PHYSICS (042)
CODE: 55/3/1

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Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Senior Secondary School Examination, 2026 (XIIth)
SUBJECT NAME : PHYSICS (Q.P. CODE : 042/55-3-1)

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 totalled 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: 55/3/1			
Q. No	**VALUE POINTS/EXPECTED ANSWERS**	**Marks**	**Total Marks**
	SECTION A		
1.	(B) $qE_0 x$	1	1
2.	No option is correct (Award full credit for attempting)	1	1
3.	(A) $2.0 \times 10^8\ ms^{-1}$	1	1
4.	(B) $\frac{-R}{\mu-1}$	1	1
5.	(A) 2nπ	1	1
6.	(A) 24, 150 cm	1	1
7.	(A) Twinkling of stars	1	1
8.	(D) 2.0 eV	1	1
9.	(C) 4, 1	1	1
10.	(B) $\frac{4}{3}$	1	1
11.	(C) 100 Ω	1	1
12.	(A) forward biasing	1	1
13.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A)	1	1
14.	(D) Both Assertion (A) and Reason (R) are false	1	1
15.	(B) Both Assertion (A) and Reason (R) are true but Reason (R) is **not** the correct explanation of the Assertion (A)	1	1
16.	(D) Both Assertion (A) and Reason (R) are false	1	1
	SECTION B		
17.	(a) Finding potential difference between points B and C. 2 $I = \frac{\varepsilon_{net}}{R_{net}}$ $= \frac{2}{4}$ $= 0.5$ A $V_{BC=} - \varepsilon_2 - Ir_2$ $= -4 - (0.5 \times 3)$ $= -5.5$ V **OR** (b) Finding i) Resistance of the resistor 1 ii) Terminal voltage of the battery 1 i) $IR = \varepsilon - Ir$ $R = \frac{21-(3\times3)}{3}$ $= 4\Omega$	 ½ ½ ½ ½ ½ ½	

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	ii) $V = IR$ $= 3 \times 4$ $= 12\ V$	½ ½	 2
18.	Explanation — 2 For diffraction to take place, the size of obstacle has to be comparable to the wavelength of the wave. In case of sound wave, the wavelength is almost comparable to the size of the obstacles around us, while wavelength of light is much smaller than the dimensions of most obstacles around us. Hence diffraction of sound is more common in daily experience than that of light.	2	2
19.	Explanation Mass defect ΔM — ½ Binding energy (E) — ½ Relation between ΔM *and* E — 1 The difference in mass of a nucleus and its constituents is called mass defect. If a certain number of neutrons and protons are brought together to form a nucleus of a certain mass and charge, the energy released is called binding energy. $E_b = \Delta M c^2$ $= [[Zm_p + (A - Z)m_n] - M]c^2$	 ½ ½ ½ ½	 2
20.	Calculating the ratio of de-Broglie wavelengths — 2 According to law of conservation of momentum $m_1 v_1 - m_2 v_2 = 0$ $m_1 v_1 = m_2 v_2$ $\frac{v_1}{v_2} = \frac{m_2}{m_1}$ ------------(1) $\frac{\lambda_1}{\lambda_2} = \frac{h}{m_1 v_1} \times \frac{m_2 v_2}{h}$ $= \frac{m_2 v_2}{m_1 v_1}$ $= \frac{m_2}{m_1} \times \frac{m_1}{m_2}$ from (1) $= 1$ $\lambda_1 : \lambda_2 = 1:1$	 ½ ½ ½ ½	 2

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21.	Explanation of creation of charge carriers in intrinsic semiconductor. 2 At low temperatures, all the covalent bonds in an intrinsic semiconductor remain intact. As temperature increases, thermal energy becomes available and electrons may break away, becoming free electrons available for conduction. The neighbourhood from which the free electron has come out leaves a vacancy with an effective positive charge. This vacancy is called as hole. Hence charge carriers are created.	1 1	2
	SECTION C		
22	(a) Establishing the relation between drift velocity and electric current 2 (b) Effect on drift velocity when length of conductor is doubled. 1 (a) 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 $Q = -\, ne\, Av_d\, \Delta t$ As electrons move in a direction opposite to that of electric field $I\, \Delta t = ne\, A\, v_d\, \Delta t$ $I = Anev_d$ (b) $v_d = \frac{eV\tau}{ml}$ Length is doubled, drift velocity is halved.	1 ½ ½ ½ ½	3
23	(a) Calculating the magnitude of external torque 2 Effect on torque if circular coil is replaced by planar coil 1 $\tau = NIBA \sin\theta$ $= 30 \times 6 \times 1 \times 3.14 \times (8 \times 10^{-2})^2 \times \sin 60^\circ$ $= 90 \times 64 \times 3.14 \times 1.73 \times 10^{-4}$ $= 3.13$ Nm Torque will remain the same. **OR** (b) Finding the radius of circular path 2 Mentioning condition for which the particle i) describes helical path ½ ii) goes straight undeviated ½ $K.E = \frac{q^2B^2r^2}{2m}$ $r = \frac{\sqrt{2 \times K.E. \times m}}{qB}$ $= \frac{\sqrt{2 \times 8 \times 1.6 \times 10^{-19} \times 10^6 \times 6.4 \times 10^{-27}}}{3.2 \times 10^{-19} \times 0.5}$	 ½ ½ ½ ½ 1 ½ ½	

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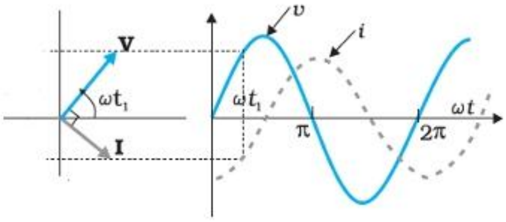
	$= \frac{12.8 \times 10^{-20}}{1.6 \times 10^{-19}}$	½	
	$= 8 \times 10^{-1}$m = 80 cm	½	
	(i) Particle enters the magnetic field at angle $0^o < \theta < 90^o$	½	
	(Alternatively) If a component of velocity is parallel or antiparallel to the magnetic field and another component is perpendicular to the magnetic field.		
	(ii) Particle moves parallel or antiparallel to the magnetic field.	½	3
24	(a) Discussion of behaviour of inductor connected to i) dc source ½ ii) high frequency ac source ½ (b) Phase relation between current and voltage 1 Drawing phasor diagram 1		
	(a) (i) Initially inductor opposes the change in current and gradually current becomes steady.	½	
	(Alternatively) Inductor behaves like a conductor.		
	(ii) The magnetic field changes continuously around inductor and induces the back emf. At high frequency, the reactance becomes high, blocking the flow of current.	½	
	(b) Current lags behind the voltage by an angle $\frac{\pi}{2}$ radian.	1	
		1	3
25	(a) Depicting the variation of electric and magnetic field 1 Writing two important characteristics ½ + ½ (b) Showing $\frac{1}{\sqrt{\varepsilon_0 \mu_0}}$ gives velocity of Electromagnetic wave in free space 1		

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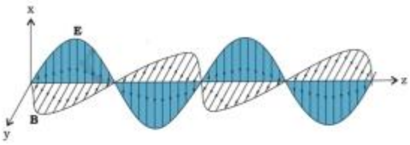
	(a) 	1	
	Characteristics of Electromagnetic wave: (i) Electric and magnetic fields are perpendicular to each other. (ii) Speed of Electromagnetic wave in free space or vacuum is equal to 3×10^8 ms^{-1}. (iii) Electric and magnetic fields are in same phase. (iv) Electromagnetic waves are transverse in nature. (v) Electromagnetic waves can travel in vacuum. **(any two)**	½ +½	
	(b) $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$	½	
	$= \frac{1}{\sqrt{4\pi \times 10^{-7} \times \frac{1}{4\pi \times 9 \times 10^9}}}$ $= \sqrt{9 \times 10^{16}}$ $= 3 \times 10^8$ m/s = Velocity of electromagnetic wave in free space.	½	3
26	Finding angle of emergence at water – air surface 3		
	$\sin i_C = \frac{1}{n}$ $= \frac{2}{3}$	1	
	For glass – water surface $\frac{3}{2} \sin i_C = \frac{4}{3} \sin r$ $\frac{3}{2} \times \frac{2}{3} = \frac{4}{3} \sin r$	½	
	$\sin r = \frac{3}{4}$	½	
	For water – air surface. $\frac{4}{3} \sin r = \sin e$ $\frac{4}{3} \times \frac{3}{4} = \sin e$	½	
	$\sin e = 1$ $e = 90^\circ$	½	3
27	Difference between nuclear fission and nuclear fusion 1 Example of each with nuclear reaction 1+1		
	Nuclear fission is decay of heavy nucleus into two or more intermediate mass fragments whereas in nuclear fusion, light nuclei fuse into a heavier nucleus.	1	

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<table>
<tr><td></td><td>Nuclear Fission:
$^{1}_{0}n + ^{235}_{92}U \rightarrow ^{144}_{56}Ba + ^{89}_{36}Kr + 3^{1}_{0}n$

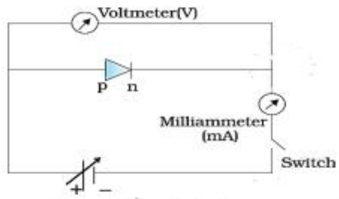
Nuclear Fusion:
$^{1}_{1}H + ^{1}_{1}H \rightarrow ^{2}_{1}H + e^{+} + \nu + Q$</td><td>1

1</td><td>

3</td></tr>
<tr><td>28</td><td>

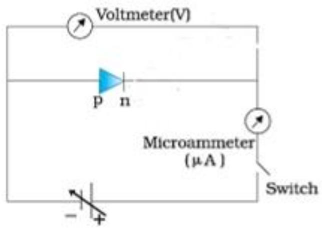
Explanation of Forward biasing	1½
Explanation of Reverse biasing	1½

Forward biasing



The p-side of the diode is connected to positive terminal and the n-side is connected to the negative terminal of the battery.

Reverse biasing



The p-side of the diode is connected to negative terminal and n-side is connected to the positive terminal of the battery.</td><td>1
½

1
½</td><td>3</td></tr>
<tr><td></td><td>SECTION D</td><td></td><td></td></tr>
<tr><td>29</td><td>(i) (D) 2μF
(ii) (C) 0.2 A
(iii) (A) 2V
(iv)
(a) (B) 4μC
OR
(b) (C) remain the same</td><td>1
1
1

1</td><td>4</td></tr>
<tr><td>30</td><td>(i) (A) $\frac{1}{2}$
(ii) (D) 2
(iii) (D) Particle 1 revolves anticlockwise while particle 2 revolves clockwise
(iv)
(a) (A) 1s
OR
(b) (B) $p_1 = p_2$</td><td>1
1
1

1</td><td>4</td></tr>
</table>

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	SECTION E		
31	(a) (i) (I) Identifying nature of two charges — ½ + ½ (II) Finding value of $\left(\frac{Q_1}{Q_2}\right)$ — 1 Justification — 1 (ii) Finding electrostatic potential energy — 2		
	(i) (I) Q_1 - Positive	½	
	Q_2 – Negative	½	
	(II) $\frac{Q_1}{Q_2} = \frac{\text{Slope of A}}{\text{Slope of B}}$	1	
	$= \frac{\tan 60°}{\tan 30°}$		
	$= \frac{3}{1}$	1	
	(ii) $V(r) = -\int E\, dx = -\int \frac{A}{x^2} dx$	½	
	$= \frac{A}{x}$		
	$U = q_1 V(x_1) + q_2 V(x_2) + \frac{q_1 q_2}{4\pi\epsilon_0 x_{12}}$	½	
	$= q_1 \frac{A}{x_1} + q_2 \frac{A}{x_2} + \frac{q_1 q_2}{4\pi\epsilon_0 x_{12}}$		
	$= \frac{-2\times10^{-6}\times9\times10^{5}}{30\times10^{-2}} + \frac{5\times10^{-6}\times9\times10^{5}}{30\times10^{-2}} - \frac{5\times2\times10^{-12}\times9\times10^{9}}{60\times10^{-2}}$	½	
	= (-6 + 15 – 0.15) J		
	= 8.85 J	½	
	OR		
	(b) (i) Finding nature of force — ½ Finding magnitude of force/length — 1½ (ii) Finding (I) electric flux through Gaussian surfaces — ½ + ½ (II) electric field at points — ½ + ½ (III) surface charge density on inner surfaces — ½ + ½		
	(i) Nature of force: Attractive $dq = \lambda dl$	½	
	Electric field on wire 2 due to wire 1, $E = \frac{-\lambda}{2\pi\varepsilon_0 r}$ Force on wire 2 = qE	½	
	$\frac{Force}{length} = \frac{F_1}{l} = \frac{-\lambda\times3\lambda}{2\pi\varepsilon_0 r}$	½	

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	$= \frac{-3\lambda^2}{2\pi\varepsilon_0 r}$	½	
	Similarly, $\frac{F_2}{l} = \frac{-3\lambda^2}{2\pi\varepsilon_0 r}$		
	(ii) (I) (1) $x < r_1$ $\phi = \frac{2q}{\varepsilon_0}$	½	
	(2) $r_1 < x < r_2$ $\phi = \frac{(Q+2q)}{\varepsilon_0}$	½	
	(II) (1) $x > r_3$ $E = \frac{k\,(Q-q)}{x^2}$	½	
	(2) $r_1 < x < r_2$ $E = \frac{k\,(Q+2q)}{x^2}$	½	
	(III) (1) $\sigma = \frac{-2q}{4\pi r_1^2}$	½	
	(2) $\sigma = \frac{-(Q+2q)}{4\pi r_2^2}$	½	5
32	(a) (i) Effect on glow of bulb when (I) Iron bar in inserted ½ Justification ½ (II) Frequency of source is decreased ½ Justification ½ (ii) Calculating (I) Impedance of the circuit 1 (II) rms value of current 1 (III) Power Factor 1		
	(i) (I) Brightness of the bulb decreases	½	
	As iron bar is inserted, inductive reactance of the coil increases. Larger fraction of applied AC voltage appears across inductor, leaving less voltage across the bulb. **(Alternatively)** $L' = \mu_r L$, L increases, $X_L = \omega L$ increases, current decreases.	½	
	(II) Brightness of the bulb increases.	½	
	As frequency of the source decreases, inductive reactance of coil		

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	decreases. Less fraction of applied AC voltage appears across inductor. Hence higher voltage appears across the bulb. **(Alternatively)** $X_L = \omega L$, ω decreases, X_L decreases, current increases. (ii) $V = 280 \sin(100\pi t)$ $X_L = 100\pi \times \frac{5}{\pi} = 500\,\Omega$ $X_C = \frac{10^6}{100\pi \times \frac{50}{\pi}} = 200\,\Omega$ (I) $Z = \sqrt{R^2 + (X_L - X_C)^2}$ $= \sqrt{(400)^2 + (300)^2}$ $= 500\,\Omega$ (II) $I_{rms} = \left(\frac{V_0}{Z\sqrt{2}}\right) = \frac{280}{500 \times 1.4}$ $= 0.4$ A (III) Power factor $= \cos\phi = R/Z$ $= 400/500$ $= 0.8$	½ ½ ½ ½ ½ ½ ½	
	OR (b) (i) Statement of Lenz's law — 1 Explanation — 1 (ii) Writing dimensional formula — 1 Calculating self-inductance of coil — 2 (i) The polarity of induced emf is such that it tends to produce a current which opposes the change in magnetic flux that produces it. Consider north pole of a magnet being moved towards a coil. The magnetic flux through the coil increases, hence current is induced in counter clockwise direction making the side of the coil behave as north pole causing repulsion. If this is not the case then bringing magnet towards a coil will construct a perpetual motion machine by a suitable arrangement. Therefore production of induced emf in a direction which opposes the change in magnetic flux follows from law of conservation of energy.	1 1	

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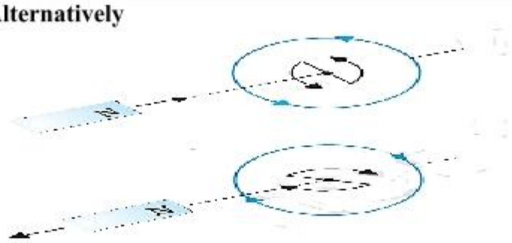
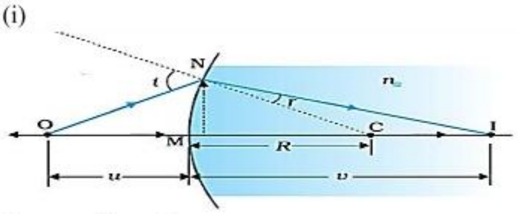
	Alternatively  (Note: Award full credit for this part if a student draws the diagram and explains conservation of energy.) (ii) $[ML^2T^{-2}A^{-2}]$ $\varepsilon = -L\frac{dI}{dt}$ $L = \frac{-(50)\times 0.6}{(2-8)}$ $= 5$ H	 1 ½ 1 ½	 5
33	(a) (i) Drawing ray diagram — 1 Deriving relation between u, v, n and R — 2 (ii) Finding position and nature of image — 1½ + ½ (i)  For small angles $\tan\angle NOM = \frac{MN}{MO}$ $\tan\angle NCM = \frac{MN}{MC}$ $\tan\angle NIM = \frac{MN}{MI}$ i = $\angle NOM + \angle NCM$ $= \frac{MN}{MO} + \frac{MN}{OC}$ ------------(1) Similarly r = $\angle NCM - \angle NIM$ $= \frac{MN}{MC} - \frac{MN}{MI}$ ------------(2) By Snell's law for small angles $1 \times i = n \times r$ substituting i and r from (1) and (2) $\frac{1}{MO} + \frac{n}{MI} = \frac{n-1}{MC}$ ------------(3)	 1 ½ ½ ½	

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Using cartesian sign conventions
MO = -u, MI = +v, MC = +R
Substituting in (3)

$$\frac{n}{v} - \frac{1}{u} = \frac{n-1}{R}$$ ½

(Note : Give full credit of this part if student derives the relation by forming virtual image.)

(ii) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ ½

$\frac{1}{20} = \frac{1}{v} - \frac{1}{-30}$ ½

½

v = 60 cm

Nature of image: Real and inverted ½

OR

(b)

(i) Deriving expression for focal length of combination of lens	2
(ii) Calculating	
(I) Fringe width	1
(II) Distance of second dark fringe from central maximum	1
(III) Effect on immersion in water	1

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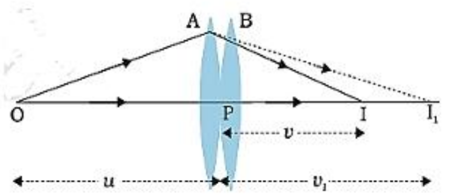
(i) ½



For image formed by first lens A

$$\frac{1}{v_1} - \frac{1}{u} = \frac{1}{f_1}$$ ½

For image formed by second lens B

$$\frac{1}{v} - \frac{1}{v_1} = \frac{1}{f_2}$$ ½

Adding and comparing with lens formula

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$ ½

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	(ii) (I) $\beta = \frac{\lambda D}{d}$ $= \frac{550 \times 10^{-9} \times 2.2}{1.1 \times 10^{-3}}$ = 1.1 mm (II) $x = \frac{(2n-1)\lambda D}{2d}$ n = 2 x =1.65 mm (III) Fringe width decreases **(Alternatively)** $\beta' = \frac{\beta}{n}$	½ ½ ½ ½ 1	 5

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