PHYSICS (042)
CODE: 55/B

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

MARKING SCHEME: PHYSICS (042) **Session: 2025–26**			
Code: 55/ B			
Q. No.	**VALUE POINTS/EXPECTED ANSWERS**	**Marks**	**Total Marks**
	SECTION – A		
1	(D) 6.25×10^9	**1**	**1**
2	(D) 1.33×10^{-1} A	**1**	**1**
3	(D) a bar magnet is moved rapidly toward the wire loop	**1**	**1**
4	(D) total internal reflection of light	**1**	**1**
5	(C) no electrons are emitted	**1**	**1**
6	(D) $\sqrt{\frac{m_p}{m_e}}$	**1**	**1**
7	(C) 10	**1**	**1**
8	(B) 92 electrons	**1**	**1**
9	(A) fusion of the lighter nuclei	**1**	**1**
10	(A) -27.2eV	**1**	**1**
11	(B) Arsenic	**1**	**1**
12	(B) decreases the depletion layer width	**1**	**1**
13	(D) Both Assertion (A) and reason (R) are false	**1**	**1**
14	(C) Assertion (A) is true, but Reason (R) is false	**1**	**1**
15	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is the not the correct explanation of the Assertion (A)	**1**	**1**
16	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is the not the correct explanation of the Assertion (A)	**1**	**1**
	SECTION B		
17	(a) Calculating the resistance of the resistor 1 (b) Calculating the terminal voltage of the battery 1		
	(a) E = 6V , r =1Ω , I = 0.5A $V = E - Ir$ $IR = E - Ir$ $R = \frac{E-Ir}{I} = \frac{6-(0.5)(1)}{(0.5)}$ R = 11 Ω	½ ½	
	(b) V = IR V = (0.5)(11) V = 5.5 volt	½ ½	
	Alternatively, $V = E - Ir$ $= 6 - (0.5)(1)$ = 5.5volt		**2**
18	(a) Explaining the cause for the light retracing its path 2		
	When a ray of light travelling along the principal axis is incident on a spherical mirror, then incident light is normal to the surface of spherical mirror, so it reflects back along the same path. Alternatively,	**2**	

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	The angle of incidence along the principal axis is zero therefore from the laws of reflection, the angle of reflection will be zero. Thus, it reflects back along the same path. **OR** (b) Writing Sign conventions 2 1. All the distances are measured from the optical center of the lens. 2. Distances measured along the direction of the incident ray are taken as positive. 3. Distance measured opposite to the direction of incident ray are taken as negative. 4. Height above the principal axis is taken as positive and height below the principal axis is taken as negative.	½ ×4	2
19	Finding the position of the image $1\frac{1}{2}$ Finding the nature of the image 1/2 $\frac{-n_1}{u}+\frac{n_2}{v}=\frac{n_2-n_1}{R}$ $\frac{-1}{(-50)}+\frac{1.5}{v}=\frac{1.5-1}{20}$ $\frac{1}{50}+\frac{1.5}{v}=\frac{0.5}{20}$ $\frac{1.5}{v}=\frac{1}{40}-\frac{1}{50}$ v = 300 cm or 3m Nature of the image is real and inverted	½ ½ ½ ½	2
20	Defining threshold frequency 1 Dependence of frequency on intensity 1/2 Showing variation of photoelectric current with the intensity 1/2 Threshold frequency is minimum frequency of the incident radiation required for photoelectric effect to take place. Threshold frequency is independent of intensity. Photoelectric current increases linearly with the intensity of radiation of the frequency υ ($>\upsilon_o$)	1 ½ ½	2
21	Differentiate between n-type and p-type semiconductors ½ ×4	½ ×4	

n-type	p-type
Impurity/dopant atoms are pentavalent	Impurity/dopant atoms are trivalent
Electrons are the majority charge carriers and holes are the minority charge carriers. OR $n_e >> n_h$	Holes are the majority charge carriers and electrons are the minority charge carriers. OR $n_h >> n_e$

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	Any other differences between n-type and p-type		2
	SECTION C		
22	(a) (i) Showing the electrons drift with an average velocity 2 (ii) Reasoning 1 An electron will suffer collisions with the heavy fixed ions, but after collision it will emerge with the same speed but in random directions. If we consider all the electrons, their average velocity will be zero since their directions are random. Thus, if there are N electrons and the velocity of the electron at a given time is v_i then: $\frac{1}{N}\Sigma\vec{v}_i=0$	½	
	When an electric field is present, the electron will be accelerated due to this field by: $\vec{a}=\frac{-e\vec{E}}{m}$	½	
	Consider again electron at a given time t. Then its velocity at time t is: $\vec{v}_t=\vec{v}_i+\frac{(-e\vec{E})}{m}t_i$	½	
	where $\vec{v}_i$ was the velocity immediately after the last collision and t_i is the time elapsed after the last collision The average velocity of the electrons at time t is the average of all the v_t The collisions of electrons do not occur at regular intervals but at random times. Let so, τ be the electrons average time between successive collisions, known as relaxation time. Thus, averaging over the N electrons at any given time 't' gives us the average velocity $\vec{v}_d$ $\vec{v}_d=(\vec{v}_t)_{average}=(\vec{v}_i)_{av}-\frac{e\vec{E}}{m}(t_i)_{av}$ $\vec{v}_d=0-\frac{e\vec{E}}{m}\tau$	½	
	(ii) Each free electron does accelerate, increasing to its drift speed until it collides with a positive ion of the metal. It loses its drift speed after collision but starts to accelerate and increase its drift speed again only to suffer a collision and so on. On the average, therefore electron acquire only a drift speed.	1	
	OR		
	(b) Defining resistance of a conductor ½ Giving S.I unit ½ Naming the factors on which resistance depends ½×3 = 1½ Writing the relation between them ½		
	Resistance is defined as the opposition offered by conductor to the flow of current Alternatively, $R=\frac{V}{I}$	½	
	S.I unit: volt/ampere Alternatively, ohm (Ω)	½	

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	Factors: 1) R is directly proportional to the length (l) of the conductor. 2) R $\alpha \frac{1}{A}$, area of cross-section of the conductor. 3) Depends upon the nature of the conductor Relation: $R = \rho \frac{l}{A}$	½ ½ ½ ½	3
23	(a) Calculating the magnitude of the magnetic field 1 Finding the direction of magnetic field ½ Naming the rule used ½ (b) Reason 1 (a) $B = \frac{\mu_0}{4\pi} \frac{2I}{r}$ $= \frac{(10^{-7})(2)(3)}{15\times10^{-2}}$ $= 4\times10^{-6}$T Direction: Along Y-axis or $\hat{j}$ Rule: Right hand thumb rule or Maxwell screw rule (b) Circular shape of the loop with its plane normal to the field to maximize flux, since for a given perimeter a circle encloses greater area than any other shape.	½ ½ ½ ½ **1**	**3**
24	(a) Explanation 1 (b) Proving 2 (a) Lenz's law is consistent with the law of conservation of energy because: When a magnet is moved towards or away from a coil, then induced current creates its own magnetic field that opposes the motion of the magnet. Due to this opposition an external force must be applied to keep the magnet moving. The work done by this external force is converted into electrical energy. (b) Magnetic field inside a solenoid, $B=\mu_0 nI$ Coefficient of self-inductance, $L=\mu_0 n^2 Al$ Magnetic energy $U_B = \frac{1}{2}LI^2$ $= \frac{1}{2}(\mu_0 n^2 Al)\left(\frac{B}{\mu_o n}\right)^2$ $= \frac{1}{2\mu_o} B^2 Al$ Magnetic energy per unit volume, $\frac{U_B}{Volume} = \frac{U_B}{Al} = \frac{B^2}{2\mu_0}$	**1** ½ ½ ½ ½	**3**

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25	(a) Calculating wavelength and time period ½ + ½ (b) Calculating the magnitude and direction the magnetic field 1 + 1		
	(a) $\nu = 40\text{MHz}$ wavelength $\lambda = \frac{c}{\nu} = \frac{3\times10^8}{40\times10^6} = 7.5\text{m}$	½	
	Time period, $T = \frac{1}{\nu} = \frac{1}{40\times10^6}$ $= 2.5\times10^{-8}\text{s}$	½	
	(b) $E_0 = 750\text{N/C}$ Magnitude of magnetic field, $B_0 = \frac{E_0}{c}$	½	
	$= \frac{750}{3\times10^8} = 250\times10^{-8} = 2.5\times10^{-6}\text{T}$	½	
	$\vec{E}$ and $\vec{B}$ are perpendicular to each other and perpendicular to the direction of propagation $\therefore \vec{B}$ is in +z direction	**1**	**3**
26	Defining coherent sources of light 1 Reason 1 Example 1		
	Coherent sources of light: The sources which emit light waves with the same frequency, wavelength and no phase difference or a constant phase difference between them.	**1**	
	If two sources are coherent then the phase difference at any point will not change with time and we will have a stable interference pattern i.e. position of maxima and minima will not change with time. Hence coherent sources are essential for observing sustained interference pattern.	**1**	
	Example: Light waves interacting in soap bubbles or oil films on water surface.	**1**	**3**
27	Calculating: (a) angular momentum 1 ½ (b) potential energy of the electron 1 ½		
	(a) Total energy, $E_n = \frac{-13.6}{n^2}$ eV $\Rightarrow n^2 = \frac{-13.6}{-3.4} = 4$ $n = 2$	½	
	Angular momentum, $L = \frac{nh}{2\pi}$ $= \frac{(2)(6.63\times10^{-34})}{(2)(3.14)}$	½	
	$= 2.11\times10^{-34}\text{Js}$	½	

	(b) Potential energy $= 2\times\text{Total Energy}$ $= 2\times(-3.14)$ $= -6.8\text{eV}$	½ ½ ½	3
28	(a) Explaining the working of half-wave rectifier 2 (b) Explanation 1 (a) If an alternating voltage is applied across a diode in series with a load, only during the half cycles of the a.c input the diode is forward biased. Therefore, in the positive half cycle of a.c input, there is a current through the load resistor and we get an output voltage, whereas there is no output current in the negative half cycle of a.c input. Thus, the output voltage, though still varying but is restricted to only one direction and is said to be rectified. Since the rectified output of this circuit is only for half of the input a.c wave, it is called a half-wave rectifier. (b) A half wave rectifier utilizes only one half of the a.c cycle, resulting in a pulsating d.c output. The other half of a.c is discarded or blocked. Discarded power during half cycle is 60%, which is not converted into d.c.	2 1	3
	SECTION D		
29	(i) (B) 2aq and is along -x-axis (ii) (B) 2 (iii) (a) (C) 1.73×10^{-4} J **OR** (b) (D) [LTA] (iv) (B) perpendicular to both the $\vec{E}$ and $\vec{p}$	1 1 1 1	4
30	(i) (A) electron (ii) (D) Right-hand Rule (iii) (a) (C) 2R **OR** (b) (C) 2.5N (iv) (B) $\frac{qB}{2\pi m}$	1 1 1 1	4
	SECTION E		
31	(a) (i) (I) Deducing the relation between $\vec{E}$ and $\vec{F}$ 1 (II) Deducing the relation between $\vec{E}$ and V 2 (ii) Finding an expression for net force on charge 2 (i) (I) Electric field produced by the charge Q at a point r is given by:		

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$$\vec{E}(r) = \frac{1}{4\pi\varepsilon_o}\frac{Q}{r^2}\hat{r} = \frac{1}{4\pi\varepsilon_o}\frac{Q}{r^3}\vec{r}$$ ½

$$\vec{F}(r) = \frac{1}{4\pi\varepsilon_o}\frac{Qq}{r^2}\hat{r}$$

$$\vec{F}(r) = q\vec{E}(r)$$ ½

(II) Consider two closely spaced equipotential surfaces A and B, with potential values V and V+δV. Let δl be the perpendicular distance between equipotential surfaces A and B. ½

The small amount of work done in moving a unit positive charge from the surface B to A along perpendicular distance δl,

$$\delta W = |\vec{E}|\,\delta l = V - (V + \delta V) = -\delta V$$ ½

$$|\vec{E}| = \frac{-\delta V}{\delta l}$$ ½

Since δV is negative,

$$\therefore |\vec{E}| = \frac{-\delta V}{\delta l} = +\frac{|\delta V|}{\delta l}$$ ½

(ii) Forces due to two charges on one charge at the vertices of equilateral triangle will be repulsive, The angle between the forces will be 60°, So, net force ½

$$F_{net} = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos 60^\circ}$$ ½

$F_1 = F_2 = F$ (as charges are same)

$$F_{net} = \sqrt{2F^2 + 2F^2\cos 60^\circ}$$ ½

$$= \sqrt{3F^2} = \sqrt{3}F$$

$$F_{net} = \sqrt{3}\left(\frac{1}{4\pi\varepsilon_0}\right)\frac{q^2}{a^2}$$ ½

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(b) (i) Deriving an expression of energy stored in a capacitor	2
Effect of dielectric slab on the energy stored in the capacitor	½
Justification	½
(ii) Finding the effective capacitance	2

Let a capacitor of capacitance C be connected across a battery. Consider the intermediate situation, when two plates have charges Q' and $-Q'$ respectively, and at this stage the potential difference b/w the plates is V' i.e, $V' = \frac{Q'}{C}$ ½

let δW be small amount of work done in transferring $\delta Q'$ from plate 1 to plate 2.

$$\delta W = V'\,\delta Q'$$

Total work done $W = \int \delta W = \int_0^Q V'\delta Q'$ ½

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	$= \int_0^Q \frac{Q'}{C}\delta Q'$ $W = \frac{Q^2}{2C} = \frac{1}{2}CV^2 = \frac{1}{2}QV$ This work done is stored as energy $U = \frac{Q^2}{2C} = \frac{1}{2}CV^2 = \frac{1}{2}QV$ When the space between its plates is filled by a medium of dielectric constant K, then energy increases by K times or ($U' = KU$) Justification: capacitance increases by K times or ($C' = KC$) (ii) $C_1 = \frac{K_1\varepsilon_0 A/2}{d}$, $C_2 = \frac{K_2\varepsilon_0 A/2}{d}$ Now the capacitor will behave as the parallel combination of two capacitors C_1 and C_2 $C_{net} = C_1 + C_2$ $C_{net} = \frac{\varepsilon_0 A}{2d}(K_1 + K_2)$	 ½ ½ ½ ½ ½ + ½ ½ ½	 5
Q 32	(a) (i) Defining mutual induction 1 Units 1 Factors on which mutual Inductance depends ½ ×2=1 (ii) Finding the mutual inductance between a given pair of coils depends 2 (i) Mutual inductance is defined as the induced emf in primary coil when the current in secondary coil changes at the unit rate. Alternatively, Mutual inductance is defined as the magnetic flux linked with the primary coil when the current in secondary coil is unity. S.I unit: henry (H) Alternatively, weber/ampere Alternatively, Tm^2A^{-1} Factors: (1) Separation between two coils (2) Relative orientation between two coils (3) Nature of the medium (Any two) (ii) Mutual Inductance, $M = \frac{\mu_0 N_1 N_2 \pi r_1^2}{l}$ $= \frac{(4\pi\times10^{-7})(2000)(1000)(3.14)\left(2\times10^{-2}\right)^2}{1}$ $= 3.16 \times 10^{-3}H$	 **1** **1** ½ ½ **1** ½ ½	

	OR (b) (i) Proving that in pure inductive a.c circuit, voltage leads by π/2 — 2 Defining inductive reactance — 1 (ii) Finding: (I) rms value of applied voltage — 1 (II) the frequency of a.c supply — 1		
	(i) An a.c. source is connected to a pure inductor. Let voltage across the source be, $V = V_m \sin\omega t$ Using Kirchhoff's law $\sum \varepsilon(t) = 0$	½	
	$\therefore V - L\frac{dI}{dt} = 0$ $\frac{dI}{dt} = \frac{V_m}{L}\sin\omega t$ $\Rightarrow dI = \frac{V_m}{L}\sin\omega t dt$ $\Rightarrow I = \int \frac{V_m}{L}\sin\omega t dt$ p	½	
	$I = \frac{V_m}{\omega L}(-\cos\omega t)$ $= \frac{V_m}{\omega L}\sin\left(\omega t - \frac{\pi}{2}\right)$ $I = \frac{V_m}{X_L}\sin\left(\omega t - \frac{\pi}{2}\right)$	½	
	Where X_L is inductive reactance $\Rightarrow I = I_m \sin\left(\omega t - \frac{\pi}{2}\right)$ It shows that applied voltage is $\frac{\pi}{2}$ ahead the current	½	
	<u>Definition</u>: The inductive reactance limits the current in a purely inductive circuit in the same way as the resistance limits current in a purely resistive circuit	1	
	<u>(ii)</u> (I) $V_{rms} = \frac{V_m}{\sqrt{2}}$	½	
	$= \frac{140}{\sqrt{2}} = 100$ volt	½	
	(II) $\nu = \frac{\omega}{2\pi}$	½	5
	$= \frac{314}{2(3.14)} = 50$ Hz	½	

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33.	(a) (i) Effect on angular width of central maximum and justification for (I) Slit width is increased ½ + ½ (II) Distance between slits and screen is increased ½ + ½ (III) Light of smaller wavelength is used ½ + ½ (ii) Finding the value of slit width 2		
	(i) (I) Angular width (θ) of central maximum decrease.	½	
	As $\theta = \frac{\lambda}{d}$, where λ is the wavelength of light and d is the slit width	½	
	(II) The angular width is independent of the distance between slit and the screen	½	
	The angular width ($\theta = \frac{\lambda}{d}$) remains same	½	
	(III) Angular width decreases.	½	
	$\therefore\ \theta = \frac{\lambda}{d}$, Thus using light of smaller wavelength will result in a smaller angular width	½	
	(ii) $d\sin\theta = \lambda$	½	
	for first minima n =1 $d\sin\theta = \lambda$		
	$\Rightarrow d = \frac{\lambda}{\sin 30^\circ} = \frac{700\times10^{-9}}{\sin 30^\circ}$	1	
	$d = 1.4\times10^{-6}\text{m} = 1.4\,\mu\text{m}$	½	
	OR		
	(b) (i) Working of a reflecting type telescope 2 Writing two advantages over a refracting telescope ½ +½ (ii) Finding magnifying power, when final image is (I) At infinity 1 (II) At distance 25cm 1		
	(i) Parallel rays from a distant object (star) enter in the telescopes parallel to principal axis of the mirror tend to collect at the focus of the concave mirror. These reflected rays encounter a secondary convex mirror before meeting at focus, the convex mirror reflected them to the eye piece. Final image is seen through the eye piece. Final image formed is inverted w.r.t the object.	2	
	Advantages: (1) Free from chromatic aberration (2) Free from Spherical aberration (3) Require Less mechanical support (4) low Cost (Any Two)	½ + ½	
	(ii) Magnifying power, (I) $m = \frac{-f_0}{f_e} = \frac{-125}{5} = -25$	½ + ½	
	(II) $m = -\frac{f_o}{f_e}\left(1+\frac{f_e}{D}\right)$	½	

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	$m = \frac{-125}{5}\left(1+\frac{5}{25}\right) = -30$ NOTE:- Award full marks if student does not use negative sign in the formula of magnification.	½	**5**

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