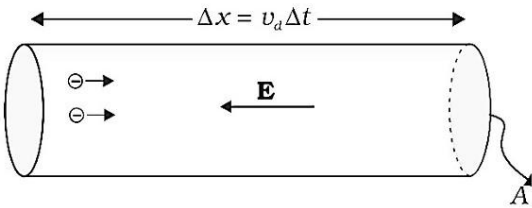
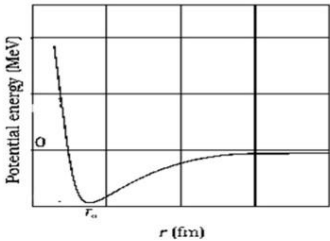
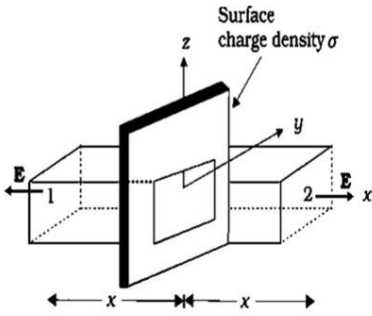
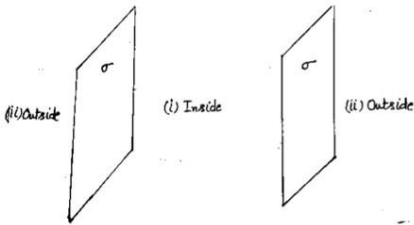
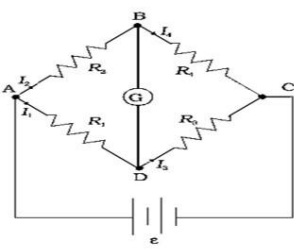
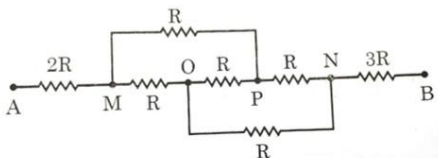


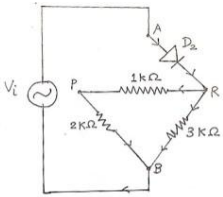
MARKING SCHEME: PHYSICS (042)			
Session: 2025–26			
Code: 55/1 /1			
Q. No.	VALUE POINTS/EXPECTED ANSWERS	Marks	Total Marks
SECTION – A			
1	(C) 50 N/C along + x	1	1
2	(B) $\frac{r_2}{r_1}$	1	1
3	(C) $\frac{\mu_0 I}{4\pi a}$	1	1
4	(A) Straight	1	1
5	(C) wavelength is halved and frequency remains unchanged.	1	1
6	(B) $5\sqrt{2}$ V	1	1
7	(A) 1nm to 10^{-3} nm	1	1
8	(D) 4d	1	1
9	(A) 20 cm	1	1
10	(C) (i), (iii) and (iv) only	1	1
11	(D) $\frac{P_1 P_2}{4(P_1 + P_2)}$	1	1
12	(C) Diffusion and drift currents are equal and opposite	1	1
13	(D) Both Assertion (A) and (R) Reason are false	1	1
14	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1	1
15	(C) Assertion (A) is true, but reason (R) is false.	1	1
16	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A)	1	1
SECTION – B			
17	Calculating the work function (in eV) 2 $h\nu = \phi_0 + KE_{\max}$ $\frac{hc}{\lambda} = \phi_0 + eV_0$ $\phi_0 = \frac{hc}{\lambda} - eV_0$ $\phi_0 = \left[\frac{6.63 \times 10^{-34} \times 3 \times 10^8}{1.6 \times 10^{-19} \times 200 \times 10^{-9}} - 0.80 \right] \text{eV}$ $\phi_0 = 5.4 \text{eV}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2
18	Finding least distance 2 (a) At the point of coincidence for dark fringes. $d \sin \theta = n\lambda_2 = (n+1)\lambda_1$ $n \times 600 = (n+1) \times 400$ $n = 2$	$\frac{1}{2}$ $\frac{1}{2}$	

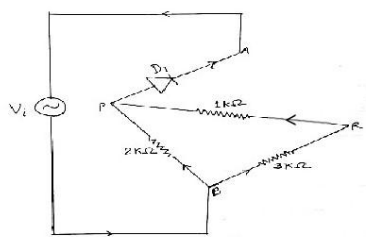
	Position of dark fringe from the central maxima $y = \frac{(n+1)\lambda_1 D}{d}$ $y = \frac{3 \times 400 \times 10^{-9} \times 1.5}{1 \times 10^{-3}}$ $y = 1.8 \text{ mm}$ Alternatively: $y = \frac{n\lambda_2 D}{d}$ $y = \frac{2 \times 600 \times 10^{-9} \times 1.5}{1 \times 10^{-3}}$ $y = 1.8 \text{ mm}$ OR • Finding the least distance 2	$\frac{1}{2}$ $\frac{1}{2}$	
	(b) At the point of coincidence for bright fringes $\frac{n\lambda_2 D}{d} = \frac{(n+1)\lambda_1 D}{d}$ $n \times 660 = (n+1) \times 440$ $n = 2$ Position of bright fringe from the central maxima $y = \frac{n\lambda_2 D}{d}$ $y = \frac{2 \times 660 \times 10^{-9} \times 1.5}{0.6 \times 10^{-3}}$ $y = 3.3 \text{ mm}$ Alternatively: $y = \frac{(n+1)\lambda_1 D}{d}$ $y = 3.3 \text{ mm}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
19.	• Finding the ratio of maximum value of torque 2 Side of square $a = \frac{L}{4N}$ and radius of circular coil $r = \frac{L}{2\pi N}$ $\tau = NIBA$ $\frac{\tau_1}{\tau_2} = \frac{NIBA_1}{NIBA_2}$	$\frac{1}{2}$ $\frac{1}{2}$	2

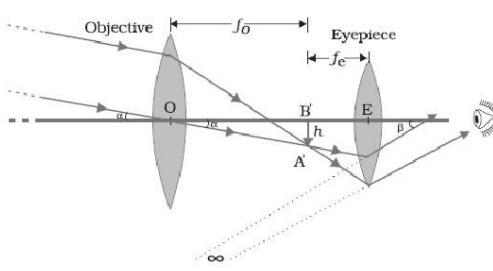
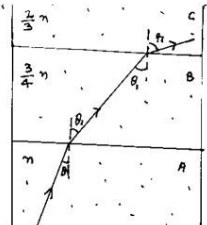
	$\frac{\tau_1}{\tau_2} = \frac{A_1}{A_2}$ $\frac{\tau_1}{\tau_2} = \frac{(L/4N)^2}{\pi \left(\frac{L}{2\pi N}\right)^2}$ $\frac{\tau_1}{\tau_2} = \frac{\pi}{4}$	$\frac{1}{2}$ $\frac{1}{2}$	2
20.	• Writing the order of Magnitude of drift velocity $\frac{1}{2}$ • Deducing the relation between current flowing through a conductor and drift velocity. $1\frac{1}{2}$ • Magnitude of drift velocity in conductor is of the order of a few mm/s  • For n number of free electrons per unit volume in a conductor of cross section area A, the total charge transported across the area in time Δt is $Q = -neA v_d \Delta t$ As electron moves in a direction opposite to that of electric field $I \Delta t = neA v_d \Delta t$ $I = neA v_d$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	2
21.	• Plotting the graph for potential energy of a pair of nucleons as the function of their separation. 1 • Writing two important conclusions. $1/2 + 1/2$ • Graph 	1	

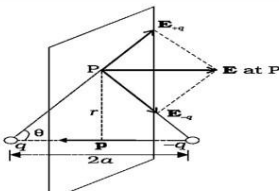
	• Important conclusions (i) Potential energy is minimum at a distance r_0 of about 0.8 fm (ii) Force is attractive for distances larger than 0.8 fm. (iii) Force is repulsive for distances smaller than 0.8 fm [Any two conclusions]	$\frac{1}{2} + \frac{1}{2}$	2
SECTION – C			
22	(a) Deducing an expression for electric field at point due to the uniformly charged infinite plane thin sheet. 2 (b) Writing the net electric field due to two thin sheets. (i) Inside $\frac{1}{2}$ (ii) Outside $\frac{1}{2}$ (a)  As seen from the figure, only the two faces 1 and 2 will contribute to the flux. Therefore, flux $\vec{E} \cdot \vec{\Delta S}$ through both the surfaces are equal and add up. Therefore, net flux through the Gaussian surface is 2 EA. The charge enclosed by the close surface is σA. $2EA = \frac{\sigma A}{\epsilon_0}$ $\vec{E} = \frac{\sigma}{2\epsilon_0} \hat{n}$ (b)  (i) $E_{in} = 0$ $\frac{1}{2}$ (ii) $E_{out} = \frac{\sigma}{\epsilon_0}$ $\frac{1}{2}$		3

	OR (a) Obtaining the Condition for balanced Wheatstone bridge. 2 (b) Finding the net resistance of the given network. 1 (a)  By using Kirchhoff's rule to closed loops ADGA and CBGC. The first loop gives $-I_1 R_1 + 0 + I_2 R_2 = 0$ ----- (1) $\because [V_B = V_D, I_g = 0]$ Second loop gives $I_4 R_4 + 0 - I_3 R_3 = 0$ $\because I_g = 0$, hence $I_1 = I_3$ and $I_2 = I_4$ $I_2 R_4 - I_1 R_3 = 0$ ----- (2) From equations (1) and (2) Hence $\frac{R_2}{R_1} = \frac{R_4}{R_3}$ (b)  Due to balanced Wheatstone bridge $R_{MN} = R$ Total resistance across AB $R_{AB} = R_{AM} + R_{MN} + R_{NB}$ $R_{AB} = 2R + R + 3R$ $R_{AB} = 6R \Omega$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	HOME
23	Effect and justification of (a) Capacitance of the capacitor $\frac{1}{2} + \frac{1}{2}$ (b) Energy stored in the capacitor $\frac{1}{2} + \frac{1}{2}$ (c) The potential difference between the plates of the capacitor. $\frac{1}{2} + \frac{1}{2}$		

	(a) $C = K \frac{\epsilon_0 A}{d}$ Capacitance of capacitor with dielectric slab $C' = \frac{\epsilon_0 A}{d}$ Capacitance of a capacitor without dielectric slab $C' = \frac{C}{K}$ (Capacitance decreases) (b) As charge Q is constant $U = \frac{Q^2}{2C}$ $U' = \frac{Q^2}{2C'} = KU$ (Energy stored in the capacitor increases) (c) $V = \frac{Q}{C}$ $V' = \frac{Q}{C'} = KV$ (Potential difference between the plates increases)	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	3
24	Calculating the applied potential difference between the plates. 3 Since $a = \frac{qE}{m} = \frac{qV}{mL}$ $t = \frac{x}{u_x}$ $y = \frac{1}{2} \left(\frac{qV}{mL} \right) \left(\frac{x}{u_x} \right)^2$ $V = \frac{2ymLu_x^2}{ex^2}$ $V = \frac{2 \times 1 \times 10^{-2} \times 9.1 \times 10^{-31} \times 2 \times 10^{-2} (3 \times 10^7)^2}{1.6 \times 10^{-19} \times (3 \times 10^{-2})^2}$ $V = 2275 \text{ Volt}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	3
25	(a) Identifying the diode which conducts and justification. $\frac{1}{2}$ (b) Redrawing the equivalent circuit. 1 (c) Calculating the output voltage drop across the three resistors. $1\frac{1}{2}$ (a) Diode D_2 is in forward bias and it conducts. (b) 	$\frac{1}{2}$ 1	

	(c) Voltage drop across RP, PB and RB is $V_{RP} = 4V$, $V_{PB} = 8V$, $V_{RB} = 12V$ Alternatively: If the student considers positive AC cycle reaching diode D_1 (a) Diode D_1 is in forward bias and it conducts. (b)  (c) $V_{PB} = 12V$, $V_{PR} = 3V$, $V_{RB} = 9V$	$\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$	
26	Explaining the two important process that occurs during formation of p-n junction. $1\frac{1}{2} + 1\frac{1}{2}$ Two important processes are in the formation of p-n junction. (i) Diffusion (ii) Drift Diffusion: During the formation of p-n junction, due to concentration gradient across p- and n-sides, holes diffuse from p-side to n-side ($p \rightarrow n$) and electrons diffuse from n-side to p-side ($n \rightarrow p$). This motion of charge carriers give rise to diffusion current across the junction. Drift: Due to the positive space charge region on n-side of the junction and negative space charge region on p-side of the junction, an electric field directed from positive charge towards negative charge develops. Due to this field an electron on p-side of junction moves to n-side and a hole on n-side of the junction moves to p-side. The motion of charge carriers due to the electric field is called drift and constitutes drift current.	$\frac{1}{2}$ $\frac{1}{2}$ 1 1	3
27	(a) ●Drawing the ray diagram for image formation by refracting telescope $1\frac{1}{2}$ ●Expression for angular magnification. $\frac{1}{2}$ (b) Two reasons 1		

	(a)  $m = \frac{f_o}{f_e}$ (b) Reasons: (i) No Chromatic aberration (ii) Less mechanical support is required to install it. (iii) Image formed is brighter and clear. (iv) Cost efficient. (v) No / less Spherical aberration [Any two reasons]	$1\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2} + \frac{1}{2}$	3
28.	(a) Two Conditions for total internal reflection $\frac{1}{2} + \frac{1}{2}$ (b) Proving that beam does not enter into region C at all for $\sin\theta \geq \frac{2}{3}$ 2 (a) (i) Light must travel from denser medium to rarer medium. (ii) Angle of incidence must be greater than Critical angle. $i > i_c$ (b)  For refraction at AB interface $\frac{\sin\theta}{\sin\theta_1} = \frac{3n/4}{n}$ $\sin\theta = \frac{3}{4}\sin\theta_1 \quad \text{----- (1)}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	

	For refraction at BC interface $\frac{\sin \theta_1}{\sin r} = \frac{2n/3}{3n/4}$ $\sin \theta_1 = \frac{8}{9} \sin r \quad \text{----- (2)}$ From equations (1) and (2) $\frac{3}{2} \sin \theta = \sin r$ for $\sin \theta = \frac{2}{3}$ $\sin r = 1 \text{ i.e } r = 90^\circ$ Ray grazes the surface Hence for $\sin \theta \geq \frac{2}{3}$ does not enter the region C at all	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	3
SECTION – D			
29	(I) (B) radial magnetic field (II) (A) increasing number of turns of the coil (III) (D) 0.25 Nm OR (B) 3985 Ω (IV) (C) 0.01 Ω should be connected in parallel with it.	1 1 1 1	4
30	(I) (C) $h\nu_1$ and $h\nu_2$ (II) (A) greater for metal A because it has a smaller work function. (III) (D) the slope of the parallel lines will not change but more electrons will be emitted per second. (IV) (C) $\frac{2}{5}$ OR (A) me	1 1 1 1	4
SECTION - E			
31.	(a)•Deriving an expression for the electric field $\vec{E}$ due to a dipole at a point on the equatorial plane. $2\frac{1}{2}$ •Writing the expression for electric field at a far off point. $\frac{1}{2}$ (b) Calculating the force and torque. 2  The magnitude of the electric fields due to the two charges + q and – q are given by $E_{+q} = \frac{q}{4\pi\epsilon_0 (r^2 + a^2)}$	$\frac{1}{2}$ $\frac{1}{2}$	

$$E_{-q} = \frac{q}{4\pi\epsilon_0} \frac{1}{(r^2 + a^2)^{3/2}}$$

The components normal to the dipole axis cancel away. The components along the dipole axis add up. The Total electric field is opposite to $\vec{p}$.

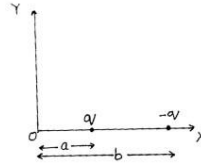
$$\vec{E} = -(E_{+q} + E_{-q}) \cos\theta (\hat{p})$$

$$\vec{E} = -\frac{1}{4\pi\epsilon_0} \frac{2qa}{(r^2 + a^2)^{3/2}} \hat{p}$$

At large distance $r \gg a$

$$\vec{E} = \frac{-2qa}{4\pi\epsilon_0 r^3} \hat{p}$$

(b)



$$\vec{F} = \vec{F}_{+q} + \vec{F}_{-q}$$

$$\text{Net force} = [+q \cdot 2\hat{i} - q \cdot 2\hat{i}] = 0 \text{ N}$$

$$\text{Torque } \vec{\tau} = \vec{p} \times \vec{E}$$

$$\vec{\tau} = p(-\hat{i}) \times 2\hat{i}$$

$$\tau = 0$$

Alternatively:

$$\tau = pE \sin\theta$$

Angle between $\vec{p}$ and $\vec{E}$ is π

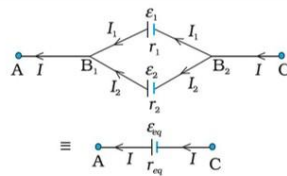
OR $\tau = 0$

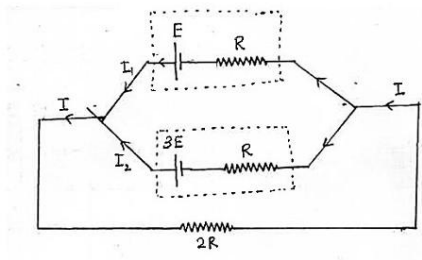
(a) Deriving the expression for

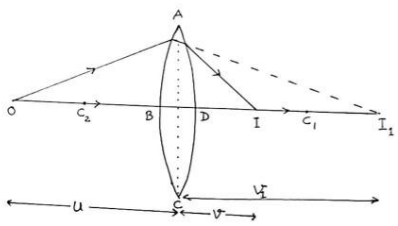
- Equivalent e.m.f
- Equivalent internal resistance

(b) Finding the current through resistance $2R$.

(a)

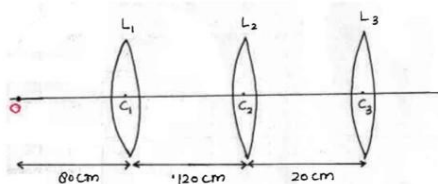


Let I_1 and I_2 are the currents leaving from the positive electrodes of the cells $\mathcal{E}_1$ and $\mathcal{E}_2$ respectively, Hence $I = I_1 + I_2$ Potential difference across the terminals of cell $\mathcal{E}_1$ is $V = \mathcal{E}_1 - I_1 r_1$ Potential difference across the terminals of cell $\mathcal{E}_2$ is $V = \mathcal{E}_2 - I_2 r_2$ $I = I_1 + I_2$ $I = \frac{\mathcal{E}_1 - V}{r_1} + \frac{\mathcal{E}_2 - V}{r_2}$ $I = \left(\frac{\mathcal{E}_1}{r_1} + \frac{\mathcal{E}_2}{r_2} \right) - V \left(\frac{1}{r_1} + \frac{1}{r_2} \right)$ $V = \frac{\mathcal{E}_1 r_2 + \mathcal{E}_2 r_1}{r_1 + r_2} - I \left(\frac{r_1 r_2}{r_1 + r_2} \right)$ $V = \mathcal{E}_{eq} - I r_{eq}$ $\mathcal{E}_{eq} = \left(\frac{\mathcal{E}_1 r_2 + \mathcal{E}_2 r_1}{r_1 + r_2} \right)$ $r_{eq} = \left(\frac{r_1 r_2}{r_1 + r_2} \right)$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1	
(b)  Equivalent emf $E_{eq} = \frac{\mathcal{E}_1 r_2 + \mathcal{E}_2 r_1}{r_1 + r_2}$ $E_{eq} = \frac{E \times R + 3E \times R}{R + R}$ $E_{eq} = \frac{4ER}{2R}$	$\frac{1}{2}$	

	$E_{eq} = 2E$ Equivalent resistance $r_{eq} = \frac{r_1 r_2}{r_1 + r_2}$ $r_{eq} = \frac{RR}{R + R}$ $r_{eq} = \frac{R}{2}$ $I = \frac{E_{eq}}{2R + \frac{R}{2}}$ $I = \frac{4E}{5R} A$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	5
32	(a) Deriving the expression for lens maker's formula. 3 (b) Finding the distance of the final image from the object. 2 (a)  The first refracting surface forms the image of the object O at I_1 For refraction from first interface ABC $\frac{n_1}{OB} + \frac{n_2}{BI_1} = \frac{n_2 - n_1}{BC_1} \quad \text{----- (1)}$ Similarly for refraction from second interface ADC. The image I_1 acts as a virtual object for the second surface ADC $-\frac{n_2}{DI_1} + \frac{n_1}{DI} = \frac{n_2 - n_1}{DC_2} \quad \text{----- (2)}$ For thin lens $BI_1 = DI_1$ By adding equation (1) and (2) $\frac{n_1}{OB} + \frac{n_1}{DI} = (n_2 - n_1) \left[\frac{1}{BC_1} + \frac{1}{DC_2} \right]$ $-\frac{n_1}{u} + \frac{n_1}{v} = (n_2 - n_1) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$ $\frac{1}{v} - \frac{1}{u} = \left(\frac{n_2}{n_1} - 1 \right) \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$ If object is kept at ∞, image will form at focus hence	1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	

$$\frac{1}{f} = \left(\frac{n_2}{n_1} - 1 \right) \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$$

(b)

For lens L_1

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{40} = \frac{1}{v_1} + \frac{1}{80}$$

$$\frac{1}{40} = \frac{1}{v_1} + \frac{1}{80}$$

$$\frac{1}{v_1} = \frac{1}{80}$$

$$v_1 = 80 \text{ cm}$$

For lens L_2

$$u_2 = 120 - 80$$

$$u_2 = 40 \text{ cm}$$

$$\frac{1}{40} = \frac{1}{v_2} + \frac{1}{40}$$

$$\frac{1}{v_2} = 0$$

$$v_2 = \infty$$

For lens L_3

$$u_3 = \infty$$

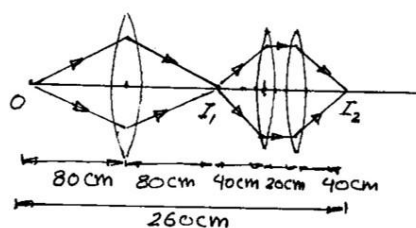
$$\frac{1}{40} = \frac{1}{v_3} + \frac{1}{\infty}$$

$$v_3 = 40 \text{ cm}$$

Distance between final image and object

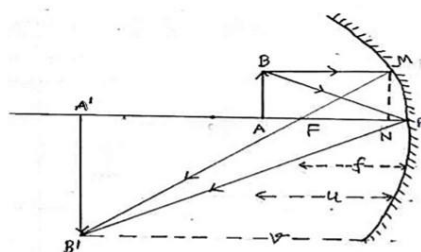
$$= 80 + 120 + 20 + 40$$

$$= 260 \text{ cm}$$

Alternatively: $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$

- | | |
|--|---|
| (a) •Drawing ray diagram | 1 |
| •Deriving of mirror formula | 2 |
| (b) Calculating the focal length of mirror | 2 |

(a)



$\triangle BAP$ and $\triangle B'A'P$ are similar then

$$\frac{BA}{B'A'} = \frac{AP}{A'P} \quad \text{-----(1)}$$

$$\therefore BA = MN$$

$\triangle MNF$ and $\triangle B'A'F$ are similar then

$$\frac{MN}{B'A'} = \frac{NF}{A'F}$$

$$\frac{BA}{B'A'} = \frac{NF}{A'F} = \frac{PF}{A'F} \quad (\text{N is very close to P and } BA = MN) \quad \text{-----(2)}$$

From equation (1) and (2)

$$\frac{AP}{A'P} = \frac{PF}{A'F}$$

$$\frac{-u}{-v} = \frac{-f}{-v+f}$$

$$-uv + uf = -vf$$

$$\frac{-uv}{uvf} + \frac{uf}{uvf} = \frac{-vf}{uvf}$$

$$\frac{-1}{f} + \frac{1}{v} = \frac{1}{-u}$$

$$\boxed{\frac{1}{f} = \frac{1}{v} + \frac{1}{u}}$$

Note: Award full marks if student derives mirror formula by using any other justified method

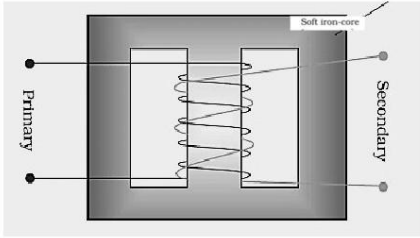
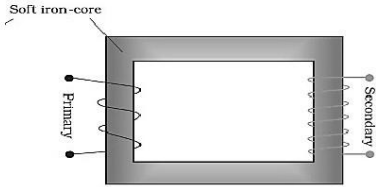
$$(b) \quad m = \frac{-v}{u}$$

$$m = 2$$

$$\therefore v = -2u \Rightarrow v = -2(-10) = 20 \text{ cm}$$

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

	$\frac{1}{20} - \frac{1}{10} = \frac{1}{f}$ $\frac{1-2}{20} = \frac{1}{f}$ $f = -20 \text{ cm}$	$\frac{1}{2}$ $\frac{1}{2}$	5																		
33	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">(a) Stating Faraday's law</td> <td style="width: 20%; text-align: right;">1</td> </tr> <tr> <td>(b) Deriving of Expression for self-inductance.</td> <td style="text-align: right;">2</td> </tr> <tr> <td>(c) Finding the induced e.m.f</td> <td style="text-align: right;">2</td> </tr> </table> (a) The magnitude of the induced e.m.f in a circuit is equal to the time rate of change of magnetic flux through the circuit. Alternatively: $\varepsilon = -\frac{d\phi_B}{dt}$ (b) Magnetic field due to current carrying long solenoid of length l area of cross section A having n turns per unit length is $B = \mu_0 nI$ Total magnetic flux linked with the solenoid is $N\phi_B = (nl)(\mu_0 nI)(A)$ $= \mu_0 n^2 A l I$ Where nl is total number of turns. Thus $\therefore$ Self inductance of the solenoid $L = \frac{N\phi_B}{I}$ $L = \mu_0 n^2 A l$ Note: Award full marks for any other correct alternative method (c) Induced e.m.f $\varepsilon = \frac{1}{2} B l^2 \omega$ $= \frac{1}{2} \times 4 \times 10^{-3} \times (50 \times 10^{-2})^2 \times (2\pi \times 1)$ $= 3.14 \text{ mV}$ OR <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">(a) •Drawing labelled diagram of step-up transformer.</td> <td style="width: 20%; text-align: right;">1</td> </tr> <tr> <td> •Stating the principle</td> <td style="text-align: right;">$\frac{1}{2}$</td> </tr> <tr> <td> •Obtaining the ratio of voltages in terms of number of turns and current</td> <td style="text-align: right;">2</td> </tr> <tr> <td colspan="2">(b) <u>Finding:</u></td> </tr> <tr> <td> (i) Current in Primary coil</td> <td style="text-align: right;">$\frac{1}{2}$</td> </tr> <tr> <td> (ii) Output Voltage</td> <td style="text-align: right;">1</td> </tr> </table>	(a) Stating Faraday's law	1	(b) Deriving of Expression for self-inductance.	2	(c) Finding the induced e.m.f	2	(a) •Drawing labelled diagram of step-up transformer.	1	•Stating the principle	$\frac{1}{2}$	•Obtaining the ratio of voltages in terms of number of turns and current	2	(b) <u>Finding:</u>		(i) Current in Primary coil	$\frac{1}{2}$	(ii) Output Voltage	1	1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
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	(a) Fig  Alternatively:  Principle: When an alternating voltage is applied to the primary, the resulting current produces an alternating magnetic flux which links the secondary and induces an e.m.f in it / mutual induction. Let ϕ be the flux in each turn in the core at time t due to current in the primary when a voltage v_p is applied to it. The induce e.m.f in the secondary coil is $\varepsilon_s = -N_s \frac{d\phi}{dt} \quad \text{-----(1)}$ Alternating flux ϕ also induces an e.m.f. called back e.m.f in the primary. This is $\varepsilon_p = -N_p \frac{d\phi}{dt} \quad \text{-----(2)}$ But $\varepsilon_p = v_p$ If this were not so, the primary current would be infinite since the primary has zero resistance. If the secondary is an open circuit or the current taken from it is small then $\varepsilon_s = v_s$ Now equations (1) and (2) can be written as. $\therefore v_s = -N_s \frac{d\phi}{dt} \quad \text{----- (3)}$ $v_p = -N_p \frac{d\phi}{dt} \quad \text{----- (4)}$ From equations (3) and (4) $\frac{v_s}{v_p} = \frac{N_s}{N_p}$ If the transformer is ideal the input power is equal to the power output Since $P = IV$ $I_p V_p = I_s V_s$ $\frac{V_p}{V_s} = \frac{I_s}{I_p}$	1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
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	(b)			
	(i)	$P = V_p I_p$ $5000 = 200 I_p$ $I_p = 25A$	$\frac{1}{2}$	
	(ii)	$\therefore \frac{N_p}{N_s} = \frac{V_p}{V_s}$ $\frac{1}{5} = \frac{200}{V_s}$ $V_s = 1000V$	$\frac{1}{2}$	5