FIRST PRE-BOARD EXAMINATION – 2024-2025

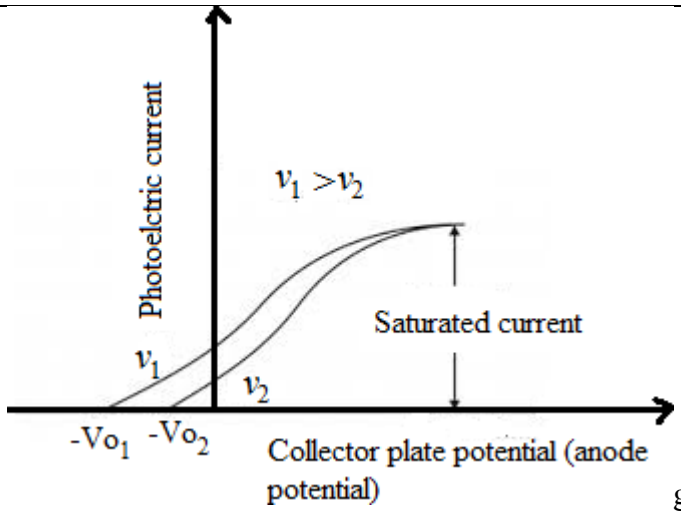
SUBJECT: PHYSICS

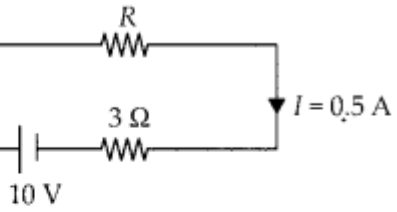
Class: XII
Maximum Marks: 70

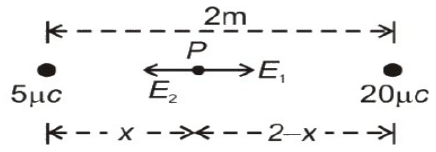
MARKING SCHEME

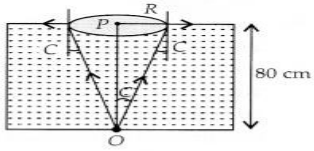
1.	(b) $\frac{q\lambda}{2\pi\epsilon_0 r}$	1
2	(b) Decreases	1
3	(d) Equidistant Planes normal to electric field.	1
4	(c) the resistance will be halved and the specific resistance will remain unchanged	1
5	(b) Straight and parallel	1
6	(c) the charge carriers are electrons and holes in the valence band at higher temperatures	1
7	(b) 1-S, 2-P, 3- Q, 4-R	1
8	(a)Concave lens	1
9	(d) – 3.75 D	1
10	(c)4:1	1
11	(a) decrease with increase of work function	1
12	(a) 3.6×10^{-15} m	1
13	c	1
14	a	1
15	b	1
16	a	1
	SECTION B	
17	Diagram ½ Derivation 1.5M	2
18	Definition.(1/2) Derivation (1.5 M) OR Definition- ½ M Derivation 1.5 M	2

19	A current-carrying solenoid behaves like a bar magnet because a magnetic field develops along its axis, i.e., along with its length.(1) The magnetic moment associated with the given current-carrying solenoid is calculated as: M = N I A =800×3×2.5×10−4 =0.6 J/T(1)	2
20	Second excited state : n=3 $E_{n=\frac{-13.6}{n^2}}$ eV. (0.5 M) Energy in n=3 quantum state = -1.51 eV. (0.5M) E=-1.51 -(-13.6) (0.5M) =12.09 eV (0.5M)	2
21	Diffusion and Drift (½ M + ½ M) Explanation of formation of barrier – 1M	2
	SECTION -C	
22	Definitions – 1/2M + ½ M atomic mass $M(H)$ of hydrogen and nuclear mass (M_n) are $M(H) = 1.007825u$ and $M_n = 1.008665u$ Mass defect $\Delta m = [M(H) + M_n - M(D)]; M(D) = 2.016490u - 2.014102u = 0.002388u$ As $1u$ corresponds to $931.494MeV$ energy, therefore, mass defect corresponds to energy $E_b = 0.002388 \times 931.5 = 2.224MeV$ 2M	3

23	 graph- 1M The photoelectric equation in terms of stopping potential V0 is given by $eV_0 = h\nu - h\nu_o$ So, $V_0 \propto \nu$ - 1M for explanation Thus, Stopping potential will be higher for ν_1. – 1M	3
24	Ray diagram-1Mark working of a reflecting telescope-1 two advantages of a reflecting telescope over a refracting telescope-1 OR Ray diagram-1Mark Derivation -2Marks	3
25	Diagram-0.5 M Derivation -1.5 M Definition of 1Ampere -1 M	3
26	(i) When switch S is closed : $Q_1 = Q_2 = 10\ \mu C$ (before dielectric slab) When Switch is opened and dielectric is introduced, $Q_1 = KC_1\ V = 50\ \mu C$ (increases 5 times) , (½ M) $Q_2 = KC_2 \frac{V}{K} = 10\ \mu C$ (remains same) (½ M) (ii) P.d. across C_1 is still 5V (½ M) and across C_2 will become $V' = \frac{V}{5} = \frac{5}{5} = \mathbf{1V}$ (1/2 M) (iii) Initially (when the switch is closed) both will store same amount energy. (U_0)	3

	After the dielectric is introduced : $U_1 = KU_0$ $U_2 = U_0/ K$ (1/2 M) $\frac{U1}{U2}$ = K^2 :1 = 25:1 (½ M)	
27	(a) yes. While charging -- 1M (b) numerical- 2M $I = \frac{E}{R+r}$  $0.5 = \frac{10}{R+3}$ $R + 3 = 20$ $R = 17\ \Omega$ Terminal voltage of the battery $V = E - Ir$ $V = 10 - 0.5 \times 3 = 8.5$ V OR i) statements (½ M each). ii) Diagram – ½ M & derivation – 1.5 M	3
28	Rectifier circuit diagram-1M Working-1M Input and Output Wave forms-1M	3
	SECTION - D	
29	1) c 2)d 3)a 4) c OR 4) c	4
30	1)d 2)b 3)b 4) d OR 4) d	4
31	Definition of Electric Dipole moment- 0.5 M Diagram (0.5M) & Derivation-2 M	5

	Let at point P the electric field is zero.  $\Rightarrow \quad E_1 - E_2 = 0$ $\Rightarrow \quad \frac{1}{4\pi \in_0}\frac{q_1}{x^2} - \frac{1}{4\pi \in_0}\frac{q_2}{(2-x)^2}$ $\Rightarrow \quad \frac{q_1}{q_2} = \left(\frac{x}{2-x}\right)^2$ $\Rightarrow \quad \frac{5\times10^{-6}}{20\times10^{-6}} = \left(\frac{x}{2-x}\right)^2$ $\Rightarrow \frac{x}{2-x} = \sqrt{\frac{1}{4}} = \frac{1}{2}$ $\Rightarrow \quad 2x = 2-x$ $\Rightarrow \quad 3x = 2$ $\Rightarrow \quad x = \frac{2}{3}$ m from 5 μc (2 M for numerical) OR a) Diagram (0.5M) & Derivation-2.5 M b) Let us assume that the given square be one face of the cube of edge 10 cm. As charge of +10 μC is at a distance of 5 cm above the centre of a square, so it is enclosed by the cube. Hence by Gauss's theorem, electric flux linked with the cube is $\phi = \frac{q}{\varepsilon_0} = \frac{10\times10^{-6}}{8.85\times10^{-12}} = 1.13 \times 10^6 \text{ N m}^2 \text{ C}^{-1}$ So, the magnitude of the electric flux through the square is $\phi_{sq} = \frac{\phi}{6} = \frac{1.13}{6} \times 10^6$ or $\phi_{sq} = 1.9 \times 10^5 \text{ N m}^2 \text{ C}^{-1}$ (2)	
32	(I) (a)TRANSFORMER Diagram-0.5 M Principle: 0.5 M Working: 2M (b) The two sources of energy losses are eddy current losses and flux leakage losses. (any two) 1M (c)There is no violation of the principle of the conservation of energy in a step-up transformer. When output voltage increases the output current decreases automatically keeping the power the same.1M	(5 Marks)

	OR Determination of source frequency -1 M Obtaining impedance & amplitude – 1M+1 M Determining RMS drop - 0.5 M for each drop (across L, C, R, and LC) (total 2 M) (Refer NCERT)	
33	2- Conditions-0.5 M each – (1Mark) Relation between Critical angle and Ref.Index-1 Mark 2 applications – 1M. Numerical – correct answer (2M) We know $\sin C = \frac{1}{{}^{a}\mu_{w}}$ $C = \sin^{-1}\left(\frac{1}{{}^{a}\mu_{w}}\right)$  $C = \sin^{-1}\left(\frac{1}{1.33}\right) \Rightarrow \sin C = \frac{1}{1.33} = \frac{3}{4}$ $\tan C = \frac{R}{OP}$(radius) $[\because (0.80)^2 = 0.6400]$ $R = \tan C \times OP = \tan C\ (0.80)$ Area $= \pi R^2 = \pi \times \tan^2 C\ (0.64)$ $A = \pi(0.64) + \tan^2 C$ $= \pi(0.64) \times \frac{\text{Sin}^2 C}{\text{Cos}^2 C} = \pi(0.64) \times \frac{\text{Sin}^2 C}{1 - \text{Sin}^2 C}$ $= \pi(0.64) \times \frac{9}{16} = \pi(0.64) \times \frac{9}{16} \times \frac{16}{7}$ $= \frac{22}{7} \times 0.64 \times \frac{9}{7} = 2.6\ \text{m}^2$ OR Diagram-0.5 Mark Proving Prism Formula-2.5M Tracing the Path of light ray -1Mark in each case C is critical angle. Sin C=1/1.5=2/3=0.66 C=41.8^0 When Ref.Index-=1.5, TIR Take place When Ref.Index-=1.4, TIR will not take place. here critical angle =45.9^0. For solution : Any other relevant method may be adopted.	5