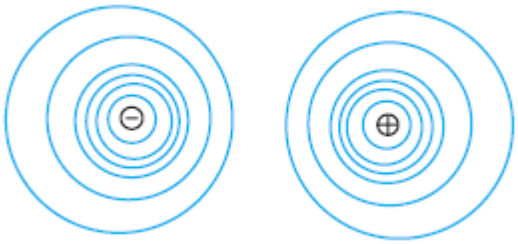
Marking Scheme

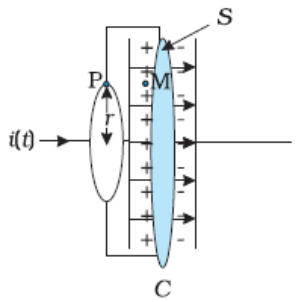
55/2/2

Q. No.	Value Points/Expected Answers	Marks	Total Marks
Q.1	$\vec{f} = q\,(\vec{v} \times \vec{B})$	1	1
Q.2	• For writing relationship between susceptibility and temperature 1/2 • Calculating the temperature 1/2 $\chi_m \propto \frac{1}{T}$ $T_2 = \frac{\chi_{m1}}{\chi_{m2}} \times T_1$ $T_2 = \frac{1.2\times10^5}{1.44\times10^5} \times 300 = 250K$ **OR** • For identification of magnetic material 1 It is diamagnetic material	½ ½ 1	1 1
Q.3	• For drawing equipotential surfaces for an electric dipole. 1  (Even if a student mentions or draws equatorial plane, award 1 mark.)	1	1
Q.4	• To identify the part of the electromagnetic spectrum 1/2 • For writing its frequency range 1/2 Microwaves Frequency range is 10^{10} to 10^{12} Hz	½ ½	1

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	OR • Production of electromagnetic wave 1 Accelerated charge produces an oscillating electric field which produces an oscillating magnetic field, which is a source of oscillating electric field, and so on. Thus electromagnetic waves are produced.	1	1
Q.5	Solar Cell	1	1
	SECTION-B		
Q.6	• For writing expression for energy of photon ½ • For writing expression for kinetic energy of proton 1 • For proving the relationship between the two ½ Energy of photon $E_p = \frac{hc}{\lambda}$ For proton $\lambda = \frac{h}{m\text{v}}$ $m\text{v} = \frac{h}{\lambda}$ Kinetic energy of proton $E_k = \frac{1}{2}m\text{v}^2$ $E_k = \frac{1}{2}\frac{h^2}{m\lambda^2}$ $E_p = \left(\frac{2m\lambda c}{h}\right)E_k$	½ ½ ½ ½	2
Q.7	• Diagram $\frac{1}{2}$ • Explanation $1\frac{1}{2}$		

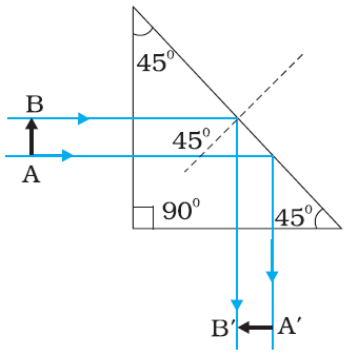
Marking Scheme

55/2/2

Q. No.	Value Points/Expected Answers	Marks	Total Marks
		½	2
	$\oint_{C_1} \vec{B}\cdot\vec{dl} = \mu_0 i_c$	½	
	$\oint_{C_2} \vec{B}\cdot\vec{dl} = \mu_0 (0)$	½	
	There is an inconsistency in the Ampere's Circuital law ∴ $Maxwell\ modified$ it to be $\oint \vec{B}\cdot\vec{dl} = \mu_0 (i_c + i_d)$ $where\ i_d = E_o \frac{d\phi_E}{dt}$	½	
Q.8	• Conditions $\frac{1}{2}+\frac{1}{2}$ • Diagram 1 **Conditions:-** 1. Digit travels from denser to rarer medium 2. Angle of incidence in denser medium must be greater than critical angle.	½ ½	2

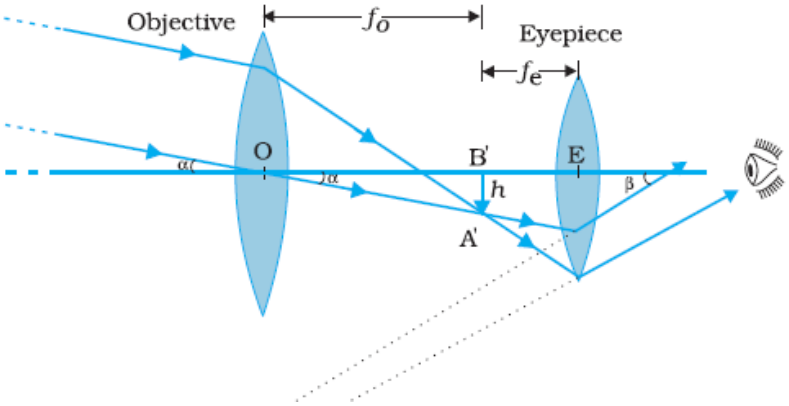
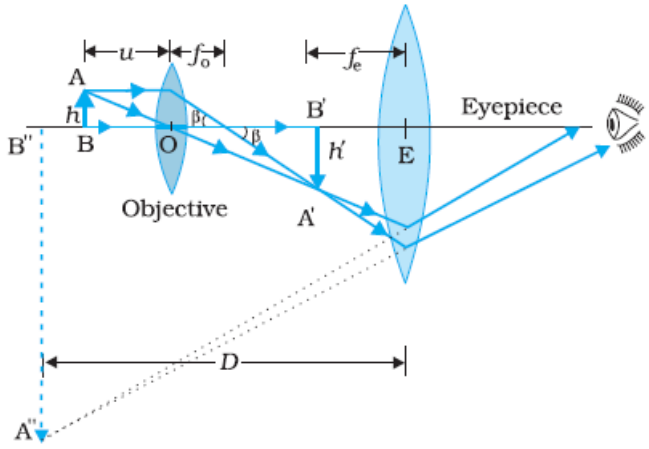
Marking Scheme

55/2/2

Q. No.	Value Points/Expected Answers	Marks	Total Marks
		1	
Q.9	• For writing Einstein's photoelectric equation 1/2 • For writing $E_n = -\frac{13.6}{n^2}$ 1/2 • For finding the value of n 1		
	From photoelectric equation $h\nu = \phi_0 + eV_s$	½	
	$= 2 + 0.55 = 2.55$ eV		
	Given $E_n = -\frac{13.6}{n^2}$		
	The energy difference $\Delta E = -3.4 - (-2.55)\, eV = -0.85\, eV$	½	2
	$\therefore \quad \frac{-13.6}{n^2} = -0.85$	½	
	$\because \quad n = 4$	½	
	OR		
	• Calculation of energy in excited state ½ • Formula ½ • Finding out the maximum number of lines 1		
	Energy in ground state, $E_1 = -13.6eV$		
	Energy supplied$= 12.5eV$		
	Energy in excited state, $-13.6 + 12.5 = -1.1eV$	½	
	But, $E_n = \frac{-13.6}{n^2} = -1.1$	½	
	$n = 3$	½	
	Maximum number of lines$=3$	½	2

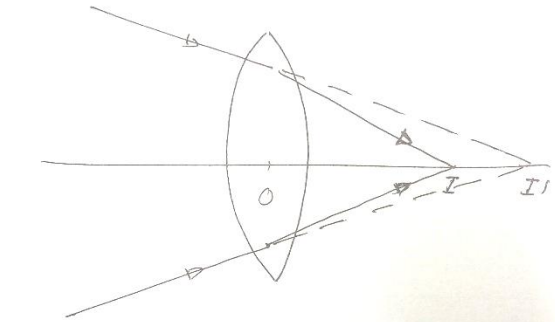
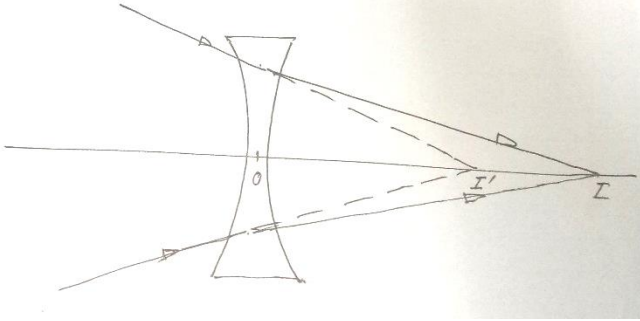
Marking Scheme

55/2/2

Q. No.	Value Points/Expected Answers	Marks	Total Marks
Q.10	• To draw the ray diagram of astronomical telescope 1 ½ • Expression for magnification 1/2 Ray diagram  Magnification$=\frac{f_0}{f_e}$ Or $m=\frac{\beta}{\alpha}$	1½ ½	2
	OR • To draw the ray diagram of compound microscope 1½ • Expression for resolving power 1/2 Ray diagram  Resolving power$=\frac{2n\sin\beta}{1.22\lambda}$	1½ ½	2

Marking Scheme

55/2/2

Q. No.	Value Points/Expected Answers	Marks	Total Marks
Q.11	• Ray diagrams to show path of beam of light in case of (i) Convex lens 1 (ii) Concave lens 1		
	 	1	2
	 	1	
Q.12	• Relation ½ • Modified relation in case of line of sight 1 • Range of frequency ½		
	$d = \sqrt{2hR}$	½	
	In case of line of sight of communication $d = \sqrt{2h_R R} + \sqrt{2h_T R}$	1	2
	Frequency range is above $40Mhz$	½	

Marking Scheme

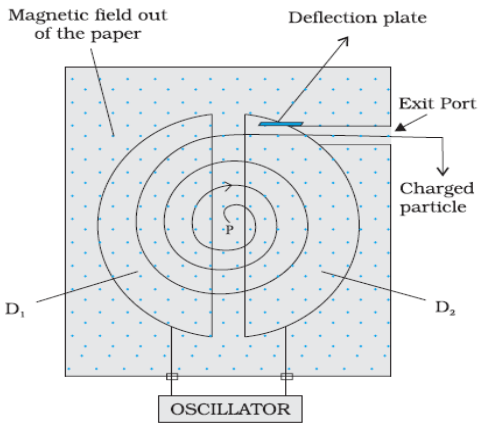
55/2/2

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	SECTION-C		
Q.13	Proving magnetic moment as $\frac{e\text{vr}}{2}$ 2 Deducing expression of the magnetic moment of hydrogen atom 1 The magnetic moment is $m = IA$ *But current is* $I = \frac{e}{T} = \frac{e\text{v}}{2\pi r}$ *Where* $T = \frac{2\pi r}{\text{v}}$ *and the area,* $A = \pi r^2$ $m = \frac{e\text{v}}{2\pi r}\pi r^2 = \frac{e\text{vr}}{2}$ But from Bohr's second postulate $\text{m}_e\text{vr} = \frac{nh}{2\pi} = \frac{h}{2\pi}$ for n=1 $\text{v}r = \frac{nh}{2\pi m_e}$ Hence the magnetic moment is $m = \frac{e}{2}\frac{h}{2\pi m_e} = \frac{eh}{4\pi m_e}$ (Here n=1)	½ ½ ½ ½ ½	3
Q.14	(a) Explanation 2 (b) Identification of Series $\frac{1}{2}$ (c) Identification of shortest wavelength $\frac{1}{2}$ (a) **Explanation :** The quantised electron orbits and energy state are due to wave nature of the electron and only resonant standing waves can persist. Ace. De Broglie Apotheosis.	2	3

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	$2\pi r = n\lambda$ $= \frac{nh}{mv}$ $mvr = \left(\frac{nh}{2\pi}\right)$		
	(b) Lyman series	$\frac{1}{2}$	
	transition from *n=4 to n=1* will have shortest wavelength.	$\frac{1}{2}$	
Q.15	• Calculation of impedance 2 • Calculation of inductance 1		
	$Z = \sqrt{R^2 + X_c^2}$	½	
	$R = \frac{V_R}{I_R} = 30\Omega$	½	
	$X_c = \frac{V_c}{I_c} = \frac{120}{30} = 40\Omega$	½	
	$Z = \sqrt{(30)^2 + (40)^2} = 50\Omega$	½	
	$X_c = X_L$ As power factor $=1$ $100\pi L = 40$		
	$L = \frac{2}{5\pi}$ *henry*	½	
		½	3
	OR		
	• Determining the source frequency 1 • Calculating impedance 1/2 • For showing potential drop across LC 1 ½		
	(a) $\omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{5\times80\times10^{-6}}} = \frac{1}{\sqrt{400\times10^{-6}}}$		
	$\omega = \frac{1000}{20} = 50Hz$	1	

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	(b) $Z = R = 40\Omega$ $I_m^{max} = \frac{230\sqrt{2}}{R} = \frac{230\sqrt{2}}{40} = 8.1A$ $V_c = I_m^{max} X_c = \frac{230\sqrt{2}}{40} \times \frac{1}{\omega C} = 2033\, volt$ $V_L = I_m^{max} X_L = \frac{230\sqrt{2}}{40} \times 2\pi\nu L = 2033\, volt$ (c) $V_c - V_L = 0$	½ ½ ½ ½	3
Q.16	• Reason - 1 • Formula - ½ • Calculation of range of wave length. ½ + ½ + ½ **Reason :-** Under reverse bias change in current with the change in intensity of light is more significant. **Calculation : -** $\lambda = \frac{hc}{E}$ $\lambda_1 = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{2.5 \times 1.6 \times 10^{-19}} = 497 \times 10^{-9} m$ $\lambda_2 = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{2.5 \times 1.6 \times 10^{-19}} = 444 \times 10^{-9} m$ *Range is* $444 \times 10^{-9} m$ *to* 497×10^{-9m}	1 ½ ½ ½ ½	3
Q.17	• Diagram of cyclotron 1 • Explaining the working principle 1 • Showing frequency is independent of radius and speed 1 Diagram:		

Q. No.	Value Points/Expected Answers	Marks	Total Marks



1

Working principle: The cyclotron uses crossed electric and magnetic fields which increases the kinetic energy of a charged particle without changing its frequency of revolution. 1

$F_c = F_m$

$\frac{mv^2}{r} = qvB$ ½

$\omega = \frac{qB}{m}$

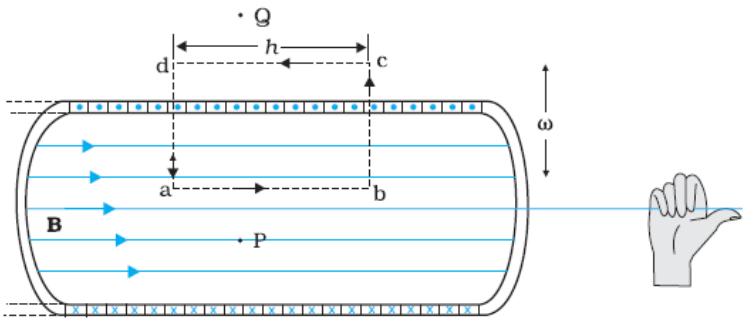
$\nu = \frac{qB}{2\pi m}$ ½

3

OR

- Diagram of straight solenoid ½
- Derivation of magnetic field 1+1/2
- Difference between toroid and solenoid (any one) 1

Diagram



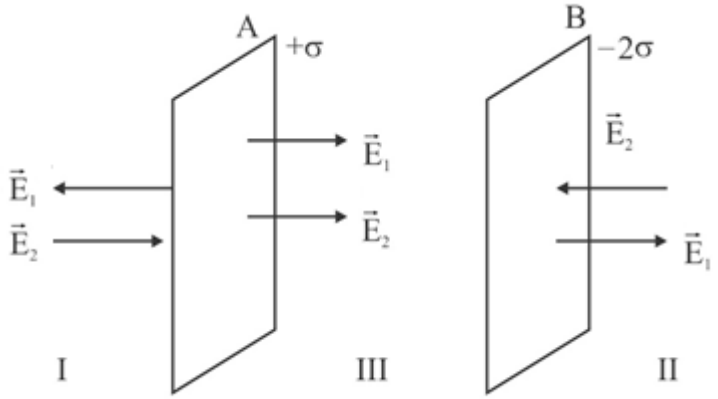
½

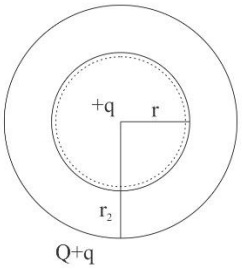
Derivation: Let n be the number of turns per unit length. The total number of turns is nh. The enclosed current is $I_e = I(nh)$

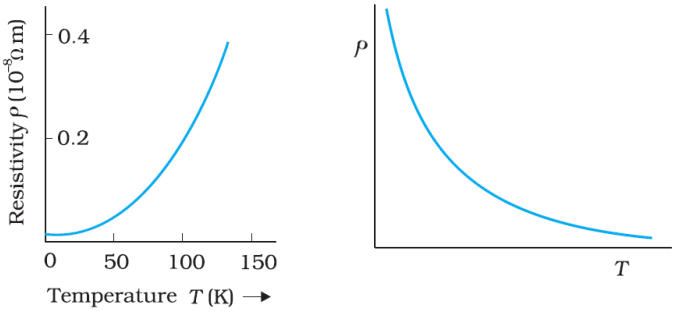
½

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	From Ampere's circuital law $BL = \mu_0 I_e$ $Bh = \mu_0 I(nh)$ $B = \mu_o nI$ Difference between toroid and solenoid (any one) (a) Solenoid behaves like a bar magnet whereas toroid does not. Or If student writes solenoid is straight and the toroid is circular give half mark. Or there is fringe effect in case of straight solenoid but not in toroid (allot one mark.)	1 1	3
Q.18	• Proving $\alpha = \beta$ 2 • Finding i_c 1 For minimum deviation $r_1 + r_2 = A \quad ; r_1 = r_2$ $(90 - \beta) + (90 - \beta) = A$ $180 - 2\beta = A$ $2\beta = 180 - A$ $2\beta = 2\alpha$ $\beta = \alpha$ $r_1 + r_2 = A$ $r_1 + i_c = A$ $i_c = A - r_1$ $i_c = A - (90 - \beta)$	1 ½ ½ ½ ½	3
Q.19			

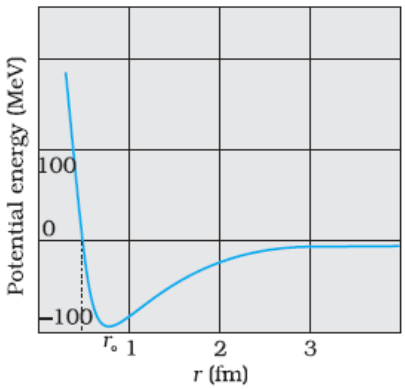
Q. No.	Value Points/Expected Answers	Marks	Total Marks

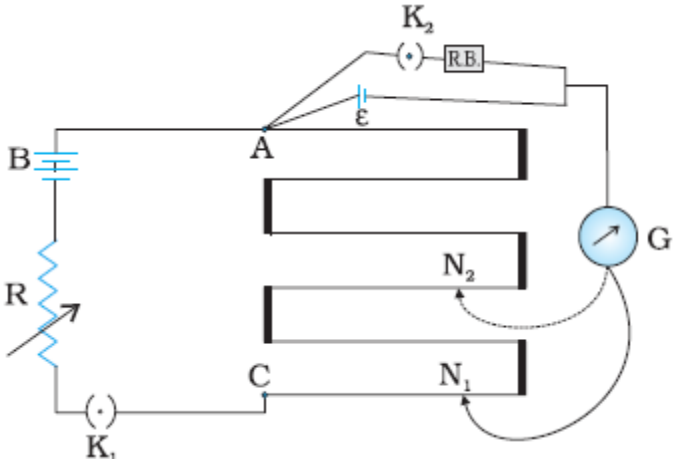
	Diagram 1+1/2 Deducing electric field expression (i) To the left of first sheet (ii) To the right of second sheet (iii) Between the two sheets 1/2+1/2+1/2		
	Diagram  	1½	3
	Electric field in the region left of first sheet $E_I = E_1 + E_2$ $E_I = \frac{\sigma}{\varepsilon_0} - \frac{\sigma}{2\varepsilon_0}$ $E_I = +\frac{\sigma}{2\varepsilon_0}$ It is towards right	½	
	Electric field in the region to the right of second sheet $E_{II} = \frac{\sigma}{2\varepsilon_0} - \frac{\sigma}{\varepsilon_0}$ $E_{II} = -\frac{\sigma}{2\varepsilon_0}$ It is towards left	½	
	Electric field between the two sheets $E_{III} = E_1 + E_2$ $E_{III} = \frac{\sigma}{\varepsilon_0} + \frac{\sigma}{2\varepsilon_0}$ $E_{III} = \frac{3\sigma}{2\varepsilon_0}$ Electric field is towards the right	½	

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	OR		
	Diagram ½ Finding the surface charge density in the inner and outer surface of the shell 1+1/2 Electric field in the cavity 1		
	(a) Diagram  	½	
	The surface charge density on inner surface of the shell is $\sigma_1 = -\frac{q}{4\pi r_1^2}$	1	
	The surface charge density on outer shell is $\sigma_2 = \frac{Q+q}{4\pi r_2^2}$	½	
	(b) Consider a Gaussian surface inside the shell, net flux is zero since $q_{net} = 0$. According to Gauss's law it is independent of shape and size of shell.	1	3
Q.20	• Derive expression for amplitude modulated wave. 2 • Deducing expression for lower and upper side bands. ½ • Obtaining expression for modulation index. ½		
	Let a carrier wave be given by $c(t) = A_c \sin \omega_c t$ where $\omega_c = 2\pi f_c$ And signal wave be $m(t) = A_m \sin \omega_m t$ where $\omega_m = 2\pi f_m$ The modulated signal is	½	
	$c_m(t) = (A_c + A_m \sin \omega_m t)\sin\omega_c t$ $c_m(t) = A_c(1 + \frac{A_m}{A_c} \sin \omega_m t)\sin\omega_c t$	½	
	$c_m(t) = A_c \sin\omega_c t + \mu \frac{A_c}{2} \cos(\omega_c - \omega_m)t - \mu \frac{A_c}{2} \cos(\omega_c + \omega_m)t$	½	
	The modulation index $\mu = \frac{A_m}{A_c}$	½	

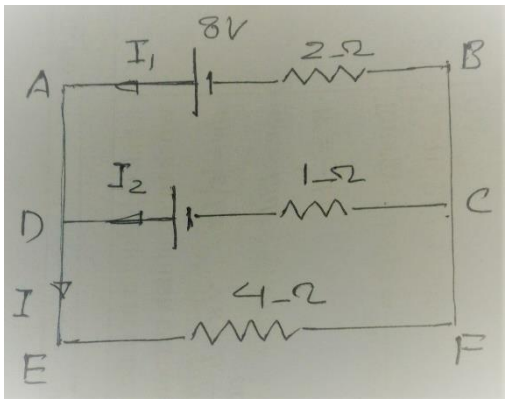
Q. No.	Value Points/Expected Answers	Marks	Total Marks
	Lower frequency band $\omega_c - \omega_m$ Upper frequency band $\omega_c + \omega_m$	½ ½	3
Q.21	• Showing the plot of variation of resistivity ½ + ½ • Expression for resistivity 1 • Explaining variation of resistivity for conductor and semiconductor ½ + ½  • $\rho = \frac{m}{ne^2\tau}$ • In case of conductors with increase in temperature, relaxation time decreases, so resistivity increases. • In case of semiconductors with increase in temperature number density (n) of free electrons increases, hence resistivity increases.	½ ½ 1 ½ ½	3
Q.22	i) Change in Capacitance 1 ii) Change in Electric field 1 iii) Change in Energy density 1 Dielectric slab of thickness 4mm = $\frac{4}{5}mm = 0.8mm$ $\therefore Effective\ (air) plate\ separation$ $= (4 + 0.8)mm$		

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	$= 4.8mm$ (i) $Effective\ new\ capacitance$ $C^1 = 100\ \mu F \times \frac{4mm}{4.8mm} = \frac{400}{4.8}\mu F$ Change on capacitor remains same $Q = C \times V = 100 \times 10^{-6} \times 200 = 2 \times 10^{-2} C$ New p.d. $V' = \frac{Q}{C'} = \frac{2\times10^{-2}\times4.8\times10^{-6}}{400} = 2.4 \times 10^{-6}\ volt\ 'h$ (ii) Effective new Electric Field $= E' = \frac{2.4\times10^{-10}}{4.8\times10^{-3}}$ $= 5 \times 10^{-8} Vm^{-1}$ (iii) $\frac{New\ energy\ stored}{rigrial\ energy\ stored} = \frac{\frac{1}{2}C^1V^2}{\frac{1}{2}CV^2}$ $\frac{C^1}{C} = \frac{400}{4.8 \times 100} = 0.8$ New energy density will be (0.8) of the original density.	½ ½ 1 1	3
Q.23	• Reason for difficulty in detecting presence of anti-neutrino during $\beta - decay$ ½ • Define decay constant of radioactive nucleus ½ • Derive expression for mean life in terms of decay constant 2 • Penetrating power is high • Do not interact with matter (weak interaction) any one • Decay constant is the reciprocal of the time duration in which undecayed radioactive nuclei reduce to 1/e times the nuclei present initially. $\tau = \frac{\text{total life time of all nuclei}}{\text{total number of nuclei}}$	½ 1 ½	

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	$\tau = \frac{\int_0^\infty tdN}{N_0}$	½	
	$\tau = \frac{\int_0^\infty t(N_0\lambda\varepsilon^{-\lambda t}dt)}{N_0} = \lambda\int te^{-\lambda\tau}dt$		
	$\tau = \frac{1}{\lambda}$	½	3
	OR		
	(a) Stating distinguishing feature of nuclear force. 1 (b) Drawing a plot showing variation of potential energy. 1 (c) Marking the regions. 1/2+1/2		
	(1) Short rang force (2) Strongest force (3) Attractive in nature (4) Does not depend on charge (any two)	1	
	(b) Figure  	1	
	$r < r_0$ repulsive force	½	
	$r > r_0$ attractive force	½	3
Q.24			
	• Proving the phase difference 1 • Calculation of Amplification factor 1 • Calculation of load resistance 1		
	Input signal, $V_i = \Delta I_B r_i$ Output signal, $V_o = -\Delta I_c R_L$		

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	Voltage amplification, $A_V = \frac{V_o}{V_i}$ • $A_V = -\frac{\Delta I_B}{\Delta I_C} \times \frac{r_i}{R_L}$ • $A_V = -\beta \times$ resistance gain Here negative sign indicates that output is 180° out of phase w.r.t. input signal. • $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{4\times10^{-3}}{30\times10^{-6}} = \frac{400}{3}$ $r_i = \frac{\Delta V_{BE}}{\Delta I_B} = \frac{0.02}{30\times10^{-6}} = \frac{2\times10^{-2}}{3\times10^{-5}}$ • $r_i = \frac{2}{3}\times10^3\,\Omega$ $A_V = \beta\frac{R_L}{r_i}$ $R_L = \frac{A_V \times r_i}{\beta} = \frac{400\times2\times10^3\times3}{400\times3} = 2\times10^3\,\Omega$	½ ½ 1 ½ ½	3
Q.25	• Circuit diagram and describing the method to measure internal resistance of cell by potentiometer 1+1 • Reason 1 • Calculating balancing length and reason (circuit works or not) 1½ +1 (a) Circuit diagram:  	1	

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	Brief description: Plug in the key k_1 and keep k_2 unplugged and the find the balancing length l_1 such that: $E = kl_1$ (1)	½	
	With the key k_2 also plugged in find out balancing length l_2 again such that: $V = kl_2$ (2)	½	
	As $r = \left(\frac{E}{V} - 1\right)R$		
	$r = \left(\frac{l_1}{l_2} - 1\right)R$		
	(b) The potentiometer is preferred over the voltmeter for measurement of e.m.f. of a cell because potentiometer draws no current from the voltage source being measured.	½	
	(c) $V = 5V,\ R_{AB} = 50\Omega,\ R = 450\Omega$	s	
	$\mathrm{I} = \frac{5}{450+50} = \frac{1}{100} = 0.01A$	½	
	$V_{AB} = 0.01 \times 50 = 0.5V$		
	$k = \frac{0.5}{10} = 0.05Vm^{-1}$	½	
	$l = \frac{V}{k} = \frac{300 \times 10^{-3}}{0.05} = 6m$	½	
	With 2V driver cell current in the circuit is $I = \frac{2}{450+50} = 0.004A$.	½	
	P.d. across AB is $=0.004 \times 50 = 200$mV. Hence the circuit will not work.	½	
	OR		
	• State the working principle of meter bridge 1 • Reasons 1/2 +1/2 • Calculation of potential difference using Kirchhoff's rules 3		
	(a) Meter bridge is based on the principle of balanced Wheatstone bridge.	1	
	(b) (i) Thick copper strips are used to minimize resistance of connections which are not accounted for in the bridge formula	½	
	(ii) Balance point is preferred near midpoint of bridge wire to minimize percentage error in resistance (R).	½	
	(c)		

Q. No.	Value Points/Expected Answers	Marks	Total Marks
			
	$I = I_1 + I_2 \quad (1)$ *In loop ABCDA* $-8 + 2I_1 - 1\times I_2 + 6 = 0 \quad (2)$ *In loop DEFCD* $-4I - 1\times I_2 + 6 = 0$ $4I + I_2 = 6$ $4(I_1 + I_2) + I_2 = 6$ $4I_1 + 5I_2 = 6 \quad (3)$ *From equations* (1) *and* (2) *we get* $I_1 = \frac{8}{7}A,\ I_2 = \frac{2}{7}A,\ I = \frac{10}{7}$ Potential difference across resistor 4Ω is: $V = \frac{10}{7}\times 4 = \frac{40}{7} volt$	1 1 ½ ½	5
Q.26	• Deriving expression for e.m.f. 3 • Finding induced e.m.f. between the axel and rim of wheel 2 Flux linked with the coil at any instant of time is: $\phi = \mathrm{NB}A\cos\omega t$ $\frac{d\phi}{dt} = NBA\omega(-\sin\omega t)\,\mathrm{S}$ $\varepsilon = -\frac{d\phi}{dt}$ $\varepsilon = \mathrm{NB}A\omega\sin\omega t$ $\varepsilon = \varepsilon_0 \sin\omega t \quad (\text{Here } \varepsilon_0 = NBA\omega)$	½ 1 ½	

Q. No.	Value Points/Expected Answers	Marks	Total Marks

(b) $l = 0.5m,\ \nu = 120rpm = 2rps$

$\omega = 2\pi\nu = 4\pi\ rad/s,\quad B = 4\times10^{-4}T,\quad \delta = 30^0$ ½

$B_H = 4\times10^{-4}\times\frac{\sqrt{3}}{2}$

$B_H = 2\sqrt{3}\times10^{-4}T$ ½

$\varepsilon = \frac{1}{2}B\omega l^2$ 1

$\varepsilon = \frac{1}{2}\times2\sqrt{3}\times10^{-4}\times4\pi\times(0.5)^2$

$\varepsilon = 5.4\times10^{-4}volt$ 1 5

OR

- Deriving expression for magnetic energy stored in inductor and expression for energy density 1½+ ½
- Calculating the resultant magnetic force and torque 2½+ ½

(a) When external source supplies current to the inductor, e.m.f. is induced in it due to self induction. So the external supply has to do work to establish current. The amount of work done is:

$dw = |\varepsilon| Idt \qquad \because \varepsilon = L\frac{dI}{dt}$ ½

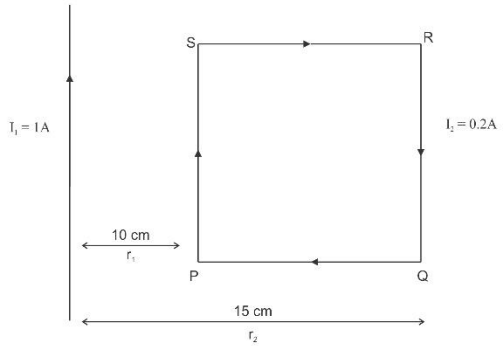
$dw = LIdt$

$W = \frac{1}{2}LI^2$ 1

Energy density $= \frac{Energy}{Volume}$

$u = (1/2LI^2)/volume$ ½

(b)

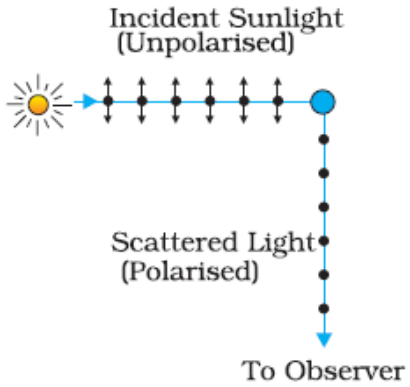


3

Force of attraction experienced by the length SP of the loop per unit length.

$f_1 = \frac{2\mu_0 I_1 I_2}{4\pi r_1}$ ½

$f_1 = \frac{2\times10^{-7}\times1\times0.2}{10\times10^{-2}} = 4\times10^{-7}\ Nm^{-1}$ ½

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	Force is attractive $f_2 = \frac{2\mu_0 I_1 I_2}{4\pi r_2}$ $f_2 = \frac{2\times10^{-7}\times1\times0.2}{15\times10^{-2}} = 2.6\times10^{-7}\,Nm^{-1}$ Force is repulsive So the net force experienced by the loop is (per unit length) $f = (f_1 - f_2)$ Total force experienced by the loop is: $F = (f_1 - f_2)l = \left(1.4\times10^{-7}\right)\times5\times10^{-2}$ $F = 7\times10^{-7}\,N$ Net force is attractive in nature As the lines of action of forces coincide torque is zero.	½ ½ ½ ½	5
Q.27	• Diagram production of polarized light by scattering of sun light 1 • Explanation 1 • Calculation of intensity of light transmitted through P_1, P_2 *and* P_3 ½ +1+1½ Diagram:  Explanation: Charges accelerating parallel to the double arrows do not radiate energy towards the observer. The radiation scattered by the molecules therefore is polarised perpendicular to the plane of the figure. ALTERNATIVELY : If the student writes " scattered light when viewed in a perpendicular direction is found to be polarised " (award one mark) Intensity of light transmitted by 1st Polaroid is, $I_1 = \frac{I}{2}$	1 1 ½	

Marking Scheme

55/2/2

Q. No.	Value Points/Expected Answers	Marks	Total Marks
	Intensity of light transmitted by 2nd Polaroid is, $I_2 = I_1 \cos^2 45^0 = \frac{I}{2}\left(\frac{1}{\sqrt{2}}\right)^2 = \frac{I}{4}$	1	
	Intensity of light transmitted by 3rd Polaroid is, $I_3 = I_2 \cos^2 45^0 = \frac{I}{2}\left(\frac{1}{\sqrt{2}}\right)^2 = \frac{I}{8}$	1½	5
	OR		
	• Reason ½ • Deriving the expression for resultant intensity and condition for constructive and destructive interference $1\frac{1}{2} + ½ + ½$ • Calculating the separation 2		
	(a) Because two independent sources cannot be coherent OR they are not coherent	½	
	(b) $y_1 = a\cos\omega t$ $y_2 = a\cos(\omega t + \phi)$ So resultant displacement is give by $y = y_1 + y_2$ $y = a\cos\omega t + a\cos(\omega t + \phi)$ $y = 2a\cos(\phi/2)\cos(\omega t + \phi/2)$		
	The amplitude of the resultant displacement is $2a\cos(\phi/2)$ and therefore intensity at that point will be $I = 4I_0\cos^2(\phi/2)$	1 ½	
	For constructive interference: $\phi = 0, \pm 2\pi, \pm 4\pi, ...$	½	
	For destructive interference: $\phi = \pm\pi, \pm 3\pi, \pm 5\pi, ...$	½	
	(c) Position of second maxima $y_2 = \frac{5}{2}\frac{\lambda D}{a}$ Separation between the positions of the second maxima with λ_1 and λ_2 is: $\Delta y = \frac{5D(\lambda_2 - \lambda_1)}{2a} = \frac{5\times 1.5\times(596-590)\times 10^{-9}}{2\times 2\times 10^{-6}} = 11.25\times 10^{-3} m$	1 1	5