}{8} = \frac{4}{3}\pi r^3 \times \rho$$

$$\frac{M}{8}=\frac{4}{3}\pi r^3\times\frac{3M}{4\pi R^3}$$

$$r^3=\frac{R^3}{8}$$

$$r=\frac{R}{2}$$

$$I_2=\frac{2}{5}\left(\frac{M}{8}\right)\left(\frac{R}{2}\right)^2=\frac{MR^2}{80}$$

$$\frac{I_1}{I_2}=\frac{7MR^2}{4\times\frac{MR^2}{80}}=140$$

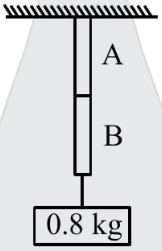
6. Length of rods are ℓ and 2ℓ respectively and their young's modulus are γ and 2γ respectively.

$\ell=0.314$ m

$R=0.2$ mm(same)

$\gamma=2\times10^9$

Find total extension $\Delta\ell=?$



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

Ans. **(3)**

Sol. $\Delta\ell\Rightarrow\Delta\ell_1+\Delta\ell_2$

$$\Rightarrow\frac{Mg.L_1}{A\gamma_1}+\frac{MgL_2}{A\gamma_2}$$

$$=\frac{Mg}{A}\left\{\frac{L}{\gamma}+\frac{2L}{2\gamma}\right\}=\frac{2MgL}{\gamma}$$

$$\Rightarrow\frac{0.8\times10}{\pi\times4\times10^{-6}}\left\{\frac{2\times0.314}{2\times10^9}\right\}$$

$=2\times10^{-4}$ m $=0.2$ mm

7. Nuclei A & B form a nucleus C. BE per nucleon for A, B & C are 3MeV, 7MeV & 6 MeV. Energy produced in following is :

$2A^3+B^4\rightarrow C^{10}$

(1) 12 MeV (2) 14 MeV (3) 13 MeV (4) 15 MeV

Ans. **(2)**

Sol. Energy produced ' Q ' is

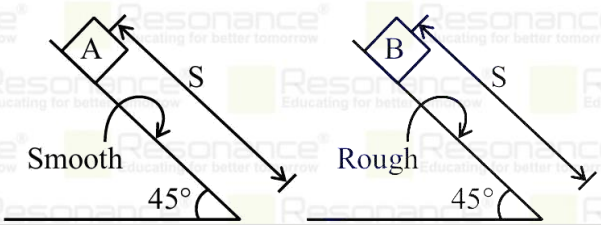
$Q=BE(RHS)-BE(LHS)$

$=10\times6-[2\times3\times3+4\times7]$

$=60-[18+28]$

$Q=60-46=14$MeV

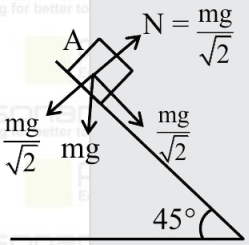
8. Two block A and B released from rest on two inclined plane of same inclination but one incline plane has rough surface as shown in figure. If block B takes 50% more time to reach bottom than A, find coefficient of friction (μ) :



(1) $\frac{5}{9}$ (2) $\frac{13}{9}$ (3) $\frac{3}{9}$ (4) $\frac{7}{9}$

Ans. **(1)**

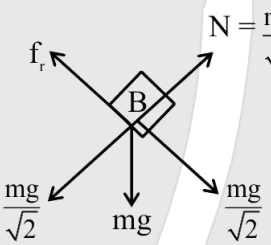
Sol.



$a = \frac{g}{\sqrt{2}}$

$S = \frac{1}{2}\left(\frac{g}{\sqrt{2}}\right)t^2$

$t_A = \sqrt{\frac{2\sqrt{2}S}{g}}$



$a = \frac{g}{\sqrt{2}}(1-\mu)$

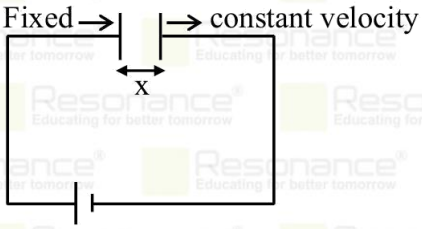
$t_B = \sqrt{\frac{2\sqrt{2}S}{g(1-\mu)}}$

$t_B = 1.5t_A \Rightarrow t_B = \frac{3}{2}t_A$

$\frac{2\sqrt{2}S}{g(1-\mu)} = \frac{9}{4}\left(\frac{2\sqrt{2}S}{g}\right) \Rightarrow 1-\mu = \frac{4}{9}$

$\mu = 1 - \frac{4}{9} = \frac{5}{9}$

9. If right plate of parallel plate capacitor is pulled at constant velocity. Then the rate of change of energy stored in capacitor is proportional to :-



(1) x^{-2} (2) x^{-3} (3) x^{-1} (4) x^2

Ans. **(1)**

Sol. Capacitance $= C = \frac{\varepsilon_0 A}{x}$

Energy stored $= U = \frac{1}{2}Cv^2$

$$U = \frac{1}{2}\frac{\varepsilon_0 A}{x}v^2$$

$$\frac{dU}{dt} = \frac{1}{2}\varepsilon_0 A v^2\left(-\frac{1}{x^2}\right)\frac{dx}{dt}$$

$$\frac{dU}{dt} \propto \frac{1}{x^2}$$

10. If force $\vec{F} = 2t\hat{i} + 3t^2\hat{j}$ and mass of particle $m = 2$ Kg then find power at $t = 2$ s if particle was initially at rest :

(1) 54 watt (2) 58 watt (3) 56 watt (4) 52 watt

Ans. **(3)**

Sol. $\vec{a} = \frac{\vec{F}}{m} = t\hat{i} + \frac{3t^2}{2}\hat{j}$

$\int dv = \int adt$

$\vec{v} \Rightarrow \frac{t^2}{2}\hat{i} + \frac{t^3}{2}\hat{j}$

$P \Rightarrow \vec{F}\cdot\vec{v} \Rightarrow t^3 + \frac{3}{2}t^5$

at $t = 2$ s

$P = 2^3 + \frac{3}{2}\times 2^5$

$= 8 + 3\times 2^4$

$= 8 + 48$

$\Rightarrow 56$ watt

11. Resolving power of a telescope is 5×10^{-7}rad. If wavelength of incident light is 500 nm , then find diameter of aperture of telescope. ($\lambda = 500$ nm)

(1) 1.22 (2) 4.66 (3) 2.33 (4) 0.56

Ans. **(1)**

Sol. $\lambda_\theta \Rightarrow \frac{1.22\lambda}{D}$

$$5\times 10^{-7} = \frac{1.22\times 500\times 10^{-9}}{D}$$

$D \Rightarrow 1.22$ m

12. An ideal gas has number of moles $n = 2$ initial volume V_0 and pressure $P = P_0\left[1 + \left(\frac{V_0}{V}\right)^2\right]^{-1}$ is going from A (initial) to B (final) state so that volume becomes $3V_0$ find out $T_A - T_B$.

(1) $\frac{11P_0V_0}{10R}$ (2) $\frac{5P_0V_0}{11R}$ (3) $\frac{11P_0V_0}{5R}$ (4) $\frac{10P_0V_0}{11R}$

Ans. **(1)**

Sol. For $V = V_0, P = \frac{P_0}{2}$

$$\frac{P_0}{2}\times V_0 = 2\times RT_A$$

$$T_A = \frac{P_0 V_0}{4R}$$

for $V = 3V_0$ $P = \frac{9P_0}{10}$

$\frac{9P_0}{10} \times 3\ V_0 = 2 \times RT_B$

$T_B = \frac{27P_0\ V_0}{20R}$

So, $T_B - T_A$

$= \frac{11P_0\ V_0}{10R}$

13. A slit of width ' a ' is illuminated by the light of wavelength ' λ '. The linear separation between 1^{st} and 3^{rd} minima in the diffraction pattern produced on a screen placed at a distance ' D ' from the slit is ___ .

(1) $\frac{3D\lambda}{a}$ (2) $\frac{3D\lambda}{2a}$ (3) $\frac{D\lambda}{a}$ (4) $\frac{2D\lambda}{a}$

Ans. **(4)**

Sol. For minima

$y = \frac{nD\lambda}{a}; n = \pm1, \pm2, ...$

For 1^{st} minima $y_1 = \frac{D\lambda}{a}$

For 3^{rd} minima $y_3 = \frac{3D\lambda}{a}$ separation $= y_3 - y_1$

$= \frac{2D\lambda}{a}$

14. In a screw gauge when the circular scale is given five complete rotation, it moves linearly by 2.5 mm . If the circular scale has 100 divisions, the least count of screw gauge is (mm)

(1) 1×10^{-2} (2) 5×10^{-3} (3) 1×10^{-3} (4) 2×10^{-2}

Ans. **(2)**

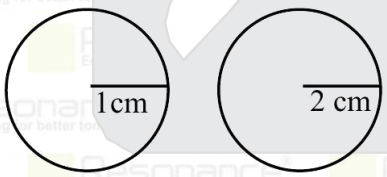
Sol. Pich $\Rightarrow \frac{2.5\ mm}{5} = 0.5\ mm = 5 \times 10^{-4}\ m$

L.C. $\Rightarrow \frac{\text{Pitch}}{\text{No. of divisions}} = \frac{5\times10^{-4}}{100}\ m$

$= 5 \times 10^{-6}\ m$

$= 5 \times 10^{-3}\ mm$

15.



Find the work done in expanding the soap bubble from 1 cm to 2 cm . Surface tension is $\gamma = 7.2 \times 10^{-2}$ N/m

(1) 542.6×10^{-6} J (2) 543.6×10^{-6} J (3) 542.6×10^{-5} J (4) 545.6×10^{-6} J

Ans. **(1)**

Sol. $W = \Delta U = 2\gamma[4\pi(2r)^2 - 4\pi r^2]$

$W = 2 \times 7.2 \times 10^{-2} \times 4\pi[4r^2 - r^2]$

$= 8\pi \times 7.2 \times 10^{-2} \times 3 \times (1 \times 10^{-2})^2$

$W = 542.6 \times 10^{-6}$ J

16. 2 forces are acting on a body:

$\vec{F}_1 = 3\hat{i} - 5\hat{j} + 2\hat{k}$

$\vec{F}_2 = 8\hat{i} + 2\hat{j} - 3\hat{k}$
and displacement of body is 25 m along $3\hat{i} - 4\hat{j}$.
Find work done :-
(1) 225 Joule (2) 200 Joule (3) 125 Joule (4) 325 Joule

Ans. **(1)**

Sol. $F_{net} = \vec{F}_1 + \vec{F}_2$

$\vec{F}_{net} = 11\hat{i} - 3\hat{j} - \hat{k}$

$\vec{S} = 25\dfrac{(3\hat{i} - 4\hat{j})}{5} = 15\hat{i} - 20\hat{j}$

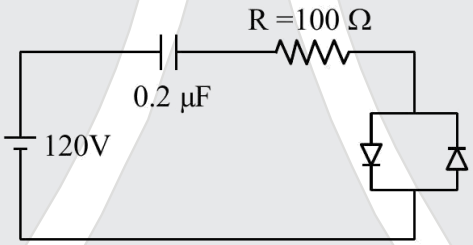
work $= \vec{F}.\vec{S}$

$= (11\hat{i} - 3\hat{j} - \hat{k}) \cdot (15\hat{k} + -20\hat{j})$

$= 165 + 60$

$= 225$ Joule

17. Each diode in circuit has 10Ω resistance in forwards bias and infinite resistance in reverse. Find time constant of circuit :



(1) 20μ s (2) 22μ s (3) 18μ s (4) 5μ s

Ans. **(2)**

Sol. $\tau = RC$

$= 110 \times 0.2 \times 10^{-6}$

$= 22\mu$ s

18. Find final temperature of mixture of two gases. If one gas is at pressure P_1, temperature T_1, no. of moles n_1 & volume V_1. and second gas is at pressure P_2 temperature T_2, no. of moles n_2 & volume V_2. If final pressure is ' P ' and Final volume is ' V '. Then find temperature of mixture.

(1) $\frac{PV}{\frac{P_1V_1}{T_1}+\frac{P_2V_2}{T_2}}$

(2) $\frac{PV(T_1+T_2)}{P_1V_1+P_2V_2}$

(3) $\frac{(P_1V_1+P_2V_2)(T_1+T_2)}{PV}$

(4) $\frac{PV}{P_1V_1}T_1 + \left(\frac{PV}{P_2V_2}\right)T_2$

Ans. **(1)**

Sol. $n = n_1 + n_2$

$\therefore PV = nRT \Rightarrow n = \dfrac{PV}{RT}$

$\dfrac{P(V)}{T_{Final}} = \dfrac{P_1V_1}{T_1} + \dfrac{P_2V_2}{T_2}$

$$\frac{PV}{RT_f} = \frac{P_1 V_1}{RT_1} + \frac{P_2 V_2}{RT_2}$$

$$T_f = \frac{PV}{P_1 V_1/T_1 + P_2 V_2/T_2}$$

19. Two projectiles A & B are launched with same speed at angles $15°\&30°$ respectively. Find ratio of range A to range B .

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

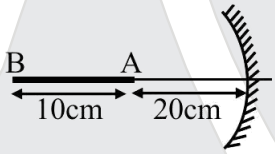
Ans. **(2)**

Sol. $\frac{R_A}{R_B} = \frac{u^2 \sin 2\theta_A/g}{u^2 \sin 2\theta_B/g}$

$$= \frac{\sin 2\theta_A}{\sin 2\theta_B} = \frac{\sin 30°}{\sin 60°} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}$$

$$\frac{R_A}{R_B} = \frac{1}{\sqrt{3}}$$

20. Find length of image of rod AB .



$f = 10$ cm

(1) 10 cm (2) 5 cm (3) 15 cm (4) 20 cm

Ans. **(2)**

Sol. For A $u = -20$ cm, $f = -10$ cm

$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ $\therefore v = \frac{u \times f}{u - f} = -20$ cm

For B $u = -30$ cm, $f = -10$ cm

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$v = \frac{uf}{u - f} = -15 \text{ cm}$$

Length of image $= 20 - 15 = 5$ cm

21. In an AC circuit a resistor 100Ω, inductor 0.1 mH and a capacitor are connected in series against on AC source 220 V, 70 Hz. If power factor of circuit is $\frac{1}{2}$ and $|X_L - X_C| = \sqrt{3}\alpha$ Find α.

(1) $100\sqrt{3}$ (2) 100 (3) $\frac{100}{\sqrt{3}}$ (4) 1000

Ans. **(2)**

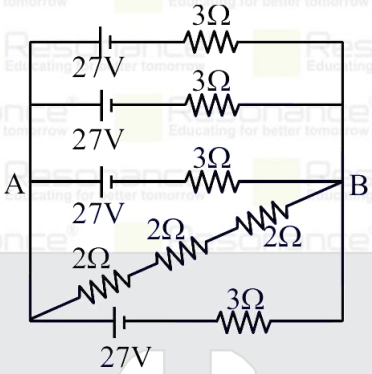
Sol. $\cos\phi = \frac{1}{2}$ $\phi = 60°$

$$\therefore \tan\phi = \sqrt{3} = \frac{|X_L - X_C|}{R}$$

$$\therefore |X_L - X_C| = R\sqrt{3} = 100\sqrt{3}\Omega$$

$\alpha = 100$

22. Find voltage V_{AB} and i_{BA} ?



(1) 24 V, 2 A (2) 24 V, 1 A (3) 18 V, 2 A (4) 18 V, 1 A

Ans. **(2)**

Sol. Equivalent circuit :

$$Eeq = \frac{\frac{27}{3}+\frac{27}{3}+\frac{27}{3}+\frac{0}{6}+\frac{27}{3}}{\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{6}+\frac{1}{3}}$$

$$= \frac{36}{\frac{9}{6}} = 24 \text{ V}$$

$$r_{eq} = \frac{1}{\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{6}+\frac{1}{3}} = \frac{2}{3}\Omega$$

$$i_{BA} = \frac{3}{3}$$

$= 1$ A