

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Senior Secondary Supplementary School Examination, 2026 (XIIth)
SUBJECT NAME PHYSICS (042) (Q.P. CODE /Set No55(B)/7)

General Instructions: -

1	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.
2	“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.”
3	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.
4	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.
5	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.
6	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.
7	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
8	If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
9	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note “Extra Question” .
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 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 :- • Leaving answer or part thereof unassessed in an answer book. • Giving more marks for an answer than assigned to it. • Wrong totaling of marks awarded on an answer. • Wrong transfer of marks from the inside pages of the answer book to the title page. • Wrong question wise totaling on the title page. • Wrong totaling of marks of the two columns on the title page. • Wrong grand total. • Marks in words and figures not tallying/not same. • Wrong transfer of marks from the answer book to online award list. • 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	Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16	The Examiners should acquaint themselves with the guidelines given in the “Guidelines for Spot Evaluation” before starting the actual evaluation.
17	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.
18	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.

MARKING SCHEME: PHYSICS (042)**Session: 2025–26****Code: No55(B)/7**

Q. No.	VALUE POINTS/EXPECTED ANSWERS	Marks	Total Marks
	SECTION – A		
1.	(C) 6.25×10^6	1	1
2.	(D) It is inversely proportional to the distance between two charges.	1	1
3.	(C) 5 A	1	1
4.	Award 1 mark for attempting the question.	1	1
5.	(D) Visible light has lower frequency and longer wavelength than that of X-rays.	1	1
6.	(B) 1.2 m	1	1
7.	(C) $10^{-27} \text{ kg m s}^{-1}$	1	1
8.	(A) $6.6 \times 10^{15} \text{ Hz}$	1	1
9.	(D) 180°	1	1
10.	(B) $\frac{h}{\pi}$	1	1
11.	(D) $2.0 \times 10^5 \text{ V m}^{-1}$	1	1
12.	(C) Boron	1	1
13.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).	1	1
14.	(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).	1	1
15.	(D) Both Assertion (A) and Reason (R) are false.	1	1
16.	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).	1	1

SECTION – B			
17.	Calculation of temperature coefficient (2) $\alpha = \frac{R_{100} - R_0}{R_{100} \Delta T}$ $\alpha = \frac{5.25 - 5}{5} \times \frac{1}{100}$ $\alpha = 5.0 \times 10^{-4} \text{ } ^\circ\text{C}^{-1}$	 $\frac{1}{2}$ $\frac{1}{2}$ 1	 2
18.	(a) Explaining the cause of no power consumption in an ideal inductor (2) Average power consumption in an AC circuit is $P_{av} = E_v I_v \cos \phi$ In case of an ideal inductor, voltage leads the current by phase angle $\pi/2$ (i.e. $\phi = \frac{\pi}{2}$) Hence, $P_{av} = E_v I_v \cos \frac{\pi}{2}$ $= 0$	 $\frac{1}{2}$ $\frac{1}{2}$ 1	 2
	OR (b) Effect on current in the loops, (1) Giving the reason (1) Current in each loop decreases. Motion of the loops changes magnetic flux. According to Lenz's law, e.m.f. is induced to oppose the motion of the loops.	 1 $\frac{1}{2}$ $\frac{1}{2}$	 2
19.	Calculating the ratio of intensity of maxima and minima in the interference pattern. (2) $\frac{I_1}{I_2} = \frac{a^2}{b^2} = \frac{1}{81}$ $\frac{a}{b} = \frac{1}{9} \text{ i.e., } b = 9a$ $\frac{I_{\max}}{I_{\min}} = \frac{(a+b)^2}{(a-b)^2}$ $\frac{I_{\max}}{I_{\min}} = \frac{(10)^2}{(8)^2} = \frac{25}{16}$ Alternatively: $\frac{I_{\max}}{I_{\min}} = \frac{(\sqrt{I_1} + \sqrt{I_2})^2}{(\sqrt{I_1} - \sqrt{I_2})^2}$ $= \frac{(1+9)^2}{(1-9)^2}$ $= \frac{100}{64} = \frac{25}{16}$	 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	 2

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	For accelerating potential $4V$, $\lambda' = \frac{12.27}{\sqrt{4V}} = \frac{\lambda}{2}$	1	3				
27.	Defining Binding Energy (1) Distinguishing Nuclear Fusion and Nuclear Fission (1) Giving Example (1) If a certain number of neutrons and protons are brought together to form a nucleus of certain charge and mass, the energy (E_b) released in the process is called binding energy. <table><tr><th>Nuclear Fusion</th><th>Nuclear Fission</th></tr><tr><td>A process in which two or more lighter nuclei ($A \leq 10$) join to form a heavier nucleus and energy is released. Examples (Any one): ${}^1_1\text{H} + {}^1_1\text{H} \rightarrow {}^2_1\text{H} + e^+ + \nu + 0.42 \text{ MeV}$ OR ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_2\text{He} + {}^1_0\text{n} + 3.27 \text{ MeV}$ OR ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_1\text{H} + {}^1_1\text{H} + 4.03 \text{ MeV}$</td><td>A process in which a very heavy nucleus breaks into smaller nuclei and energy is released. Examples (Any one): ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{236}_{92}\text{U} \rightarrow {}^{144}_{56}\text{Ba} + {}^{89}_{36}\text{Kr} + 3{}^1_0\text{n}$ OR ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{236}_{92}\text{U} \rightarrow {}^{133}_{51}\text{Sb} + {}^{99}_{41}\text{Nb} + 4{}^1_0\text{n}$ OR ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{140}_{54}\text{Xe} + {}^{94}_{38}\text{Sr} + 2{}^1_0\text{n}$</td></tr></table>	Nuclear Fusion	Nuclear Fission	A process in which two or more lighter nuclei ($A \leq 10$) join to form a heavier nucleus and energy is released. Examples (Any one): ${}^1_1\text{H} + {}^1_1\text{H} \rightarrow {}^2_1\text{H} + e^+ + \nu + 0.42 \text{ MeV}$ OR ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_2\text{He} + {}^1_0\text{n} + 3.27 \text{ MeV}$ OR ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_1\text{H} + {}^1_1\text{H} + 4.03 \text{ MeV}$	A process in which a very heavy nucleus breaks into smaller nuclei and energy is released. Examples (Any one): ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{236}_{92}\text{U} \rightarrow {}^{144}_{56}\text{Ba} + {}^{89}_{36}\text{Kr} + 3{}^1_0\text{n}$ OR ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{236}_{92}\text{U} \rightarrow {}^{133}_{51}\text{Sb} + {}^{99}_{41}\text{Nb} + 4{}^1_0\text{n}$ OR ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{140}_{54}\text{Xe} + {}^{94}_{38}\text{Sr} + 2{}^1_0\text{n}$	1 1 1	3
Nuclear Fusion	Nuclear Fission						
A process in which two or more lighter nuclei ($A \leq 10$) join to form a heavier nucleus and energy is released. Examples (Any one): ${}^1_1\text{H} + {}^1_1\text{H} \rightarrow {}^2_1\text{H} + e^+ + \nu + 0.42 \text{ MeV}$ OR ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_2\text{He} + {}^1_0\text{n} + 3.27 \text{ MeV}$ OR ${}^2_1\text{H} + {}^2_1\text{H} \rightarrow {}^3_1\text{H} + {}^1_1\text{H} + 4.03 \text{ MeV}$	A process in which a very heavy nucleus breaks into smaller nuclei and energy is released. Examples (Any one): ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{236}_{92}\text{U} \rightarrow {}^{144}_{56}\text{Ba} + {}^{89}_{36}\text{Kr} + 3{}^1_0\text{n}$ OR ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{236}_{92}\text{U} \rightarrow {}^{133}_{51}\text{Sb} + {}^{99}_{41}\text{Nb} + 4{}^1_0\text{n}$ OR ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow {}^{140}_{54}\text{Xe} + {}^{94}_{38}\text{Sr} + 2{}^1_0\text{n}$						
28.	Working of a full-wave rectifier. (1) Difference between a half-wave and full-wave rectifier. (1+1) In full wave rectifier two diodes are joined in the circuit with a centre tap. During the positive half cycle, one of the diodes become forward biased and conducts, whereas the other one being reverse biased does not conduct. During the negative half cycle, first one get reverse biased and does not conduct, whereas the other one being forward biased conducts. <table><tr><th>Half Wave Rectifier</th><th>Full Wave Rectifier</th></tr><tr><td>Rectified output is obtained only during one half of the AC cycle.</td><td>Output voltage is obtained during both positive and negative half cycles.</td></tr></table>	Half Wave Rectifier	Full Wave Rectifier	Rectified output is obtained only during one half of the AC cycle.	Output voltage is obtained during both positive and negative half cycles.	$\frac{1}{2}$ $\frac{1}{2}$ 1+1	3
Half Wave Rectifier	Full Wave Rectifier						
Rectified output is obtained only during one half of the AC cycle.	Output voltage is obtained during both positive and negative half cycles.						
SECTION – D							
29.	(i) (B) $\frac{B}{A}$ (ii) (D) $\frac{k(q_1q_2)}{r_{12}}$	1 1					

	OR (b) (i) Define electric power. (1/2+1/2) Give SI unit. (2) Finding relation for power consumption. (2) (ii) Finding the bulb consuming more power with justification (I) In series (1) (II) In parallel (1) (i) The rate at which work is done in maintaining an electric current in a circuit is called electric power. 1/2 Alternatively: The rate at which electrical energy is dissipated or consumed in an electrical circuit is called electric power. SI unit is Js⁻¹ or watt. 1/2 Amount of work done by a voltage 'V' applied to a circuit having resistance 'R' in moving a charge 'q' through the circuit is W=qV 1/2 W=(It)V 1/2 $P = \frac{W}{t}$ 1/2 $P = VI = V\left(\frac{V}{R}\right) = \frac{V^2}{R}$ 1/2 (ii) Given: P₁ = 60W; P₂ = 120W As $P = \frac{V^2}{R}$ Since P₁ < P₂, R₁ > R₂ (I) In series, current remains the same 1/2 As P=I²R Hence 60W bulb will consume more power. 1/2 (II) In parallel, voltage across each bulb is the same. 1/2 As $P = \frac{V^2}{R}$ Now, as R₂ < R₁ Power consumed by 120 W bulb is more 1/2 <u>Alternatively:</u> For the same supply voltage, more is the power, greater is the energy loss. Thus 120 W bulb will consume more power .	5	
32.	(a) (i) Stating Biot–Savart's Law (1) Deriving an expression for the magnetic field (2) (ii) Calculating the magnetic field at the centre of the coil (2) (i) According to Biot–Savart's Law, the magnitude of the magnetic field $d\vec{B}$ is directly proportional to the current I, the element length, dl and inversely proportional to the square of the distance r, and its direction is perpendicular to the plane containing $d\vec{l}$ and $\vec{r}$.	1	

$$d\vec{B} = \frac{\mu_0}{4\pi} \frac{I d\vec{l} \times \vec{r}}{r^3}$$

[Note: Award ½ mark for writing the formula only]

According to Biot–Savart's Law, the magnetic field at the centre of a circular current-carrying loop of radius r due to a current element $I d\vec{\ell}$ is

$$dB = \frac{\mu_0}{4\pi} \frac{I d\ell \sin 90^\circ}{r^2}$$

Total magnetic field at the centre

$$\begin{aligned} B &= \frac{\mu_0}{4\pi} \int \frac{I d\ell}{r^2} \\ &= \frac{\mu_0 I}{4\pi r^2} \int d\ell = \frac{\mu_0 I}{4\pi r^2} \times 2\pi r \\ &= \frac{\mu_0 I}{2r} \end{aligned}$$

$$(ii) \quad B = \frac{\mu_0 NI}{2r}$$

$$B = \frac{4\pi \times 10^{-7} \times 100 \times 5}{2 \times 10 \times 10^{-2}}$$

$$B = 3.14 \times 10^{-3} \text{ T}$$

½

½

½

½

½

½

1

(b) **OR**

- | | |
|--|------|
| (i) Deriving an expression for the magnitude of the force. | (2) |
| Define one Ampere. | (1) |
| (ii) Calculating the force exerted on the proton | (1½) |
| Mentioning its direction | (½) |

(i) Magnitude of the magnetic field due to a long straight current-carrying wire carrying current I_1 at a distance r :

$$B_1 = \frac{\mu_0 I_1}{2\pi r}$$

When another long straight wire carrying current I_2 is kept in the magnetic field of the first wire at a distance r , it experiences a force per unit length:

$$\begin{aligned} f_{21} &= B_1 I_2 \\ f_{21} &= \frac{\mu_0 I_1 I_2}{2\pi r} \end{aligned}$$

Thus force experienced by the second wire kept in the magnetic field of the first wire will be $F_{21} = f_{21} \times \text{length of the second wire}$.

Force experienced by the first wire per unit of its length in the magnetic field due to second wire is

$$\begin{aligned} f_{12} &= B_2 I_1 \\ f_{12} &= \frac{\mu_0 I_1 I_2}{2\pi r} \end{aligned}$$

Similarly force experienced by the first wire kept in the magnetic field of the second wire will be $F_{12} = f_{12} \times \text{length of the second wire}$

½

½

½

½

	One ampere is the value of that steady current which, when maintained in each of the two very long, straight, parallel conductors of negligible cross-section and placed one metre apart in vacuum, would produce on each of these conductors a force equal to 2×10^{-7} newton per metre of length. (ii) Force, $F = qvB$ ($\because v \perp B$) As $B = \frac{\mu_0 I}{2\pi r}$ $F = qv \frac{\mu_0 I}{2\pi r}$ $F = \frac{1.6 \times 10^{-19} \times 3 \times 10^6 \times 4\pi \times 10^{-7} \times 2}{2\pi \times 0.1}$ $F = 19.2 \times 10^{-19} \text{ N}$ Direction of Force: The force acts towards the wire.	1 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
33.	(i) Explaining Total Internal Reflection (TIR) (2) Stating its conditions (1) Deriving the relation (1) (ii) Calculating the critical angle (1) (i) When a ray of light enters from a denser medium to a rarer medium, it bends away from the normal. As the angle of incidence increases at the interface, angle of refraction also increases till the angle of incidence is $\frac{\pi}{2}$ (i.e the refracted ray grazes the surface of the interface). If the angle of incidence is further increased, the incident ray totally gets reflected back. This is called total internal reflection. <u>Conditions</u> 1. Light must travel from a denser medium to a rarer medium. 2. At the interface, the angle of incidence must be greater than the critical angle. <u>Relation</u> When light goes from a denser medium (refractive Index n_2) towards a rarer medium (refractive Index n_1), then for the value of critical angle, we have relation- $n_2 \sin i_c = n_1 \sin 90^\circ$ $\sin i_c = \frac{n_1}{n_2}$ or, $\frac{n_2}{n_1} = \frac{1}{\sin i_c}$ or, $n_{21} = \frac{1}{\sin i_c}$	2 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	

	(ii) Calculating critical angle $n_2 = 1.5 = \frac{3}{2}, n_1 = 1$ $\sin i_c = \frac{1}{n_{21}} = \frac{2}{3}$ Therefore, $i_c = \sin^{-1}\left(\frac{2}{3}\right)$	$\frac{1}{2}$ $\frac{1}{2}$	5
	(b) OR (i) Stating the effect on the interference pattern (6×½ = 3) (ii) Finding the ratio of intensities (2) (i) (I) Diffraction pattern will be observed. $\frac{1}{2}$ <i>Alternatively:</i> No interference will be observed. (II) Fringe width will get reduced. $\frac{1}{2}$ (III) Brightness of the fringes will decrease. $\frac{1}{2}$ (IV) Fringe width increases. $\frac{1}{2}$ (V) Fringe width increases. $\frac{1}{2}$ (VI) The central maximum will be white with some faint coloured fringes surrounding it. $\frac{1}{2}$ (ii) (I) $\Delta p = 0$ $\Delta\phi = \frac{2\pi}{\lambda} \times \Delta p = 0$ $I_P = 4I_0 \cos^2 \frac{\Delta\phi}{2} = 4I_0$ (II) $\Delta p = \frac{\lambda}{4}$ $\Delta\phi = \frac{2\pi}{\lambda} \times \frac{\lambda}{4} = \frac{\pi}{2}$ $I_Q = 4I_0 \cos^2 \frac{\pi}{4} = 2I_0$ $\frac{I_P}{I_Q} = \frac{2}{1}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	5