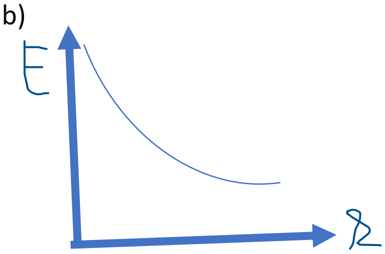
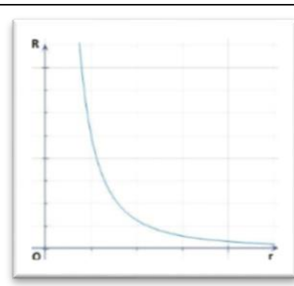
INDIAN SCHOOL AL WADI AL KABIR

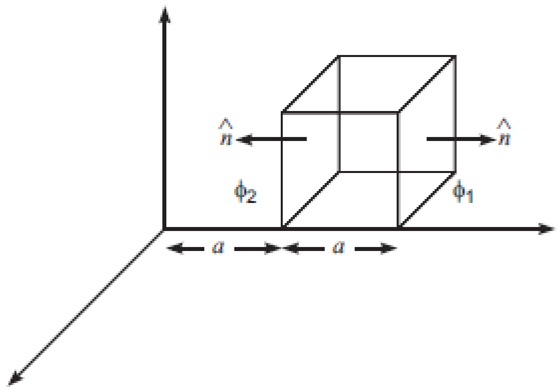
DEPARTMENT OF SCIENCE 2022-23

Subject: Physics (042)

MARKING SCHEME ASSESSMENT 1

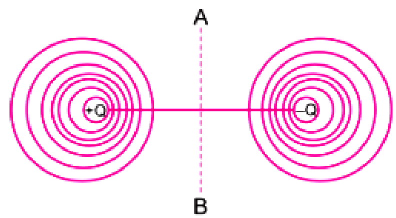
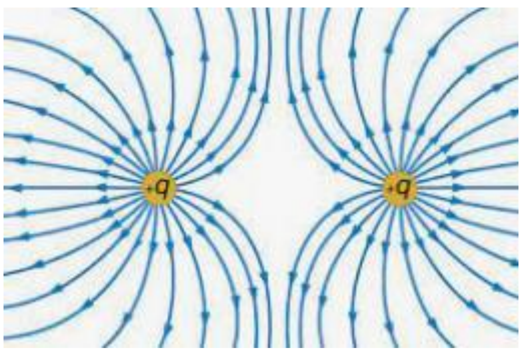
1.	d	1
2.	C	1
3.	d	1
4.	b	
5	a	
6	a	
7	d	
8	b	
9	c	
10	b	
11.	$V = Q/4\pi\epsilon_o R$, Potential at centre due to one charge and multiply by 6,	1+1
12.	(a) $E = \lambda/2\pi\epsilon_o R$ (b) 	1+1
13.	(a) Ans: - $R = \rho\, l/A$, $R \propto 1/r^2$  (b) Ans: -$R = V/I$ and varies directly to temperature. At T_1 resistance is greater. ($T_1 > T_2$)	1+1

14.	Ans: - (a) (i) DE (slope is negative and hence resistance). (ii) BC (straight line) (b) (i) Cu (metals, alloys). (ii) Si (semiconductor).	1+1
15.	When unit charge moving with unit speed perpendicular to field experiences force of one newton. Or Ans. (a device consisting perpendicular electric and magnetic fields that can be used as a velocity filter for charged particles. It is used to measure charge to mass ratio and also used in mass spectrometer.)	1+1
16.	(i)$B = \mu_o NI/2r$ (ii) $M = NIA$ ($A = \pi r^2$)	1+1
17.	The inductive reactance of the solenoid increases. Consequently, a large fraction of the applied AC voltage appears across the solenoid. As a result of this, there is a less voltage across the bulb and the brightness of the bulb decreases. Or	

18.	 $$\phi = \oint_s \vec{E}.\vec{dS} = \frac{q}{\varepsilon_0}$$ (*ii*) Net flux $\phi = \phi_1 + \phi_2$ where $\phi_1 = \vec{E}.\vec{dS}$ $= 2aC\ dS \cos 0° = 2aC \times a^2 = 2a^3 C$ $\phi_2 = aC \times a^2 \cos 180° = -a^3 C$ $\phi = 2a^3 C + (-a^3 C) = a^3 C \text{ Nm}^2 \text{ C}^{-1}$ (*iii*) Net charge $(q) = \varepsilon_0 \times \phi = a^3 C \varepsilon_0$ coulomb $q = a^3 C\ \varepsilon_0$ coulomb.	1+1+1
19.	$\vec{E} \Rightarrow E\vec{A} = \frac{K(+q)}{x^2}\ E\vec{B} = \frac{K(+9q)}{(10a-x)^2}$ Substituting in eq. 1 $\frac{K(+q)}{x^2} = \frac{K(+9q)}{(10a-x)^2}$ $(10a-x)^2 = 9x^2 \Rightarrow 10a - x = 3x$ $10a = 4x \Rightarrow x = \frac{10}{4}a$ $x = 2.5$ a from change (+q)	1+1+1
20.	Drift velocity per unit electric field applied is termed as mobility. (i) When **temperature** of the **conductor decreases**, the relaxation time τ of the **electrons** in the **conductor** increases, so **mobility** μ increase. **(ii) Mobility** μ is independent of **applied potential difference** Or Hints: -current through the capacitor (CE) is zero hence branch CEF is not worth in the circuit. So, equivalent resistance is 5Ω.	

	Total current is 3A. Current is CD = 1A	
21.	**Solution:** Total resistance = 4 x 4/4 + 4 = 2Ω Current I = 10V/2Ω = 5A Since the resistances of both the branches are equal, therefore the current of 5 A shall be equally distributed. Current through each branch = 5/2 A = 2.5A $V_C - V_A = 2.5 \times 1 = 2.5$ V $V_C - V_B = 2.5 \times 3 = 7.5$ V. $V_A - V_B = (V_C - V_B) - (V_C - V_A) = 7.5 - 2.5 = 5.0$ V.	
22.	F = qvB sinθ, Expression for F = IlB sinθ	
23.	Both $\vec{B}_1$ and $\vec{B}_2$ are mutually perpendicular, so magnetic field at O is $B = \sqrt{B_1^2 + B_2^2} = \sqrt{2}B_1$ (as $B_1 = B_2$) $= \sqrt{2}\dfrac{\mu_0 i R^2}{2(R^2 + x^2)^{3/2}}$ As $R << x$ $B = \dfrac{\sqrt{2}\mu_0 i R^2}{2.x^3} = \dfrac{\mu_0}{4\pi}.\dfrac{2\sqrt{2}\mu_0 i(\pi R^2)}{x^3}$ $= \dfrac{\mu_0}{4\pi}.\dfrac{2\sqrt{2}\mu_0 i\, A}{x^3}$ where $A = \pi R^2$ is area of loop. $\tan\theta = \dfrac{B_2}{B_1} \Rightarrow \tan\theta = 1\ (\because B_2 = B_1)$ $\Rightarrow \theta = \dfrac{\pi}{4}$	
24.	Statement Diagram Proof steps	1, ½, 1.5

25	The capacitance without dielectric is $C = \frac{A\epsilon_0}{d}$ When dielectric slab is inserted, the capacitance becomes, $C' = \frac{AK\epsilon_0}{d} = KC$ where K be the dielectric constant. i)Thus, the capacitance will increase K times of the initial. ii) As the battery is disconnected so the charge on capacitor remains constant. Since, $Q = CV$ so potential V will decrease and also $E = V/d$ so the field E will also decrease. iii) Stored energy, $U = \frac{Q^2}{2C}$. As charge Q is constant and C is increasing so energy will decrease. (ii)drawing of field lines Or (a) (i) $C_B > C_A$ (ii) Energy density, $U = \frac{1}{2}\epsilon_0 E^2$ But, $E = \frac{\sigma}{\epsilon_0} = \frac{Q}{A\epsilon_0}$ $\therefore U = \frac{1}{2}\frac{\epsilon_0 Q^2}{A^2\epsilon_0} \Rightarrow U = \frac{Q^2}{2A^2}$ $\Rightarrow U \propto \frac{1}{A^2} \Rightarrow U_A > U_B$. (b)	3 + 2

	Equipotential surfaces are closer together in the regions of strong field and farther apart in the regions of weak field. $E = -\frac{dV}{dr}$ E = negative potential gradient For same change in dV, $E = -\frac{dV}{dr}$ where 'dr' represents the distance between equipotential surfaces.  	
26	Principal of galvanometer Construction Diagram Current sensitivity Voltage sensitivity Or	

(a) Torque (t) on the loop is given by:

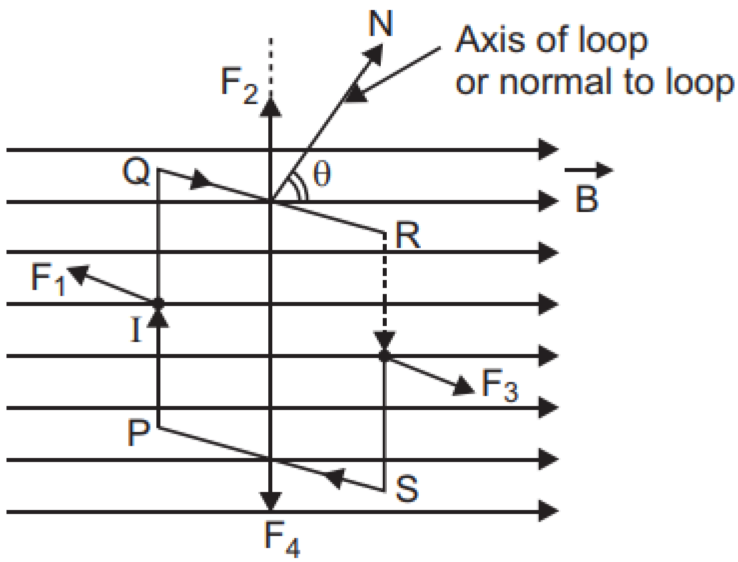
Vector τ = NI vector A x vector B

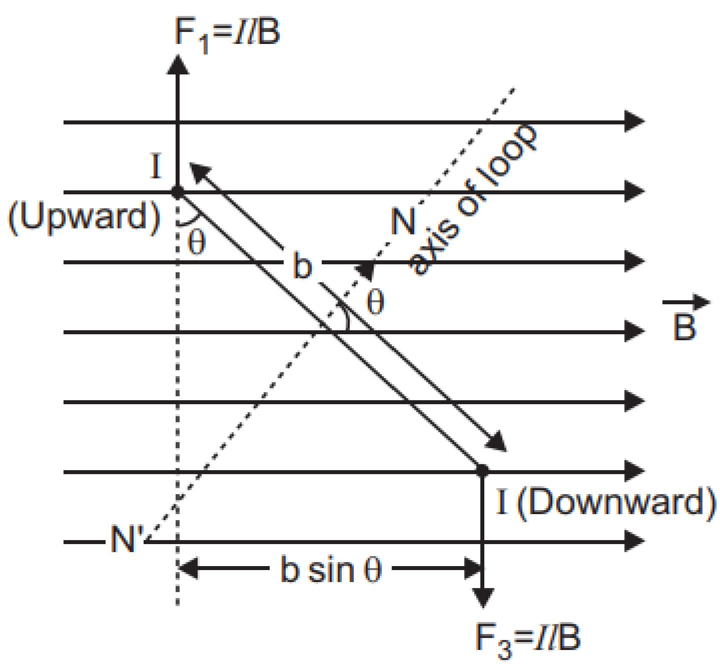
which can be written as,

vector τ = vector M x vector B

where, vector M is the magnetic dipole moment given by

vector M = NI vector A





	(c) $G = 50\,\Omega$ $I_g = 5\,mA = 5 \times 10^{-3}$ A $V = 15$ V The galvanometer can be converted into a voltmeter when a high resist connected in series with it. Value of R is given by: $R = \frac{V}{I_g} - G = \frac{15}{5 \times 10^{-3}} - 50$ $= 3000 - 50$ $= 29\,50\,\Omega = 2.95\,k\Omega.$	
27.	(b) Equivalent resistance of the circuit is 10 Ω. hence current is 10 A. Current across, 5 Ω is 8 A, p = I^2R = 64 x 5 =320 W. Or -(a), (i) series (ii) parallel. (b) Try by connecting two parallel and one in series or connecting one parallel and two in series. (c) 16/3Ω. and 5R.	
28.	(i)d, (ii)b, (iii)c, (iv)b, (v)c	
29.	(i)a, (ii)b, (iii)c, (iv)c, (v)b	