Marking Scheme Strictly Confidential (For Internal and Restricted use only) Senior School Certificate Examination, 2025 SUBJECT NAME PHYSICS (PAPER CODE 55/B)	
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 News Paper/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-X, 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 delibration 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 un assessed 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)			
Code: 55/B			
Q.No.	**VALUE POINTS/EXPECTED ANSWERS**	Marks	Total Marks
	SECTION A		
1.	(B) gain of 6.25×10^{12} electrons by the body	1	1
2.	(A) $2\times10^{-4}\ {}^{o}C^{-1}$	1	1
3.	(C) F	1	1
4.	(D) 0.015 N	1	1
5.	(D) increases the voltage to transmit power over long distance with minimum loss.	1	1
6.	(A) 5V	1	1
7.	(A) Ultraviolet rays	1	1
8.	(B) at a distance of 40 cm in front of the combination	1	1
9.	(B) $\frac{m_p}{m_e}$	1	1
10.	(A) n=3 to n=1	1	1
11.	(D) before the the reverse saturation current.	1	1
12.	(D) Boron	1	1
13.	(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is the not the correct explanation of the Assertion (A)	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.	(D) Both Assertion (A) and reason (R) are false	1	1
16.	(A) Both assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the assertion (A).	1	1
	SECTION -B		
17.	Calculating relaxation time 2		
	Drift velocity, $v_d = \frac{eE\tau}{m}$	½	
	using $E = \frac{V}{\ell}$ and $\tau = \frac{mv_d l}{eV}$	½	
	$\tau = \frac{0.8\times10^{-3}\times9.1\times10^{-31}\times0.20}{1.6\times10^{-19}\times4}$	½	
	$\tau = 2.28\times10^{-16}$ s	½	2
18.	(a) Finding the distance between object and image 2		

	$\frac{1}{u}+\frac{1}{v} = \frac{1}{f}$ $u=-x,\ \ v=-2x$ $\frac{1}{-10}=\frac{1}{-x}+\frac{1}{-2x}=-\frac{3}{2x}$ $x=15\,\text{cm}$ Distance between object and image, d = 2x- x = 30- 15 = 15cm OR (b) Finding the nature and position of the image 2 $f=\frac{1}{P}=\frac{1}{4}=0.25\ \text{m}\ =25\text{cm}$ $\frac{1}{f}=\frac{1}{v}-\frac{1}{u}$ $\frac{1}{25}=\frac{1}{v}-\left(\frac{1}{-150}\right)$ On solving, v =30 cm The image formed is real and inverted.	½ ½ ½ ½ ½ ½ ½ ½	 2
19.	Finding angular width of central maxima 2 Angular width of central maxima= $\frac{2\lambda}{a}$ $= \frac{2\times 700\times 10^{-9}}{2\times 10^{-4}}$ radian = 0.007 radian	1 ½ ½	 2

20.	Finding (a) the potential energy of electron ½ (b) the kinetic energy of electron ½ (c) the ratio of the magnitude of total energy to kinetic energy 1 (a) $U = 2E = 2\times(-13.6) = -27.2\,\text{eV}$ (b) $K = -E = -(-13.6)\text{eV} = +13.6\,\text{eV}$ (c) $\frac{E}{K} = \frac{13.6\text{eV}}{13.6\text{eV}} = 1$	 ½ ½ 1	 2
21.	Finding the dynamic resistance of diode 2 Dynamic resistance $r_d = \frac{\Delta V}{\Delta I}$ $r_d = \frac{0.95-0.90}{0.005} = \frac{0.05}{0.005}$ $r_d = 10\Omega$	 ½ 1 ½	 2
Section - C			
22	(a) • Defining emf and terminal voltage 1+1 • Explaining terminal voltage exceeding the emf 1 **emf**- It is the potential difference across the terminal of the cell, when no current is being drawn from it. **Terminal Voltage -** It is the potential difference between the terminals of the cell in a closed circuit. **Alternatively** $V = \varepsilon - Ir$ Yes, During charging, $V = \varepsilon - (-I)r = \varepsilon + Ir$ OR	 1 1 ½ ½	

	(b)		
	Defining current density and Writing its SI unit 1+ ½ Deriving $\vec{J} = \sigma\vec{E}$ 1 ½		
	Current density – It is defined as the current through unit area normal to the current.	1	
	Alternatively, $\vec{J} = \frac{I}{\vec{A}}$		
	S.I unit A/m^2	½	
	Derivation		
	$V = IR$	½	
	$\vec{E}l = I\frac{\rho l}{\vec{A}}$	½	
	$\vec{E} = \vec{J}\rho$		
	$\vec{J} = \frac{I}{\rho}\vec{E} = \sigma\vec{E}$	½	
	Alternatively		
	$I = ne\vec{A}v_d$	½	
	$\frac{I}{\vec{A}} = \frac{ne^2\tau\vec{E}}{m}$	½	
	$\vec{J} = \frac{\vec{E}}{\rho} = \sigma\vec{E}$	½	
			3
23.	(a) Writing one • Similarity ½ • Difference ½ (b) Finding ratio of magnetic field in two cases 2		
	(a) **Point of similarity(Any one)** (i) Both obey inverse square law. (ii) Both are long range. (iii) Superposition principle is applicable on both.	½	
	Point of difference (Any one) (i) The electric field is produced by scalar source , the magnetic field is produced by vector source. (ii) Electric field is radially out ward or inward towards the source charge, the magnetic field is perpendicular to plane. (iii) electric field is due to static charge , magnetic field is due to moving charge.	½	

	b) Magnetic field at the center of circular coil $B = \frac{N\mu_0 I}{2r}$ for coil 1, $l = 2\pi r_1 \Rightarrow r_1 = \frac{l}{2\pi}$ $B_1 = \frac{1\times\mu_0 I}{2\left(\frac{l}{2\pi}\right)} = \frac{\mu_0 \pi I}{l}$ for coil 2, $l = 2\times 2\pi r_2 \Rightarrow r_2 = \frac{l}{4\pi}$ $B_2 = \frac{2\times\mu_0 I}{2\times\left(\frac{l}{4\pi}\right)} = \frac{\mu_0 4\pi I}{l}$ $\frac{B_1}{B_2} = \frac{1}{4}$	½ ½ ½ ½	3
24	(a) Stating conditions for TIR ½ + ½ (b) Finding height of image 2 a) (i) The ray of light should pass from a denser to a rarer medium b) (ii)The angle of incidence is greater than the critical angle for the pair of media. c) $n = \frac{\text{Real depth}}{\text{Apparant depth}}$ $\text{Apparant depth} = \frac{\text{Real depth}}{n}$ $= \frac{3\text{ cm}}{1.5} = 2\text{cm}$ The height through which the image of the dot raised (i.e. Normal shift) = Real depth - Apparent depth = 3 - 2 = 1 cm	½ ½ ½ ½ ½ ½	3
25	(a)Explaining the change of reactance with the frequency of ac source for • A capacitor 1 • And inductor 1 (b) Calculating the peak value of current 1 a) $X_c = \frac{1}{\omega C} = \frac{1}{2\pi \nu C}$ $X_c \propto \frac{1}{\nu}$ If frequency increases, X_c decreases and vice- versa $X_L = \omega L = 2\pi\nu L$ $X_L \propto \nu$	½ ½ ½	

	If frequency increases , X_L increases and vice- versa b) $I_o = \frac{V_o}{2\pi\nu L}$ $I_o = \frac{314}{2\times3.14\times50\times0.5} = 2A$	½ ½ ½	3
26	(a) Writing two characteristics of electromagnetic waves ½ + ½ (b) Defining displacement current and explaining 1+1 (a) Characteristics of em waves(any two) (i) Electromagnetic waves carries energy and momentum. (ii) velocity of electromagnetic wave is same as velocity of light in vaccum. (iii) In electromagnetic wave electric field vector $\vec{E}$, magnetic field vector $\vec{B}$ and direction of propagation, all are mutually perpendicular. (b) Displacement current – It is defined as the current due to changing electric field and hence electric flux with time. **Alternatively** $I_d = \in_o\left(\frac{d\phi_E}{dt}\right)$ During charging of capacitor, time varying electric field/ electric flux between the plates of capacitor induces the displacement current.	1 1 1	3
27	• Stating Bohr's postulates 1½ • Showing $2\pi r_n = n\lambda$ 1½ **Bohr's Postulates** (i) an electron in an atom could revolve in certain stable orbits without the emission of radiant energy. (ii) The electron revolves around the nucleus only in those orbits for which the angular momentum is some integral multiple of $\frac{h}{2\pi}$. Alternatively, $L = \frac{nh}{2\pi} = mvr$ (iii) An electron might make a transition from one of its specified non radiating orbits to another of lower energy , if it does so a photon is emitted having energy equal to the energy difference between the intial and final states.The frequency of emitted photon is then given by $E_i - E_f = h\upsilon$ From second postulates $mv_n r_n = \frac{nh}{2\pi}$ $2\pi r_n = \frac{nh}{mv_n}$	½ ½ ½ ½ ½	

	$2\pi r_n = n\lambda$	½	3
28	(a) Defining resistivity 1 (b) Explaining, the effect of temperature on resistivity of (i) a metal and justification ½ +½ (ii) a semiconductor and justification ½ + ½ (a) Resistivity - It is the property of material that measures how much it resists the flow of current . **Alternatively** Resistivity of a material is defined as the resistance offered by a material of unit length and unit area of cross section (b) (i) As the temperature increases ,Resistivity of metal increases. $\rho = \frac{m}{ne^2\tau}$ **Justification** - As T increases , (τ) decreases So, ρ increases $\left(\rho \propto \frac{1}{\tau}\right)$ (ii) As the temperature increases, resistivity of semiconductor decreases . **Justification** If T increases , n increases and (τ) decreases but the increase of n more than compensates the decrease in (τ) , so (ρ)decreases.	1 ½ ½ ½ ½	3
	Section - D		
29	(i) (D) Lesser in magnitude but in opposite direction. (ii) (D) The potential increases in the direction of the electric field between the plates. (iii) (C) $\sqrt{\frac{2ev}{m}}$ (iv) (a) (D) 1.0 V OR (b) (C) 3.2×10^{-17} N	1 1 1 1	4
30	(i) (A) Photon (ii) (C) 1.1×10^{-27} kg m/s (iii) (C) 1.0×10^{16} (iv) (a) (D) 0.55×10^{-19} J OR (b) (C) 5.3×10^{14} Hz	1 1 1 1	4
	Section – E		

31 (a)

(A) Obtaining an expression for potential energy of the system in external field	3
(B)Effect on force if	
(i) the distance between charge doubled	1
(ii) the magnitude of charge doubled	1

(a) Expression for potential energy.

Work done in bringing the charge q_1 , from ∞ to r_1 , $W_1 = q_1 V(\vec{r}_1)$ ½

Work done in bringing the charge q_2 , from ∞ to r_2 is not only against the external field but also against the field due to q_1 ½

$$W_2 = q_2 V(\vec{r}_2) + \frac{q_1 q_2}{4\pi\varepsilon_o \vec{r}_{12}}$$ 1

Where r_{12} is the distance between q_1 and q_2

Thus , potential energy of the system = total work done in assembling the system ½

$$U = q_1 V(\vec{r}_1) + q_2 V(\vec{r}_2) + \frac{q_1 q_2}{4\pi\varepsilon_o \vec{r}_{12}}$$ ½

(b) (i) Force becomes one forth 1

(ii) Force becomes four times 1

OR

(b)

(A) Difference between electrostatic force and gravitational force	3
(B)Finding	
(i) Nature of charge	1
(ii) Magnitude of charge	1

Difference(Any three)

(i) Electrostatic force may be attractive or repulsive , while gravitational force is always attractive

(ii) Electrostatic force is stronger than gravitational force.

(iii) Electrostatic force depends on magnitude of two charge particles, and gravitational force depends on masses of two particles.

(iv) Electrostatic force depends on intervening medium between two charge particles, while gravitational force is independent of intervening medium between two bodies. 1+1+1

(B) (i) As charge particle at rest which emplies that electrostatic force balances the gravitational force.

So, nature of charge is negative. 1

(ii) $mg = qE = q\frac{V}{l}$ ½

	$q = \dfrac{4\times10^{-11}\times10\times3\times10^{-2}}{480}$ $q = 2.5\times10^{-14}$ C	½	5
32	(a) (A) (i) Stating the right-hand thumb rule 1 (ii) Variation of magnetic field with distance 1 (iii) Naming the factors affecting magnitude of magnetic field 1 (B) Explanation of magnetic dipole to attain (i) Stable equilibrium 1 (ii) Unstable equilibrium 1 (a) (i) Right hand thumb rule When we hold a conductor in right hand in such a way that a thumb stretches in the direction of flow of current than the curled fingers shows the direction of magnetic field. (ii) Magnetic field due to straight conductor at a distance r is given by Since $B \propto \frac{1}{r}$ As r increases , B decreases (iii) B depends on current ,nature of medium and angle θ between current element and displacement r.(any two factors) (B) Explanation (i) Stable equilibrium When the magnetic dipole aligned along the direction of external magnetic field. (ii) Unstable equilibrium When the magnetic dipole align in opposite direction of external magnetic field . OR (b) (A) Explaining, the reason for changing the path of a charge particle, when (i) the strength of magnetic field is decreased ½ (ii) the velocity of charge particle is decreased ½ (iii) the component of velocity of charged particle is along magnetic field and perpendicular to magnetic field ½ (iv) electrostatic force balance, the magnetic force ½ (v) the magnetic field is switched off ½ (B) Deriving the expression for torque 2 ½ (i) Radius of circular path in magnetic field is	 1 1 ½ +½ 1 1	

	$r = \frac{mv}{qB}$ $r \propto \frac{1}{B}$ If B decreases , r increases. (ii) $r \propto v$ If v decreases , r decreases. (iii) Under the influence of these two components the charge particle follow helical path. (iv) The charge particle will move in the field undeviated. (v) The charge particle will fly off tangently along the direction of velocity. **(B) Derivation of torque** The magnetic field exerts no force on two arms of length 'a' parallel to magnetic field. The field exerts a force on two arm of length b perpendicular to magnetic field is, $F_1 = F_2 = IbB$ F_1 is directed into the plane of the loop and F_2 is directed out of the plane of paper. Thus the net force on the loop is zero . There is a torque on loop due to pair of force $\overrightarrow{F_1}$ and $\overrightarrow{F_2}$. The torque on the loop tends to rotate anticlockwise. The magnitude of torque - $\tau = F_1\frac{a}{2} + F_2\frac{a}{2}$ $= IbB\frac{a}{2} + IbB\frac{a}{2} = I(ab)B$ $\tau = IAB$ Where A=ab is the area of rectangle.	 ½ ½ ½ ½ ½ ½ ½ ½ ½ ½	 5
33.	(a) (A) Finding the wavelength of light 2½ (B) Deriving expression for the ratio of minimum and maximum intensity 2½ (A) The distance of n^{th} minima		

$$Y_n = \frac{(2n+1)\lambda D}{2d} \quad , n = 0,1,2 ------$$ ½

$$Y_8 - Y_1 = \frac{15\lambda D}{2d} - \frac{\lambda D}{2d} = \frac{7\lambda D}{d}$$ ½

$$\lambda = \frac{(Y_8 - Y_1)\times d}{7D}$$ ½

$$\lambda = \frac{8\times10^{-2}\times1.5\times2\times10^{-4}}{7\times3} \text{ m}$$ ½

$$\lambda = 5.71\times10^{-7} \text{ m} = 571 \text{nm}$$ ½

(B) Intensity of resultant wave

.

$$I \propto A^2 \left(\text{where A is amplitude of resultant wave}\right)$$ ½

$$A = \sqrt{A_1^2 + A_1^2 + 2A_1A_2\cos\varphi}$$ ½

$$A_{\max} = (A_1 + A_2)^2$$ ½

$$A_{\min} = (A_1 - A_2)^2$$ ½

$$\frac{I_{\min}}{I_{\max}} = \frac{(A_1 - A_2)^2}{(A_1 + A_2)^2}$$ ½ ½

OR.

(b)

(A)Finding the relation between angle of prism (A) and refractive index (n)	2½
(B) Finding the local length of the lens	2½

(A) As refracted ray emerges normally from opposite face AC of the prism, So $r_2 = 0$ ½

$$r_1 + r_2 = A$$ ½

$$r_1 = A$$

$$n = \frac{\text{Sin } i_1}{\text{Sin } r_1} = \frac{\text{Sin } A/2}{\text{Sin A}}$$ ½

$$n = \frac{\text{Sin } A/2}{2\text{Sin } A/2 \, Cos\, A/2}$$ ½

$$n = \frac{1}{2\cos A/2}$$ ½

	(B) From lens maker formula		
	$\frac{1}{f} = \left({}^{1}n_2 - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$	½	
	$\frac{1}{f_{air}} = \left(1.5 - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$		
	$\frac{1}{f_{air}} = 0.5\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$	½	
	$\frac{1}{f_{liguid}} = \left(\frac{1.5}{1.25} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$		
	$\frac{1}{f_{liguid}} = 0.2\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$	½	
	$\frac{f_l}{f_{air}} = \frac{5}{2}$	½	5
	$f_l = \frac{5}{2} \times f_{air} = \frac{5}{2} \times 20 = 50\,\text{cm}$	½	