PHYSICS (042)
CODE: 55/5/1

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Senior Secondary School Examination, 2026 (XII[th])
SUBJECT NAME : PHYSICS (Q.P. CODE : 042-55/5/1)

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General Instructions: -

1	The CBSE has decided to introduce On Screen Marking (OSM) for the evaluation of Class XII answer Book with the 2026 Examination.
2	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
3	**"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. Its leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in Newspaper/Website, etc. may invite action under various rules of the Board and IPC."**
4	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In Class-XII, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.**
5	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
6	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
7	Evaluators will mark (√) wherever answer is correct. For wrong answer CROSS 'X' be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
8	If a question has parts, please award marks on the right-hand side for each part in the OSM Portal. Marks awarded for different parts of the question will be totaled up by the OSM System.
9	If a question does not have any parts, marks must be awarded in the left-hand margin in the OSM Portal. This may also be followed strictly.

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10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks 0 to 70 (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).This is in view of the reduced syllabus and number of questions in question paper.
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past :- • Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) • Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
14	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
15	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for Spot Evaluation**" before starting the actual evaluation.
16	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.
17	**If a candidate attempts both alternatives/options in a question where only one option/ alternative is required to be attempted, the Evaluator shall award marks in both the options. The system will take the higher of two scores and disregard the other response.**
18	**In a question having two options/alternatives, if a candidate has attempted only one, then the evaluator shall mark "NA" (Not attempted) against the option that has not been attempted by the candidate.**

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MARKING SCHEME: PHYSICS (042)

Session: 2025–26

Code: 55/5/1

Q. No.	VALUE POINTS/EXPECTED ANSWERS	Marks	Total Marks
	SECTION A		
1	(B) repel with a force F/2	1	1
2	(D) S	1	1
3	(C) $\frac{\mu_0 I}{\pi a}\sqrt{2}$ and directed along OB	1	1
4	(D) any one or more of the factors given in option (A), (B) and (C)	1	1
5	(D) ac is less dangerous	1	1
6	(C) $7.5 x 10^2$ m^{-1}	1	1
7	(D) Blue light	1	1
8	(B) Isotone	1	1
9	(A) 6.0 fm(**Note. Award full marks for Attempt)**	1	1
10	(C) $\frac{h}{\pi}$	1	1
11	(A) high resistance in reverse bias and low resistance in forward bias	1	1
12	(C) $\frac{V_0}{\sqrt{2}}, 0$	1	1
13	(D) Both Assertion(A) and reason (R) are false.	1	1
14	(A) Both Assertion(A) and reason (R) are true, 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

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	SECTION B		
17.	(a)		
	Calculating (i) Resistance ½ (ii) heat produced in 10 min. 1 ½		
	(i) $R=\dfrac{V^2}{P}$		
	$=\dfrac{(220)^2}{2.2 \text{ x } 10^3} = 22\Omega$	½	
	(ii) $H = I^2 R t$	½	
	$I=\dfrac{V_{applied}}{R}=\dfrac{110}{22}=5A$	½	
	$=5 \text{ x } 5 \text{ x } 22 \text{ x } 600$		
	$=3.3\text{x}10^5 J$	½	
	OR		
	(b)		
	Calculating the resistivity of the wire. 2		
	$\rho = \dfrac{RA}{l}$	½	
	$R = \dfrac{V}{I} = \dfrac{2}{4} = \dfrac{1}{2}\Omega$	½	
	$\rho=\dfrac{1\text{x}10^{-6}}{2\text{x}1}$	½	
	$=5 \text{ x } 10^{-7}\Omega \text{ m}$	½	
			2

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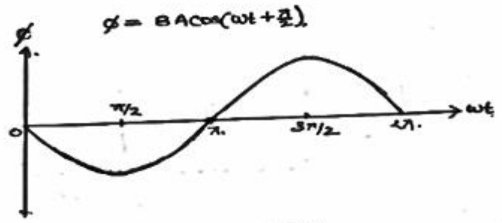
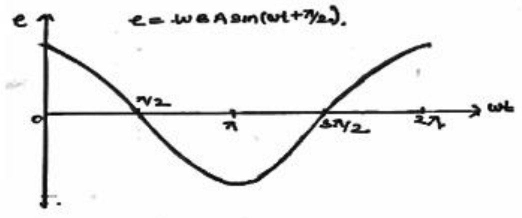
Q. No.	Value points / Expected points	Marks	Total Marks
18.	Drawing plot showing variation of a. magnetic flux linked with a coil. 1 b. emf induced in the coil as a function of ωt. 1		

(a)



1

(b)



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Alternatively,

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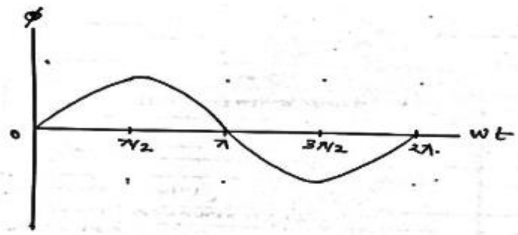
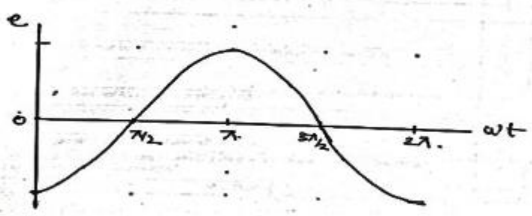
(a)



(b)



2

Note: Award full marks even if formula is not written by student.

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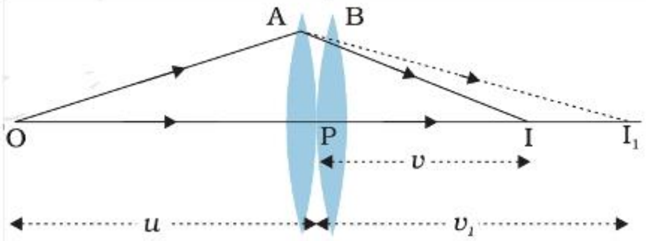
19.	Calculating the speed of light in liquid. 2 $n=\frac{\text{speed of light in vacuum(c)}}{\text{speed of light in medium(v)}}$ ……. (i) $n = \frac{\text{real depth}}{\text{apparent depth}}$ $n = \frac{12.5}{9}$ ……………………………..(ii) From (i) and (ii) $v = \frac{3 \times 10^8 \times 9}{12.5}$ $= 2.16 \times 10^8$ m/s	½ ½ ½ ½	2
20.	Proving the focal length of combination is $f = \frac{f_1 f_2}{f_1 + f_2}$ 2  For the image formed by lens A $\frac{1}{v_1} - \frac{1}{u} = \frac{1}{f_1}$ ……………...(i) For the image formed by second lens B $\frac{1}{v} - \frac{1}{v_1} = \frac{1}{f_2}$ ……………...(ii) Adding (i)and(ii) $\frac{1}{v} - \frac{1}{u} = \frac{1}{f_2} + \frac{1}{f_1}$ $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$ $f = \frac{f_1 f_2}{f_1 + f_2}$	½ ½ ½ ½	2

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21.	Calculating: Majority carrier concentration ½; Minority carrier concentration 1 ½		
	Majority carrier concentration = Doping concentration		
	∴ Majority carrier concentration (n_e)=5 x10^{22} atoms per m^3	½	
	$n_i^2 = n_e n_h$	½	
	$n_h = \frac{n_i^2}{n_e}$		
	$n_h = \frac{(1.5 \times 10^{16})^2}{5 \times 10^{22}}$		
	$=4.5 \times 10^9$ atoms per m^3	½	
	Minority carrier concentration = 4.5 x 10^9 atoms per m^3	½	
			2
	SECTION C		
22.	(a) Calculating the capacitance of X &Y. 1½; (b) Calculating the potential difference across plates of X & Y 1½		
	$(a)\ C_X = C,\ C_Y = KC = 4C$		
	$\frac{1}{C_{eq}} = \frac{1}{C_X} + \frac{1}{C_Y}$		
	$C_{eq} = \frac{C_X C_Y}{C_X + C_Y}$	½	
	$4 = \frac{C.4C}{C+4C}$		
	C=5μF	½	
	C_X=5μF		
	C_Y=20μF	½	
	(b) Total charge Q=C_{eq} V		
	=4 x10^{-6} x6		
	=24 x 10^{-6} C	½	

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.	$V_X = \frac{Q}{C_X} = \frac{24 \times 10^{-6}}{5 \times 10^{-6}}$ $= 4.8\ V$ $V_Y = \frac{Q}{C_Y} = \frac{24 \times 10^{-6}}{20 \times 10^{-6}}$ $= 1.2\ V$ Alternatively, $V_Y = V - V_X$ $= 6 - 4.8V$ $= 1.2V$	½ ½	3
23.	Writing the expression for magnetic field in vector form. 1 Calculating magnetic field $\vec{B}$ at a given point. 2 **Magnetic field due to a current element (d*l*) at a distance r,** $d\vec{B} = \frac{\mu_0}{4\pi}\frac{I(\vec{dl} \times \vec{r})}{r^3}$ $dB = \frac{\mu_0 i\ dl\ sin\theta}{4\pi r^2}$ $r = \sqrt{2}\ m$ $dB = 10^{-7} \times \frac{10 X 10^{-2}\ sin45^\circ}{2}$ $dB = 3.53 \times 10^{-9}\ T$ **Direction** : along +ve Z-axis	1 ½ ½ ½ ½	3

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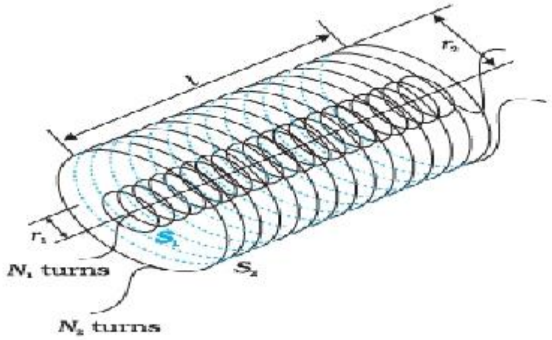
	Alternatively $\vec{r} = (\hat{i} + j)m$, $r = \sqrt{2}$ m $\vec{dl} = 10^{-2} m$ $I\vec{dl} = 10 \times 10^{-2}$ i Am $\vec{dB} = \frac{\mu_0 I(\vec{dl} x \vec{r})}{4\pi r^3}$ $= \frac{4\pi x 10^{-7}}{4\pi} x \frac{10[(10^{-2})\hat{i} \text{ x } (\hat{i} + j)]}{(\sqrt{2})^3}$ $= \frac{10^{-7}}{2\sqrt{2}}(0.1)(0 + k)$ $= \frac{5}{\sqrt{2}}$ x 10^{-9} k $\vec{dB}$=3.53 x 10^{-9} k T		
24.	Deriving the expression for mutual inductance of solenoid and coil. 2 Validating $M_{12}=M_{21}$ 1 		

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Let n_1 and n_2 be the total no. of turns per unit length of solenoid S_1 and coil S_2 respectively

$N_1 = n_1L, \quad N_2 = n_2L$

When current I_2 is set up in S_2, flux linkage with S_1 is:

$N_1\phi_1 = N_1A_1B_2$ ……………………………………………(i) ½

$N_1\phi_1 = (n_1L)(\pi r_1^2)(\mu_o n_2 I_2)$

$N_1\phi_1 = (\mu_o n_1 n_2 \pi r_1^2 L I_2)$ ……………………………….(ii) ½

$N_1\phi_1 = M_{12}I_2$ …………………………………………….(iii) ½

From (ii) and (iii)

$M_{12} = (\mu_o n_1 n_2 \pi r_1^2 L)$ ½

Considering the reverse case, when I_1 current is set up in S_1, flux linkage with S_2 is

$N_2\phi_2 = N_2A_1B_1$………………………………. (iv)

$N_2\phi_2 = (n_2L)(\pi r_1^2)(\mu_o n_1 I_1)$…………………(v)

$N_2\phi_2 = M_{21}I_1$…………………………………(vi)

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From (v) and (vi)

$M_{21} = (\mu_o n_1 n_2 \pi r_1^2 L)$ ½

Therefore, $M_{12} = M_{21}$ ½

Alternatively,

$$M_{12} = M_{21} = \frac{(\mu_o N_1 N_2 \pi r_1^2)}{L}$$

3

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25.	Defining displacement current. 1 Showing $i_d = \varepsilon_0 \frac{d\phi_e}{dt}$ 1½ Writing value of i_d when constant voltage is applied. ½		
	Displacement current arises due to time varying electric field and hence the time varying electric flux in a region.	1	
	The plates of the capacitor have an area A & a total charge Q, the magnitude of electric field between the plates:	½	
	$E=\frac{Q/A}{\varepsilon_0}$. ....$(i)$ $\phi_e = EA$ ....(ii)		
	Substituting (i) in (ii)	½	
	$\phi_e = \frac{Q}{\varepsilon_0}$ $\frac{d\phi_\varepsilon}{dt} = \frac{d}{dt}(\frac{Q}{\varepsilon_0}) = \frac{1}{\varepsilon_0}\frac{dQ}{dt}$ $\varepsilon_0 \frac{d\phi_\varepsilon}{dt} = \frac{dQ}{dt}$. ....(iii) If charge Q changes with time, the current i_d $i_d = \frac{dQ}{dt}$		
	From eq. (iii) and (iv) $i_d = \varepsilon_0 \frac{d\phi_e}{dt}$	½	
	For constant voltage E = constant, so $\phi_e = 0$	½	
	$\therefore$ i_d=0		3
26.	(a) (i)Writing two features of nuclear force. 2 (ii)Explaining how mass converted into energy. (or vice versa) in a nuclear reaction 1		
	(i) Features of Nuclear force: 1) charge independent 2) strongest force. 3) short-range force /saturated force 4) does not follow inverse square law. **Note: Award full marks for any two valid points.**	1+1	
	(ii) The total mass of the nuclei on the left-hand side need not be same as that on right hand side of nuclear reaction. Since Binding energy contributes to mass, the difference in these binding energies appear as energy released or absorbed in a nuclear reaction.	1	
			3

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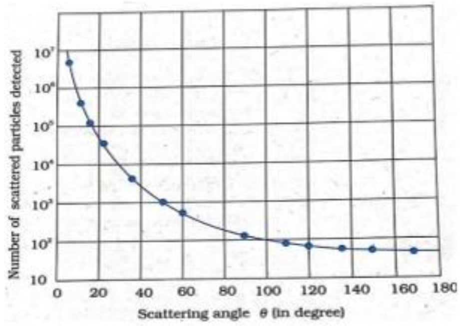
	OR (b) (i) Drawing the graph between scattered particles & scattering angle. 1 Writing two important conclusions. 1 (ii) Explaining invalidity for Bohr Quantisation postulate for planetary motion. 1		
	(i) 	1	
	Important conclusions: 1.Most of the space in the atom is empty. 2. Most part of mass of atom and its positive charge were tightly concentrated at its centre. **Note: No marks to be deducted for scale on the axis**	1	
	(ii) According to Bohr Quantisation postulate $L=mvr = nh/2\pi$ Since mass of planets is very large as compared to mass of atomic particles, angular momentum (L) will be very large. Therefore, Principal quantum number (n) will be very large. For large quantum number. the difference in successive energy levels will be negligible. Hence quantization fails.	1	3
27	Calculating a) Energy of a photon in the incident light. 1 b) Maximum kinetic energy emitted. 1 c) Stopping potential. 1		
	(a) $E= h\nu$	½	
	$= \frac{6.626 \times 10^{-34} \times 6.4 \times 10^{14}}{1.6 \times 10^{-19}}$	½	
	$=2.64eV$ or $42.24 \times 10^{-20} J$	½	
	(b) $K_{max}=E- \phi_0$ $=2.64-1.96=0.68eV$ or $(10.88 \times 10^{-20} J)$	½	
	(c) $eV_0= K_{max}$	½	
	$V_0= K_{max}/e$	½	
	$=0.68V$		3

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28.

Drawing a circuit diagram.	1
Explaining its working	1
Showing the input and output waveforms	1

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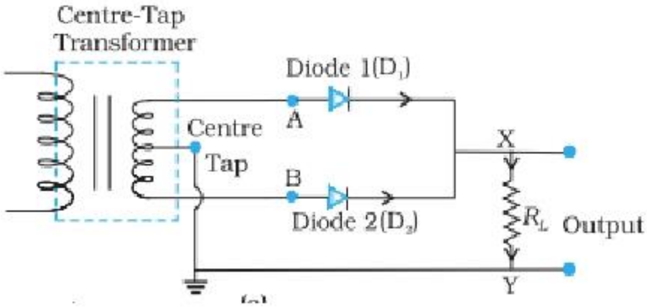

1

Working:

Suppose the input voltage to A w.r.t centre top at any instant is positive.

At that instant voltage at B being out of phase will be negative.

So, diode D_1 gets forward biased and conducts while D_2 being reverse biased is not conducting. Hence, during this positive half cycle we get an output current and output voltage across the load. 1

When the voltage at A becomes negative w.r.t centre top, the voltage at B would be positive, the diode D_1, would not conduct but D_2 conduct and giving an output current and voltage across the load.

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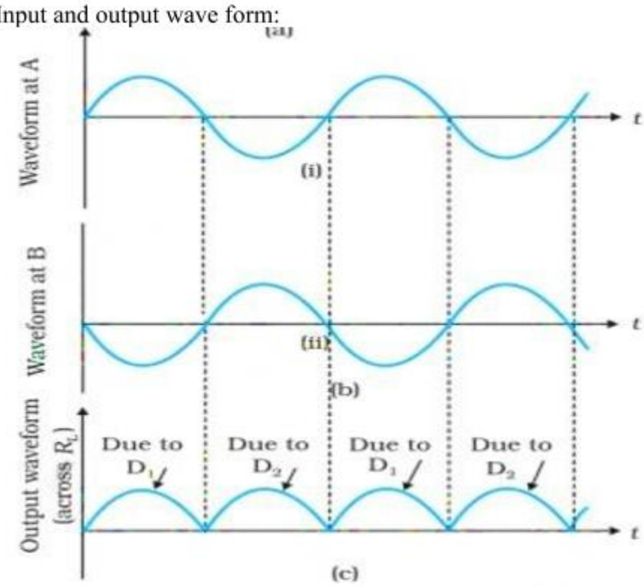
Input and output wave form:



½

½

3

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	Section D		
29.	(i) (D) $(-2 \times 10^4 \text{ V/m})\ \hat{k}$ (ii) (B) $(3.5 \times 10^{15} \text{ m/s}^2)\ \hat{k}$ (iii) (a) (C) 1.67×10^{-9}s **OR** (b). (B) 4.9mm (iv) (B) b	1 1 1 1	4
30.	(i) (A) wave nature of light. (ii) (a). (C) 480 nm **OR** (b) (A) 1.2mm (iii) (B) 7.2×10^{-7} m (iv) (D) be compressed	1 1 1 1	4

Section E

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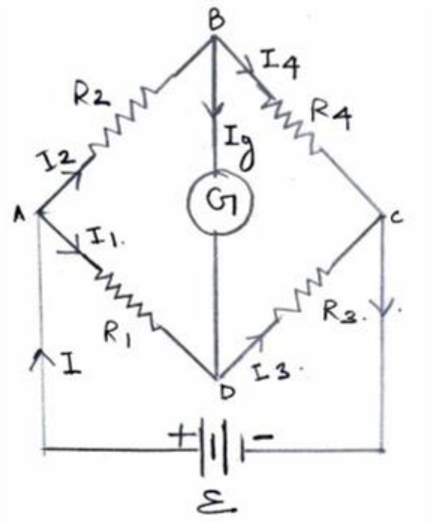
31 **a.**

(i) Deriving the condition for balanced wheat stone bridge.	2 ½
(ii) Determining the current in 3Ω branch.	2 ½

(i)



½

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Applying Kirchoff's rule to closed loop ADBA.
For balanced condition Ig=0.

$-I_1R_1 + 0 + I_2R_2 = 0$……………………..(i) ½

Applying Kirchoff's rule to closed loop CBDC using $I_3 = I_1,\ I_4 = I_2$

$I_2R_4 + 0 - I_1R_3 = 0$………………………(ii) ½

From eq.(i).

$$\frac{I_1}{I_2} = \frac{R_2}{R_1}$$

and from eq.(ii)

$$\frac{I_1}{I_2} = \frac{R_4}{R_3}$$ ½

hence $\frac{R_2}{R_1} = \frac{R_4}{R_3}$ ½

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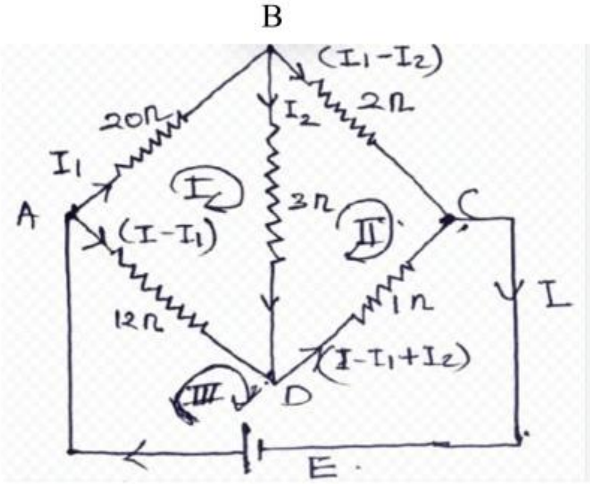
(ii)



½

Applying Kirchoff's rule to loop I (ABDA)

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$-20\ I_1 - 3\ I_2 + 12\ (I-I_1)=0$ ……………………………….(i) ½

Applying Kirchoff's rule to loop II (BCDB)

$-2\ (I_1-I_2) + 1(I-I_1+I_2) + 3I_2=0$ ……………………(ii)

½

Applying Kirchoff's rule loop III (EADCE)

$-12\ (I-I_1) - 1\ (I-I_1+I_2) = -6$ ………………(iii) ½

After solving eq. (i), (ii),(iii)…

$I_2 = 12/821 \approx 0.014A$ ½

Note: Award full marks if student takes another appropriate current distribution in the circuit.

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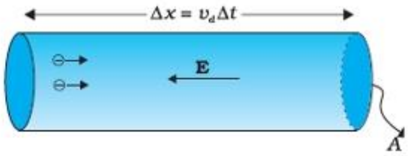
OR

(b)

(i). Showing the conductivity of material. σ = ne²τ / m	3
(ii). Determining the temperature coefficient of resistivity.	2

(i)



The amount of charge crossing the area in time Δt is

$$Q = Ne$$

$$Q = (nAl)e$$

$$I = \frac{Q}{\Delta t}$$

$$I = \frac{nAle}{\Delta t}$$

$$I = nAe\,|\vec{v}_d| \quad \ldots\ldots\ldots\ldots\ldots\text{(i)}$$ 1

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Substituting the value of $|\vec{v}_d|$ in eq.(i)

$$\frac{I}{A} = ne\left(\frac{e\,|\vec{E}|\,\tau}{m}\right)$$ ½

$$|\vec{J}| = \frac{ne^2\tau\,|\vec{E}|}{m} \quad \ldots\ldots\ldots\ldots\ldots\text{(ii)}$$ ½

where $\vec{J}$ is current density and parallel to $\vec{E}$, and

$$\vec{J} = \sigma\vec{E} \quad \ldots\ldots\ldots\ldots\ldots\text{(iii)}$$ ½

From eq.(ii) and (iii)

σ = ne²τ/m ½

(ii)

$$\alpha = \frac{(R_2 - R_1)}{[R_1\,(T_2 - T_1)]}$$ ½

$$\alpha = \frac{(1.38 - 1.05)}{[1.05 \times (100 - 20)]}$$ ½

$$\alpha = \frac{0.33}{(1.05 \times 80)}$$ ½

$$= 0.0039\ {}^{\circ}C^{-1}$$ ½ 5

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Alternatively

$R_1 = R_0(1+\alpha\ \Delta T_1)$ ……………………..(i)

$R_2 = R_0(1+\alpha\ \Delta T_2)$……………………..(ii)

$$\frac{R_1}{R_2} = \frac{(1+\alpha\ \Delta T_1)}{(1+\alpha\ \Delta T_2)}$$

$$\frac{1.05}{1.38} = \frac{1+20\alpha}{1+100\alpha}$$

On solving

$$\alpha = \frac{11}{2580}\ °C^{-1}$$

$$= 0.0042\ °C^{-1}$$

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32 (a)

(i). Showing the torque acting on the loop. $\vec{\tau} = \vec{m} \times \vec{B}$	3
(ii)(I) Calculating magnetic dipole moment of the coil.	1
(II) Calculating the magnitude of counter torque.	1

(i)

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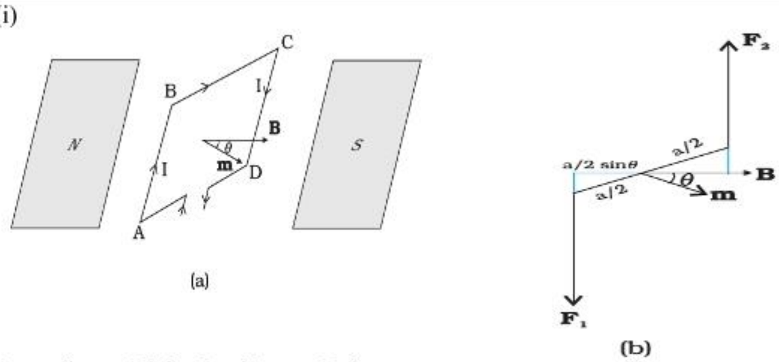

½

According to Right Hand Screw Rule, ½

Forces on BC & DA are equal and opposite in direction with same line of action, hence they cancel out each other.

Force on arm AB & CD, are also equal and opposite in direction but there is a difference in line of action so, a torque will act on it. ½

$F_1 = F_2 = I\ b\ B$

τ = Force x perpendicular distance

$\tau = F_1\ (a/2)\sin\theta + F_2\ (a/2)\sin\theta$ ½

$= (IbB)\ a\sin\theta$

$\tau = I\ A\ B\sin\theta$

$\vec{m} = I\vec{A}$ ½

$\tau = m\ B\sin\theta$

$\vec{\tau} = \vec{m} \times \vec{B}$ ½

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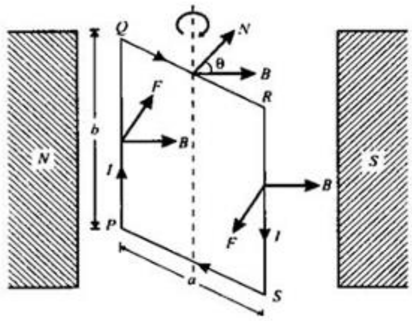
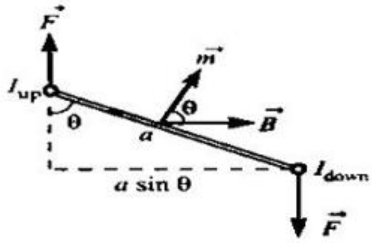
32.

Alternatively,





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According to Flemming's left-hand rule, the magnitude of force on sides PS and QR are equal and opposite to each other, so they cancel each other.
The side PQ experiences a normal inward force equal to IbB while the side RS experiences an equal normal outward force. These two forces form a couple which exerts a torque given by:

τ = Force x perpendicular distance

$= IbB \times a \sin\theta$

$= IA\ B \sin\theta$

But IA = m, the magnetic moment of the loop

$\tau = mB \sin\theta$

$\vec{\tau} = \vec{m} \times \vec{B}$

(ii) (I)

$m = NIA$ ½

$=100 \times 5 \times \pi\left(\frac{10X10^{-2}}{\sqrt{\pi}}\right)^2 = 5\ Am^2$ ½

(II)

$\tau = mB \sin\theta$ ½

$=5 \times 2 \times \sin 30$

$=5\ Nm$ ½

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	OR **(b)** (i). Deriving expression for the force acting on a conductor placed in magnetic field. 2½ (ii) Calculating the magnitude of net force acting on the wire. 2½		
	(i) Let the number density of the free electron in the conductor be *n*. So, the total charge of conductor, $q = nALe$	½	
	Total force acting on q placed in field B, moving with velocity v_d $\vec{F} = q(\vec{v} \times \vec{B})$	½	
	$\vec{F} = n(AL)e(\vec{v_d} \times \vec{B})$	1	
	Here, ne $\vec{v_d}$ is current density $(\vec{J})$ and $\lvert ne\,\vec{v_d}\rvert A$ is current in the conductor, Therefore $\vec{F} = [\vec{J}(AL)] \times \vec{B}$ $\vec{F} = I(\vec{L} \times \vec{B})$	½	
	(ii) The force acting on the wire l_1 (50cm) placed along x-axis $\vec{F_1} = I(\vec{l_1} \times \vec{B})$	½	
	$= 2\,(50 \times 10^{-2})\,\hat{\imath} \times (-0.5))\,\hat{k}$ $= 0.5\hat{\jmath}$ N	½	HOME
	The force acting on the wire l_2 (20cm) placed along y-axis $\vec{F_2} = I(\vec{l_2} \times \vec{B})$ $= 2\,(20 \times 10^{-2})\,(\hat{\jmath}) \times (-0.5)\,\hat{k}$ $= 0.2\,\hat{\imath}$ N	½	
	As F_1 and F_2 are perpendicular to each other, the resultant force on the wire will be $F = \sqrt{(F_1^2 + F_2^2)}$	½	
	$= \sqrt{(0.25 + 0.04)}$ $= \sqrt{0.29}\,N$	½	
	Alternatively, $\vec{F} = \vec{F_1} + \vec{F_2}$ $\vec{F} = I(\vec{l_x} \times \vec{B}) + I(\vec{l_y} \times \vec{B})$ $= \{2\,(50 \times 10^{-2})\,\hat{\imath} \times (-0.5)\,\hat{k}\} + \{2\,(20 \times 10^{-2})(-\hat{\jmath}) \times (-0.5)\,\hat{k}\}$ $= 0.5\hat{\jmath} + 0.2\hat{\imath}$ $F = \sqrt{(F_1^2 + F_2^2)} = \sqrt{(0.25 + 0.04)} = \sqrt{0.29}$ N		5

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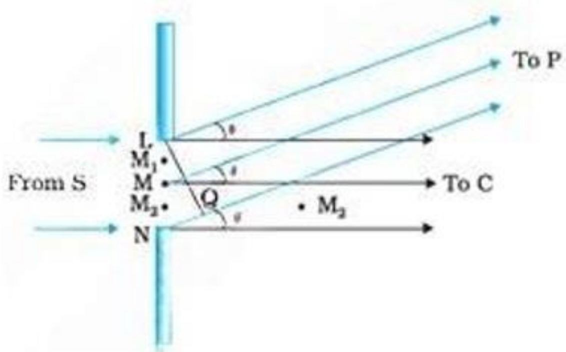
33. (a)

(i) (I)Explaining the formation of maxima and minima in the diffraction pattern. 2
(II)Explaining the reason for weakening of maxima with increasing number(n) 1
(ii) Writing two points of difference between interference and diffraction pattern 2

(i)
(I)



½

Path difference between the waves originating from points L and N superimposed at P on the screen is, NQ = a Sinθ ½

Secondary minima

$a \sin\theta = n\lambda$ n = ±1, ±2, ... ½

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Secondary maxima

$a \sin\theta = (2n + 1)\lambda / 2$ n = ±1, ±2, ... ½

Alternatively,

The light coming from the slit superimposes at the center of screen forms central maxima with maximum intensity. For secondary maxima on screen light coming from a part (one-third, one-fifth, one-seventh….) of whole slit contribute for giving intensity on screen.

For Secondary minima, contribution from two halves of whole slit cancel each other, so the intensity falls to zero.

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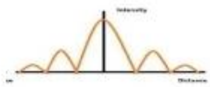
II.
As n increases, maxima goes on becoming weaker, since the light coming from a fraction of the slit (one-third, one-fifth, one-seventh, ..) contributes to the intensity at a point. 1

(ii)

Interference	Diffraction
The width of bright and dark bands is equal.	The width of central maxima is twice the width of secondary maxima or minima
Intensity of all bright fringes is same	Intensity of bright fringe decreases with distance from central maxima.
There is a good contrast between bright and dark fringes	There is a poor contrast between bright and dark fringes.
Intensity distribution curve: 	Intensity distribution curve: 

(½)x4

Note: Award full marks for any two correct differences.

OR

(b)

(i) Construction/labelling using ray diagram. 1+1
Working of a compound microscope with help of ray diagram 1
(ii)
(I). Explaining the formation of real image if the screen is removed. 1
(II) Explaining the circumstances for formation of real image. 1

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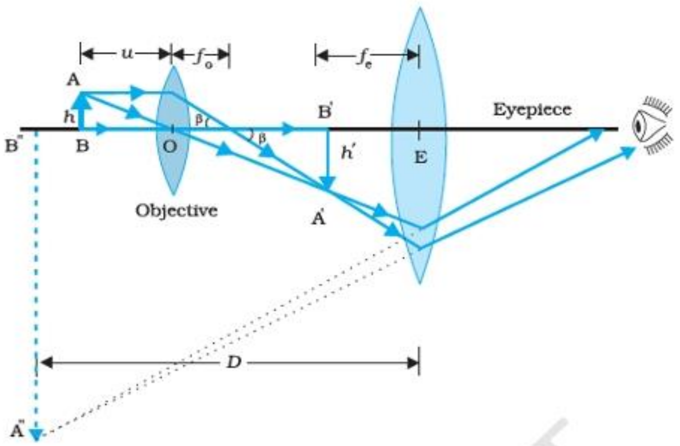
(i)



1

Construction: It consists of two convex lenses, objective lens with small aperture placed near the object and the eye piece with large aperture placed near the eye. Both lenses have small focal length. These lenses are placed coaxially in a narrow tube with rack and pinion arrangement. 1

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		Working: The lens near to the object called objective forms a real, inverted & magnified image of the object. This serves as the object for eye piece which produces the final image, enlarged & virtual. **(ii) I Yes** Real image is formed by actual intersection of rays. **II Yes** If the object is virtual. **Note: 1. If students do not write construction award full marks for well-labelled diagram representing objective lens, eye piece, along with image position at near point or normal adjustment.** **2. Deduct ½ mark if arrows are not drawn.**	1 ½ ½ ½ ½	5

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