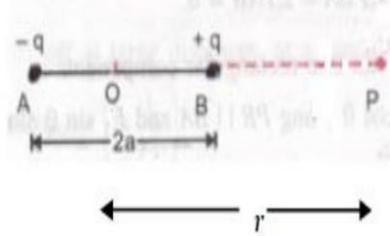
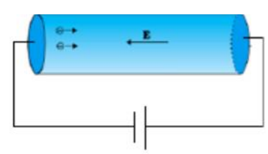
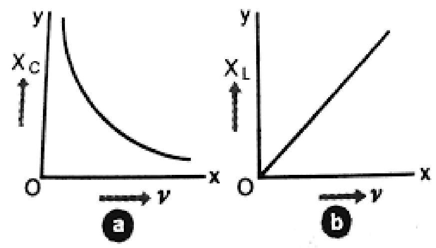
SET	A/B/C

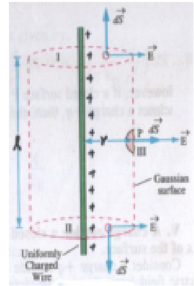
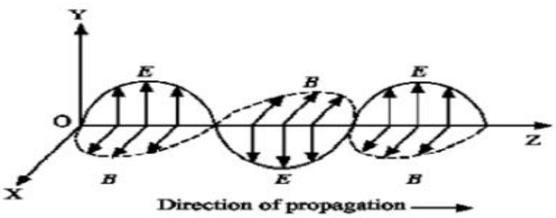
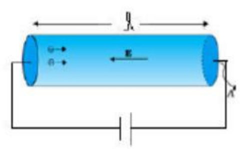
INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION 2022
PHYSICS (042)

CLASS: XII   19-11-2022   Max.Marks: 70

MARKING SCHEME			
SET	QN. NO	VALUE POINTS	MARKS SPLIT UP
A	1	C	1
A	2	C	1
A	3	B	1
A	4	D	1
A	5	B	1
A	6	A	1
A	7	B	1
A	8	D	1
A	9	A	1
A	10	A	1
A	11	A	1
A	12	B	1
A	13	A	1
A	14	D	1
A	15	(i)	1
A	16	A	1
A	17	C	1
A	**18**	A	1
A	**19**	Derivation of electric field strength at a distant point situated along the axis of an electric dipole figure Derivation	 ½ 1½

		[**Ans.** Let V_1 and V_2 be the electric potential at P due to $-q$ and $+q$ charges respectively then  $V_1 = \frac{-q}{4\pi\varepsilon_0(r+a)}$ & $V_2 = \frac{q}{4\pi\varepsilon_0(r-a)}$ Resultant electric potential at P $V = V_1 + V_2 = \frac{-q}{4\pi\varepsilon_0(r+a)} + \frac{q}{4\pi\varepsilon_0(r-a)} = \frac{q}{4\pi\varepsilon_0}\left[\frac{1}{(r-a)} - \frac{1}{(r+a)}\right] = \frac{q}{4\pi\varepsilon_0}\left[\frac{r+a-(r-a)}{(r^2-a^2)}\right]$ $\Rightarrow \quad V = \frac{1}{4\pi\varepsilon_0}\frac{2qa}{(r^2-a^2)}$ $\Rightarrow \quad V = \frac{1}{4\pi\varepsilon_0}\frac{p}{(r^2-a^2)} \qquad [\because p = 2qa]$ Obviously, if $r \gg a$, then $V = \frac{1}{4\pi\varepsilon_0}\frac{p}{r^2}$ **OR** Derivation of the electric field at a point due to a uniformly charged infinite plane sheet Figure- Derivation	½ 1½
A	**20**	Definition of potential S.I. Unit : volt $U = \frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r_{12}} + \frac{1}{4\pi\varepsilon_0}\frac{q_1q_3}{r_{13}} + \frac{1}{4\pi\varepsilon_0}\frac{q_2q_3}{r_{23}}$	½ ½ 1
A	**21**	Relation of drift velocity with relaxation time Figure Derivation Let a potential difference V is applied across the ends of a conductor, then each free electron will experience a force  $\vec{F} = -e\vec{E} \quad \Rightarrow \quad \vec{a} = -\frac{e\vec{E}}{m}$ Average of all random velocities under this acceleration is the drift velocity $\Rightarrow \quad \vec{v_d} = \frac{\vec{v_1} + \vec{v_2} + \cdots + \vec{v_N}}{N} = \frac{(\vec{u_1} + \vec{a}\,\tau_1) + (\vec{u_2} + \vec{a}\,\tau_2) + \cdots + (\vec{u_N} + \vec{a}\,\tau_N)}{N}$ $\Rightarrow \quad \vec{v_d} = \frac{\vec{u_1} + \vec{u_2} + \cdots + \vec{u_N}}{N} + \vec{a}\left(\frac{\tau_1 + \tau_2 + \cdots + \tau_N}{N}\right)$ $\Rightarrow \quad \vec{v_d} = 0 + \vec{a}\,\tau = \vec{a}\,\tau$ $\Rightarrow \quad \vec{v_d} = -\frac{e\vec{E}}{m}\tau$ **OR** Kirchhoff' first law + justification- (Statement + this law holds law of conservation of charge) Kirchhoff' second law + justification- (Statement + this law holds law of conservation of energy)	½ 1½ ½ +1/2 ½ +1/2

A	**22**	$radius\ r = \frac{mv}{q\ B} = \frac{p}{qB}$ $radius\ r \propto \frac{1}{q}$ $\frac{r_1}{r_2} = \frac{q_2}{q_1} = \frac{2}{1}$	½ ½ 1
A	**23**	(i) a – diamagnetic substance b – ferromagnetic substance (ii) for diamagnetic substance susceptibility is negative and for ferromagnetic substance its positive and high	½ ½ ½ + ½
A	**24**		1+1
A	**25**	(a) The resonance frequency is given by $\omega = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{5 \times 80 \times 10^{-6}}} = 50 rad/s$ The resonant frquency is 50 rad/s. (b) $current\ I = \frac{V}{R} = \frac{240}{40} = 6\ A$	½ + ½ ½ + ½
		SECTION C	
A	**26**	Ray diagram of reflecting telescope (without direction of ray, reduce ½ mark) Any two advantages	2 ½ +½
A	**27**	(i) The charge Q = CV, V = same, C = increases; there, charge on plates increases. (ii) As electric field $E = \frac{V}{d}$, V = constant and d = constant; therefore, electric field strength remains the same. (iii) The capacitance of capacitor increases as K > 1.	½ +½ ½ +½ ½ +½
A	**28**	Gauss theorem to obtain the expression for the electric field at a point due to an infinitely long thin, uniformly charged straight wire of linear charge density λ C/m.	

		[**Ans**. Charge enclosed by Gaussian surface, $q = \lambda l$ At the part I and II of Gaussian surface $\vec{E}$ and $\hat{n}$ are ⊥, so flux through surfaces I and II is zero. By Gauss's law, $\oint \vec{E}.\vec{ds} = \frac{q}{\varepsilon_0}$ ⇨ $\oint Eds\,cos0 = \frac{q}{\varepsilon_0}$ ⇨ $E\oint ds = \frac{q}{\varepsilon_0}$ ⇨ $E(2\pi rl) = \frac{\lambda l}{\varepsilon_0}$ ⇨ $\boldsymbol{E = \frac{\lambda}{2\pi\varepsilon_0 r}}$ 	Fig- 1 mark Derivation – 2 marks
A	**29**	(a) Microwave (b) IR (c) X ray OR oscillating charge produce electromagnetic wave- explanation em wave propagating along z direction – with proper marking of of E and B  **If any representation in diagram is missing, reduce ½ marks**	1+1+1 ½ +1 1 ½
A	**30**	(a)expression for resistivity of a conductor in terms of number density of free electrons and relaxation time OR On the basis of electron drift, derive an expression for resistivity of a conductor in terms of number density of free electrons and relaxation time. Let a potential difference V is applied across the ends of a conductor as shown. Electric field produced, $E = \frac{V}{l}$  ⇨ $v_d = \frac{eE}{ml}\tau = \frac{eV}{ml}\tau$ ⇨ $I = neAv_d = neA\left(\frac{eV}{ml}\tau\right) = \frac{ne^2\tau}{m}\left(\frac{A}{l}\right)V$ ⇨ $\frac{V}{I} = \frac{m}{ne^2\tau}\left(\frac{l}{A}\right)$ ---------(1) If the physical conditions of conductor such as temperature etc. remains constant then $\frac{m}{ne^2\tau}\left(\frac{l}{A}\right) = constant = R$ --------(2) ⇨ from (1) $\frac{V}{I} = \boldsymbol{R}$ ⇨ $V = IR$, Now, $R = \frac{\rho l}{A}$ ⇨ from (2) $\boldsymbol{\rho} = \frac{m}{ne^2\tau}$ (b) factors affecting resistivity of a conductor - any two **OR**	½ ½ ½ ½ ½ + ½

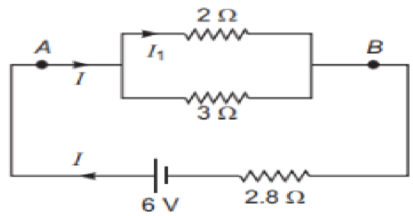
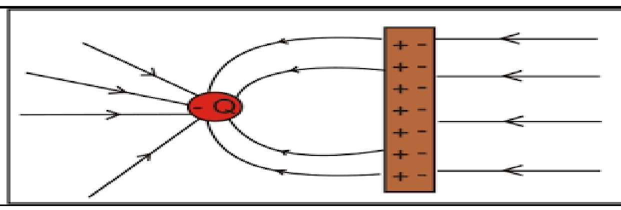
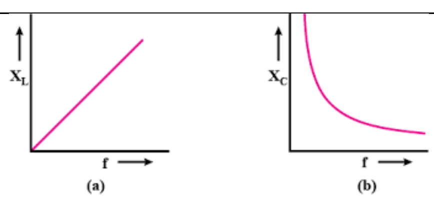
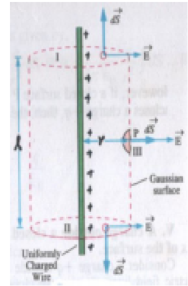
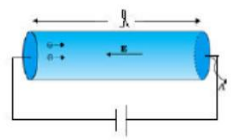
		 Net resistance of circuit $R_{eq} = \frac{2 \times 3}{2+3} + 2{\cdot}8 = 1{\cdot}2 + 2{\cdot}8 = \mathbf{4\,\Omega}$ Net emf, E = 6V Current in circuit, $I = \frac{E}{R_{eq}} = \frac{6}{4} = \mathbf{1{\cdot}5\,A}$ Potential difference across parallel combination of 2Ω and 3Ω resistances. V' = IR' =1.5 x1.2 =1.8V Current in R_1 = 2Ω resistance $I_1 = V'/R_1 = 1.8/2 = 0.9A$	½ 1 ½ 1
A		**SECTION D**	
	31	(a) figure of step up transformer Principle Working of transformer (b) Any two energy loss in transformer (c) No. Energy is conserved with the reason **OR** (a) Diagram of ac generator Principle (b) Derivation of expression $e = e_0 \sin \omega t$ (c) No, MCG can't measure ac with Reason	½ ½ 2 ½ +½ ½ +½ 1 1 2 ½ +½
A	**32**	(a) ray diagram – astronomical telescope in normal adjust Magnifying power definition (b) 0.5 D (large focal length) and 4 D or 10 D (small focal length) **OR** Refraction through curved surface – ray diagram Derivation of proper relation Sign convention **(if sign convention used in ray diagram, add 1 mark with Ray diagram)** Focal length of convex lens increases when immersed in water	2 1 1+1 1 2 1 1
A	**33**	(a) Biot savart law statement and mathematical expression (b) Derivation of magnetic field due to current carrying circular coil along the axis	2

		Diagram Derivation **OR** (a) Expression for force on current carrying conductor placed in magnetic field – Diagram Derivation The force acting on the current carrying wire in uniform magnetic field $F = Bil\sin\theta$ $F = Bil \quad (\because \theta = 90^\circ)$ Weight of the wire $w = mg = 0.2 \times 9.8N$ In the position of suspension $Bil = mg$ $B = \frac{mg}{il} = \frac{0.2 \times 9.8}{2 \times 15} = 0.65T$	1 2 1 2 ½ ½ ½ ½
A	**34**	(i) Statement faraday's laws First law Second law (ii) weber, scalar (iii) clockwise **OR** $e = -\frac{d\phi}{dt}$ $e = 1.6 \times 10^{-3}$ V	 ½ ½ ½ +½ 2 1 1
A	**35**	(i) Two Conditions for TIR (ii) Two uses of optical fibre (iii) definition of critical angle and relation between i_c and n_{21} OR From $\sin C = \frac{1}{\mu} = \frac{1}{\sqrt{2}}, C = 45^\circ$	½ +½ ½ +½ 1 +1 1 +1
B	1	A	
B	2	C	
B	3	A	
B	4	A	
B	5	C	
B	6	D	
B	7	A	
B	8	B	
B	9	A	

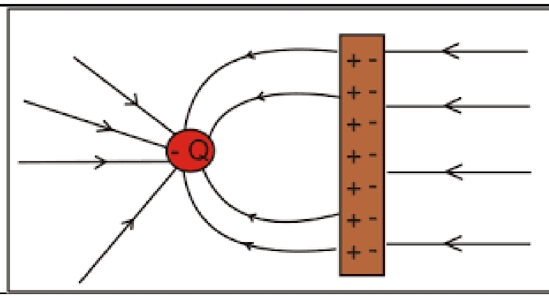
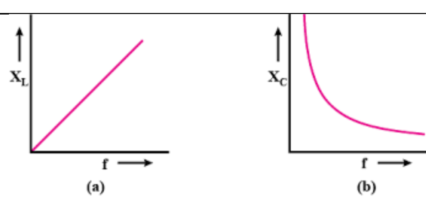
B	10	A	
B	11	A	
B	12	B	
B	13	A	
B	14	D	
B	15	(i)	
B	16	A	
B	17	C	
B	**18**	A	
B	**19**	(a) equipotential surface in z direction -diagram **showing equal spacing between two consecutive equipotential surface otherwise reduce ½ mark** (b) two different equipotential surface have different electric potential, so if they intersect then the point of intersection will have two different potentials at the same point which is not possible.	½ +½ 1
B	**20**	(a) 	1
		(b) An electrostatic field line is a continuous curve because a charge experiences a continuous force when traced in an electrostatic field. The field line cannot have sudden breaks because the charge moves continuously and does not jump from one point to the other.	1
		OR Since $x = 1m$ $\varphi_L = -50 \times 1 \times 25 \times 10^{-4}$ $= -1250 \times 10^{-4}$ $= -0.125\ Nm^2C^{-1}$	½
		Flux through the right surface, $\varphi_R = \lvert E \rvert \lvert S \rvert$ Since $x = 2m$, $\varphi_R = 50 \times 2 \times \lvert s \rvert$ $= 50 \times 2 \times 25 \times 10^{-4}$ $= 2500 \times 10^{-4}$ $= 0.250\ Nm^2C^{-1}$	½
		Now, flux through the cylinder $\varphi_{Ace} = \varphi_R + \varphi_L$ $= 0.250 - 0.125$ $= 0.125\ Nm^2C^{-1}$	1

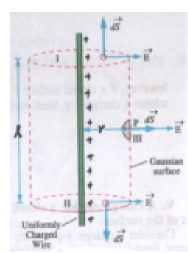
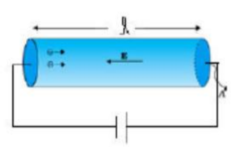
B	**21**	Relation-I = nE A v_d Derivation **(If diagram is given give ½ mark)**	2
B	**22**	Magnetic field induction at O due to current loop 1 is $B_1 = \frac{\mu_0 I R^2}{2(x^2 + R^2)^{3/2}}$, acting towards left. Magnetic field induction at O due to current loop 2 is $B_2 = \frac{\mu_0 I R^2}{2(x^2 + R^2)^{3/2}}$ acting vertically upwards. Resultant magnetic field induction at O will be $B = \sqrt{B_1^2 + B_2^2} = \sqrt{2} B_1 \; (\because B_1 = B_2)$ $= \sqrt{2} \times \frac{\mu_0 I R^2}{2(x^2 + R^2)^{3/2}}$ $= \frac{\mu_0 I R^2}{\sqrt{x^2 + R^2}^{3/2}}$ Direction – 45^0	½ ½ ½ ½
B	**23**	(i) (a) dia magnetic (b) ferromagnetic (ii) negative susceptibility for diamagnetic and high and positive for ferromagnetic substance	½ +½ ½ +½
B	**24**	(a) Definition of self-inductance in terms of induced emf (b) $e = L\frac{di}{dt}$ $L = \frac{e}{\frac{di}{dt}}$ $= \frac{200}{\frac{5}{0.1}} = 4H$ Hence the self inductance of the coil is 4H. OR Derivation for self-inductance of long solenoid Diagram Derivation	1 ½ ½ ½ 1½
B	**25**		1+1
B	**26**	the expression for the electric field at a point due to an infinitely long thin, uniformly charged straight wire of linear charge density λ C/m	

		[**Ans.** Charge enclosed by Gaussian surface, $q = \lambda l$ At the part I and II of Gaussian surface $\vec{E}$ and $\hat{n}$ are ⊥, so flux through surfaces I and II is zero. By Gauss's law, $\oint \vec{E}.\vec{ds} = \frac{q}{\varepsilon_0}$ ⇨ $\oint Eds\cos 0 = \frac{q}{\varepsilon_0}$ ⇨ $E\oint ds = \frac{q}{\varepsilon_0}$ ⇨ $E(2\pi rl) = \frac{\lambda l}{\epsilon_0}$ ⇨ $\boldsymbol{E} = \frac{\lambda}{2\pi\varepsilon_0 r}$ 	1 for diagram 2for derivation
B	**27**	(a) the capacitance increases as the dielectric constant K>1. (b) Electric field E= V/d , As V decreases and d remains the same, electric field also decreases. (c) Energy stored in a capacitor $U=Q^2/2C$, As Q is constant and C increases, U decreases.	1 1 1
B	**28**	(a) expression for resistivity of a conductor in terms of number density of free electrons and relaxation time On the basis of electron drift, derive an expression for resistivity of a conductor in terms of number density of free electrons and relaxation time. Let a potential difference V is applied across the ends of a conductor as shown.  Electric field produced, $E = \frac{V}{l}$ ⇨ $v_d = \frac{eE}{ml}\tau = \frac{eV}{ml}\tau$ ⇨ $I = neAv_d = neA\left(\frac{eV}{ml}\tau\right) = \frac{ne^2\tau}{m}\left(\frac{A}{l}\right)V$ ⇨ $\frac{V}{I} = \frac{m}{ne^2\tau}\left(\frac{l}{A}\right)$ ---------(1) If the physical conditions of conductor such as temperature etc. remains constant then $\frac{m}{ne^2\tau}\left(\frac{l}{A}\right) = constant = R$ --------(2) ⇨ from (1) $\frac{V}{I} = \boldsymbol{R}$ ⇨ $V = IR$, Now, $R = \frac{\rho l}{A}$ ⇨ from (2) $\boldsymbol{\rho} = \frac{m}{ne^2\tau}$ (b) Factors on which resistivity depends **OR** Effective resistance, $R_{12} = \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $R_{12} = 1.2\Omega$ resistance, R_{12} is in series 2.8Ω Total resistance $= 1.2 + 2.8 = 4.0\Omega$ Current, $I = \frac{6}{4} = 1.5A$ Potential difference, $AB = 1.5 \times 1.2 = 1.8V$ Current through $2\Omega = \frac{1.8}{2} = 0.9A$.	½ ½ ½ ½ ½ +½ ½ 1 ½ 1
B	**29**	(a) microwave (b) IR (c) X ray **OR** (a) oscillating charge produces em wave - explanation (b) sketch of em wave propagating in + x direction **If any representation in diagram is missing, reduce ½ marks**	1+1+1 ½ + 1 1 ½
B	**30**	Refractive index of Prism Ray diagram Derivation	 1 2
B	**31**	(a) Biot savart law statement and mathematical expression (b) Derivation of magnetic field due to current carrying circular coil along the axis Diagram Derivation	1+1 1 2

		OR (a) expression for force on current carrying conductor- derivation and figure Diagram Derivation The force acting on the current carrying wire in uniform magnetic field $F = Bil\sin\theta$ $F = Bil \quad (\because \theta = 90°)$ Weight of the wire $w = mg = 0.2 \times 9.8N$ In the position of suspension $Bil = mg$ $B = \frac{mg}{il} = \frac{0.2 \times 9.8}{2 \times 15} = 0.65T$	 1 2 ½ ½ ½ ½
B	**32**	(a) figure of step up transformer Principle Working of transformer (b) Any two energy loss in transformer (c) No. Energy is conserved with the reason **OR** (a) Diagram of ac generator Principle (b) Derivation of expression $e = e_0 \sin \omega t$ (c) No, MCG can't measure ac with Reason	½ ½ 2 ½ +½ ½ +½ 1 1 2 ½ +½
B	**33**	(a) ray diagram – astronomical telescope in normal adjust Magnifying power definition (b) (b) 0.5 D (large focal length) and 4 D or 10 D (small focal length) **OR** Refraction through curved surface – ray diagram Derivation of proper relation Sign convention **(if sign convention used in ray diagram, add 1 mark with Ray diagram)** Focal length of convex lens increases when immersed in water	2 1 1 +1 1 2 1 1
B	**34**	(i) Statement faraday's laws First law Second law (ii) weber, scalar (iii) clockwise **OR** $e = -\frac{d\phi}{dt}$ $e = 1.6 \times 10^{-3}$ V	 ½ ½ ½ +½ 2 1 1
B	**35**	(i) Two Conditions for TIR (ii) Two uses of optical fibre (iii) definition of critical angle and relation between i_c and n_{21} OR From $\sin C = \frac{1}{\mu} = \frac{1}{\sqrt{2}}, C = 45°$	½ +½ ½ +½ 1 +1 1 +1

C	1	A	
C	2	C	
C	3	A	
C	4	B	
C	5	A	
C	6	A	
C	7	B	
C	8	B	
C	9	A	
C	10	A	
C	11	D	
C	12	D	
C	13	A	
C	14	A	
C	15	(i)	
C	16	A	
C	17	C	
C	**18**	A	
C	**19**	$radius\ r = \frac{mv}{q\,B} = \frac{p}{qB}$ $radius\ r \propto \frac{1}{q}$ $\frac{r_1}{r_2} = \frac{q_2}{q_1} = \frac{2}{1}$	½ ½ 1

C	**20**	(a) 	1
		(b) An electrostatic field line is a continuous curve because a charge experiences a continuous force when traced in an electrostatic field. The field line cannot have sudden breaks because the charge moves continuously and does not jump from one point to the other.	1
		OR Since $x = 1m$ $\varphi_L = -50 \times 1 \times 25 \times 10^{-4}$ $= -1250 \times 10^{-4}$ $= -0.125\ Nm^2C^{-1}$	½
		Flux through the right surface, $\varphi_R = \lvert E \rvert \lvert S \rvert$ Since $x = 2m$, $\varphi_R = 50 \times 2 \times \lvert s \rvert$ $= 50 \times 2 \times 25 \times 10^{-4}$ $= 2500 \times 10^{-4}$ $= 0.250\ Nm^2C^{-1}$	½
		Now, flux through the cylinder $\varphi_{Ace} = \varphi_R + \varphi_L$ $= 0.250 - 0.125$ $= 0.125\ Nm^2C^{-1}$	1
C	**21**	(i) (a) dia magnetic (b) ferromagnetic	½ + ½
		(ii) negative susceptibility for diamagnetic and high and positive for ferromagnetic substance	½ + ½
C	**22**	(a) equipotential surface in z direction -diagram **showing equal spacing between two consecutive equipotential surface otherwise reduce ½ mark**	½ +½
		(b) two different equipotential surface have different electric potential, so if they intersect then the point of intersection will have two different potentials at the same point which is not possible.	1
C	**23**		1+1
C	**24**	(a) definition of self-inductance in terms of induced emf	1

		(b) $e = L\frac{di}{dt}$ $L = \frac{e}{\frac{di}{dt}}$ $= \frac{200}{\frac{5}{0.1}} = 4H$ Hence the self inductance of the coil is 4H. OR Derivation for self-inductance of long solenoid Diagram Derivation	½ ½ ½ 1½
C	**25**	$I = nEAv_d$ Derivation **(If diagram is given give ½ mark)**	2
C	**26**	(a) microwave (b) IR (c) X ray **OR** (a) oscillating charge produces em wave - explanation (b) sketch of em wave propagating in + x direction **If any representation in diagram is missing, reduce ½ marks**	1+1+1 ½ + 1 1 ½
C	**27**	(a) Remain same because source of charge disconnected (b) Electric field E= V/d , As V decreases and d remains the same, electric field also decreases. (c) the capacitance increases as the dielectric constant K>1.	1 1 1
C	**28**	Reflecting telescope – diagram Any two Advantages	2 ½ +½
C	**29**	the expression for the electric field at a point due to an infinitely long thin, uniformly charged straight wire of linear charge density λ C/m [**Ans.** Charge enclosed by Gaussian surface, $q = \lambda l$ At the part I and II of Gaussian surface $\vec{E}$ and $\hat{n}$ are ⊥, so flux through surfaces I and II is zero. By Gauss's law, $\oint \vec{E}.\vec{ds} = \frac{q}{\varepsilon_0}$ ⇨ $\oint Eds\cos 0 = \frac{q}{\varepsilon_0}$ ⇨ $E\oint ds = \frac{q}{\varepsilon_0}$ ⇨ $E(2\pi rl) = \frac{\lambda l}{\varepsilon_0}$ ⇨ $\boldsymbol{E = \frac{\lambda}{2\pi\varepsilon_0 r}}$  	1 for diagram 2 for derivation
C	**30**	a) expression for resistivity of a conductor in terms of number density of free electrons and relaxation time On the basis of electron drift, derive an expression for resistivity of a conductor in terms of number density of free electrons and relaxation time. Let a potential difference V is applied across the ends of a conductor as shown. Electric field produced, $E = \frac{V}{l}$  ⇨ $v_d = \frac{eE}{ml}\tau = \frac{eV}{ml}\tau$ ⇨ $I = neAv_d = neA\left(\frac{eV}{ml}\tau\right) = \frac{ne^2\tau}{m}\left(\frac{A}{l}\right)V$ ⇨ $\frac{V}{I} = \frac{m}{ne^2\tau}\left(\frac{l}{A}\right)$ ---------(1) If the physical conditions of conductor such as temperature etc. remains constant then $\frac{m}{ne^2\tau}\left(\frac{l}{A}\right) = constant = R$ --------(2) ⇨ from (1) $\frac{V}{I} = \boldsymbol{R}$ ⇨ $V = IR$, Now, $R = \frac{\rho l}{A}$ ⇨ from (2) $\rho = \frac{m}{ne^2\tau}$ (b) Factors on which resistivity depends	 ½ ½ ½ ½ ½ +½

		OR Effective resistance, $R_{12} = \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ $R_{12} = 1.2\Omega$ resistance, R_{12} is in series 2.8Ω Total resistance $= 1.2 + 2.8 = 4.0\Omega$ Current, $I = \frac{6}{4} = 1.5A$ Potential difference, $AB = 1.5 \times 1.2 = 1.8V$ Current through $2\Omega = \frac{1.8}{2} = 0.9A$.	 ½ 1 ½ 1
C	**31**	(a) ray diagram – astronomical telescope in normal adjust Magnifying power definition (b) 0.5 D (large focal length) and 4 D or 10 D (small focal length) **OR** Refraction through curved surface – ray diagram Derivation of proper relation Sign convention **(if sign convention used in ray diagram, add 1 mark with Ray diagram)** Focal length of convex lens increases when immersed in water	2 1 1 +1 1 2 1 1
C	**32**	(a) figure of step up transformer Principle Working of transformer (b) Any two energy loss in transformer (c) No. Energy is conserved with the reason **OR** (a) Diagram of ac generator Principle (b) Derivation of expression $e = e_0 \sin \omega t$ (c) No, MCG can't measure ac with Reason	½ ½ 2 ½ +½ ½ +½ 1 1 2 ½ +½
C	**33**	(a) Biot savart law statement and mathematical expression (b) Derivation of magnetic field due to current carrying circular coil along the axis Diagram Derivation **OR** (a) expression for force on current carrying conductor- derivation and figure Diagram Derivation (b) The force acting on the current carrying wire in uniform magnetic field $F = Bil \sin\theta$ $F = Bil \quad (\because \theta = 90^\circ)$ Weight of the wire $w = mg = 0.2 \times 9.8N$ In the position of suspension $Bil = mg$ $B = \frac{mg}{il} = \frac{0.2 \times 9.8}{2 \times 15} = 0.65T$	+1 1 2 1 2 ½ ½ ½ ½
C	**34**	(i) Statement faraday's laws First law Second law (ii) weber, scalar	 ½ ½ ½ +½

		(iii) clockwise **OR** $e = -\frac{d\phi}{dt}$ e = 1.6 x 10^{-3} V	2 1 1
C	**35**	(i) Two Conditions for TIR (ii) Two uses of optical fibre (iii) definition of critical angle and relation between i_c and n_{21} OR From $\sin C = \frac{1}{\mu} = \frac{1}{\sqrt{2}}, C = 45°$	½ +½ ½ +½ 1 +1 1 +1