COMMON PRE-BOARD EXAMINATION 2022-23

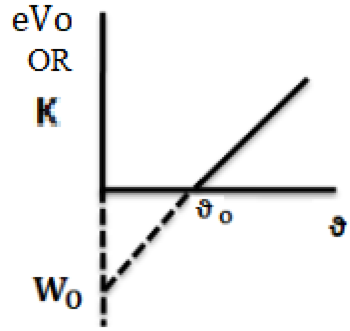
Subject: PHYSICS (042) Marking Scheme

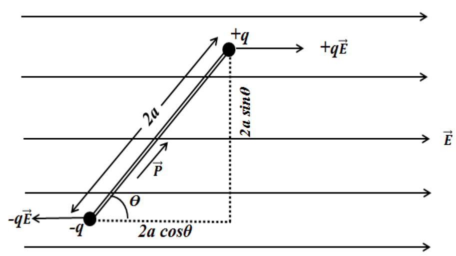
Class: XII | Time: 3 Hours

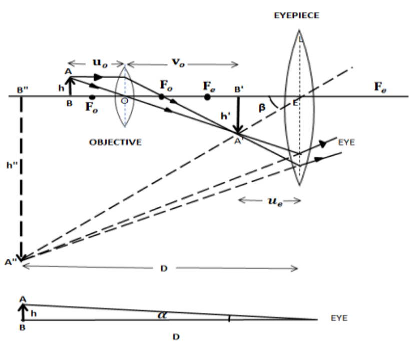
Date: | Max. Marks: 70

	SECTION A	
1.	(c) the number of flux lines entering the surface must be equal to the number of flux lines leaving it.	1
2.	(a) 7.5×10^{-9}J	1
3.	(d) remains the same throughout the conductor.	1
4.	(a) Drift velocity	1
5.	(d) The electron will continue to move with uniform velocity along the axis of the solenoid	1
6.	(a) 5 mA	1
7.	(b) *l* decreases and A increases.	1
8.	(a) looking from above, the induced current in the coil will be anti-clockwise.	1
9.	(c) 14.4 W	1
10.	(b) another capacitor should be added in parallel to the first.	1
11.	(a) $\frac{E}{\sqrt{2}}$	1
12.	(d) 0.30 mm	1
13.	(b) $\lambda_\alpha < \lambda_p = \lambda_n > \lambda_e$	1
14.	(c) $\frac{20}{7}\lambda$	1
15.	(c) directly proportional to the cube root of its mass number	1
16.	(b) Both A and R are true but R is not the correct explanation of A.	1
17.	(d) A is false but R is true.	1
18.	(c) A is true but R is false.	1
	SECTION B	
19.	$\frac{kqQ}{x^2} = \frac{kqQ}{(r-x)^2} \rightarrow x = r/2$ $\frac{kqQ}{x^2} = \frac{kQQ}{r^2} \rightarrow q = \frac{Q}{4}$	1 1
20.	Diamagnetic in nature. Any three properties	1 1½
21.	$\lambda = \frac{2\pi}{300\pi} = \frac{1}{150} = 6.6 \times 10^{-3}$m $B_z = 10^{-7}\sin(2 \times 10^{11}t + 300\pi x)$ T OR In microwave ovens, the frequency of the microwave is selected to match the resonant frequency of water molecules so that energy from waves is transferred to the K.E of molecules which in turn increases the temperature of any food containing water	½ 1½ 2
22.	Focal length decreases $\frac{1}{f} \propto \mu$	1 1

23.	$\frac{I_1}{I_2} = \frac{3}{2}$ $\frac{I_1}{I_2} = \frac{2}{1}$	1 1
24.	No, the binding energy of $^3He_1$ is greater $^3He_2$ has two protons and one neutron and $^3He_1$ has one proton and two neutrons hence coulombs force between protons are absent.	½ 1½
25.	When a p-n junction diode is forward biased, it offers less resistance and a current flow through it; but when it is reverse biased, it offers high resistance and almost no current flows through it. Thus diode conducts in forward bias and does not conduct in reverse bias This unidirectional property of a diode enables it to be used as a rectifier.	1 1
	SECTION C	
26.	$V = I_g(G+R_1)$. ....(1) $\frac{V}{2} = I_g(G+R_2)$ ....(2) $2 = \frac{G+R_1}{G+R_2}$ [(1) / (2)] $G = R_1 - 2R_2$ ....(3) Suppose R is the resistance in series for range 2V then $2V = I_g(G+R)$ ....(4) $2 = \frac{G+R}{G+R_1}$ [(1) / (2)] $R = G+2R_1$ $R = R_1 - 2R_2 + 2R_1$ [from (3)] $R = 3R_1 - 2R_2$	1 2
27.	$N_1 \Phi_1 = M_{12} I_2$ $n_1 l . \mu_0 n_2 I_2 . \pi r_1^2 = M_{12} I_2$ $M_{12} = \mu_0 n_2 n_1 \pi r_1^2 l$ $M = \mu_0 n_2 n_1 \pi r_1^2 l$ Any two	½ ½ ½ ½ 1
28.	Root mean square value of alternating emf is defined as that value of steady voltage, which would generate the same amount of heat in a given resistance in a given time, as is done by the alternating emf when applied to the same resistance for the same time $\frac{V_{dc}^2}{R}T = \int_0^T \frac{V_{ac}^2}{R} dt$ $= \int_0^T \frac{V_0^2 \sin^2 \omega t}{R} dt$ $\frac{V_{rms}^2}{R}T = \frac{V_0^2}{2R}T$ $V_{rms} = \frac{V_0}{\sqrt{2}}$ OR $X_L = \omega L = L2\pi f = 2\pi \text{ x } \frac{50}{\pi} \text{ x } 1 = 100\Omega$ $X_C = \frac{1}{\omega c} = \frac{1}{20\times10^{-6}\times2\pi\times\frac{50}{\pi}} = 500\Omega$	3 3

	$I_{rms} = \frac{50}{\sqrt{(300)^2 + (500-100)^2}} = 0.1A$	
29.	 Y- intercept of the graph gives work function W_0. It is different for different metal Slope of the graph is planks constant h. It is constant. OR $K = \frac{hc}{\lambda} - W_0 \quad = \frac{6.63\times10^{-34}\times3\times10^{8}}{2000\times10^{-10}\times1.6\times10^{-19}} - 4.2 = 6.2 - 4.2 = 2$ eV When intensity changes kinetic energy does not change 6.2 – 6.5 = 3 eV	1 1 1 1½ ½ 1
30.	$\frac{hc}{\lambda_1} = W_0 + eV_0$ & $\frac{hc}{\lambda_2} = W_0 + 2eV_0$ $eV_0 = \frac{hc}{\lambda_1} - W_0$ & $2eV_0 = \frac{hc}{\lambda_2} - W_0$ $\frac{hc}{\lambda_1} - W_0 = \frac{1}{2}[\frac{hc}{\lambda_2} - W_0]$ $W_0 = hc[\frac{2}{\lambda_1} - \frac{1}{\lambda_2}]$ $\frac{hc}{\lambda_{max}} = hc[\frac{2}{\lambda_1} - \frac{1}{\lambda_2}]$ $\lambda_{max} = \frac{1}{[\frac{2}{\lambda_1} - \frac{1}{\lambda_2}]}$	½ ½ ½ ½ ½ ½
	SECTION D	
31.	$E = \frac{\sigma}{\varepsilon_0} = \frac{q}{A\,\varepsilon_0}$ $u = \frac{1}{2}\varepsilon_0 E^2 = \frac{1}{2}\varepsilon_0[\frac{q}{A\,\varepsilon_0}]^2 = \frac{1}{2\,\varepsilon_0}[\frac{q}{A}]^2$ $u \propto \frac{1}{A^2}$ Thus $u_A > u_B$ $C_{12} = \frac{C_1C_2}{C_1+C_2} = \frac{6\mu X 6\mu}{6+6} = 3\mu F$ $q_{12} = C_{12}V = 3X10^{-6}X12 = 36X10^{-6}C = q_2 = q_2$ $q_3 = C_3V = 6X10^{-6}X12 = 72X10^{-6}C$ $C_{123} = C_{12} + C_3 = 3X10^{-6} + 6X10^{-6} = 9X10^{-6}F$ $U = \frac{1}{2}C_{123}V^2 = \frac{1}{2}X9X10^{-6}X(12)^2 = 6.48 X 10^{-4}J$ OR	1 1 3

	 Torque $\tau = F \perp^r$ distance $= q\,E\,2a\sin\theta$ $= P\,E\,\sin\theta$ $\vec{\tau} = \vec{P} \times \vec{E}$ Direction of torque is perpendicular to the plane, containing dipole moment and electric field OR Torque tends to align dipole such that its moment lies along the direction of external electric field [means bringing to equilibrium position] $W = \int_{\theta_1}^{\theta_2} dW = \int_{\theta_1}^{\theta_2} PE\sin\theta\ d\theta$ $= -PE\,[\cos\theta_2 - \cos\theta_1]$ $= -PE[\cos\theta - \cos 90]$ $W = -P\,E\cos\theta$ $U = -\vec{P}.\vec{E}$	½ 1½ 1 2
32.	$E_{eq} = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2} = \frac{1.5\ X\ 0.3 + 2\ X\ 0.2}{0.2+0.3} = 1.7V$ $r_{eq} = \frac{r_1\,r_2}{r_1 + r_2} = \frac{0.2 X\ 0.3}{0.2+0.3} = 0.12\Omega$ $\frac{R_1}{R_5} = \frac{R_4}{R_3} \rightarrow \frac{1}{2} = \frac{1}{2}$ $R_{15} = 1+2 = 3\Omega$ $R_{43} = 2+4 = 6\Omega$ $R_P = \frac{3\ X\ 6}{3\ +\ 6} = 2\Omega$ $I = \frac{V}{R_P} = \frac{4}{2} = 2A$ OR $V_1 = E_1 - I_1 r_1$ then $I_1 = \frac{E_1 - V_1}{r_1} = \frac{E_1 - V}{r_1}$ $V_2 = E_2 - I_2 r_2$ then $I_2 = \frac{E_2 - V_2}{r_2} = \frac{E_2 - V}{r_2}$ $I = I_1 + I_2 = \frac{E_1 - V}{r_1} + \frac{E_2 - V}{r_2} = \left(\frac{E_1}{r_1} + \frac{E_2}{r_2}\right) - V\left(\frac{1}{r_1} + \frac{1}{r_2}\right)$ $V = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2} - I\frac{r_1 r_2}{r_1 + r_2} = E_{eq} - Ir_{eq}$ $E_{eq} = \frac{E_1 r_2 + E_2 r_1}{r_1 + r_2}$ $r_{eq} = \frac{r_1 r_2}{r_1 + r_2}$ $\frac{E_{eq}}{r_{eq}} = \frac{E_1}{r_1} + \frac{E_2}{r_2} + \cdots .. + \frac{E_n}{r_n}$ $\frac{1}{r_{eq}} = \frac{1}{r_1} + \frac{1}{r_2} + \cdots .. + \frac{1}{r_n}$	2 3 2

	$\frac{1}{r_{eq}} = \frac{1}{r} + \frac{1}{r} + \cdots + \frac{1}{r} = \frac{n}{r}$ $r_{eq} = \frac{r}{n}$ $I = \frac{E_{eq}}{R+r_{eq}} = \frac{E}{R+\frac{r}{n}} = \frac{nE}{nR+r}$	2 1
33.	a) $m = \frac{-140}{5} = -28$ b) $m = \frac{-140}{5}[1 + \frac{5}{25}] = -33.6$ c) Separation = 140 + 5 = 145 cm d) $\alpha = \frac{1}{30}$ rad & $h = \frac{140}{30} = 4.67$ cm e) $m_e = 1 + \frac{5}{25}$ $h' = \frac{140}{30}$ X 6 = 28 cm OR  Objective:- It is a convex lens of short focal length and small aperture Eyepiece:- It is a convex lens of comparatively larger focal length and larger aperture Diagram $m = \frac{\tan\beta}{\tan\alpha} = \frac{h^I}{h}\frac{D}{u_e} = m_o m_e = \frac{v_o}{u_o}\left(1+\frac{D}{f_e}\right) = \frac{-L}{f_o}\left(1+\frac{D}{f_e}\right)$	1 1 1 1 1 1 1 3
	SECTION E	
34.	a) Two conditions b) $\frac{\sin i}{\sin 30°} = \sqrt{3}$ hence $i = 60°$ c) Violet OR Directional proportional	2 1 1
35.	a) Decreases b) $R = \frac{V_{cell} - V_{Diode}}{I} = \frac{1.5 - 0.5}{5\times10^{-3}} = 200\Omega$ c) P-type + N type OR Forward + Reverse	1 1 1+1

******