Strictly Confidential: (For Internal and Restricted use only)

Senior Secondary School Term II Examination, 2022

Marking Scheme – PHYSICS (SUBJECT CODE – 042B)

(PAPER CODE – 55/B/5)

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 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 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, marks should be awarded.**

4. 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. 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.

5. Evaluators will mark(√) wherever answer is correct. For wrong answer 'X' be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**

6. 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.

7. 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.

8. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.

9. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.

10. A full scale of marks 0-35 (example 0-40 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.

11. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 30 answer books per day in main subjects and 35 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.

12. 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 totalling of marks awarded on a reply.
    - Wrong transfer of marks from the inside pages of the answer book to the title page.
    - Wrong question wise totalling on the title page.
    - Wrong totalling of marks of the two columns on the title page.
    - Wrong grand total.
    - Marks in words and figures not tallying.
    - 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.

13. 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.

14. Any unassessed portion, non-carrying over of marks to the title page, or totalling 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.

15. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.

16. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.

17. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

MARKING SCHEME

Senior Secondary School Examination TERM–II, 2022

PHYSICS (Subject Code–042B)

[Paper Code: 55/B/5]

<table>
<tr><th>Q.No.</th><th>EXPECTED ANSWER / VALUE POINTS</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td></td><td>SECTION—A</td><td></td><td></td></tr>
<tr><td>1.</td><td>Difference between forward and reverse biasing 1
Name of one device in each case ½+½

In forward biasing the p-side of the junction is connected to the +ve terminal and n-side to the –ve terminal of the battery.
In reverse biasing the p-side of the junction is connected to the –ve terminal and n-side to the +ve terminal of the battery.

<u>Alternatively</u>

In forward biasing the width of the depletion layer decreases / resistance of the junction decreases / current increases.
In reverse biasing the width of the depletion layer increases / resistance of the junction increases / current decreases.
• Name of the device for forward biasing ----- LED
• Name of the device for reverse biasing--------Zener diode
(Note : Full credit (½ Marks) for writing diode as rectifier working under any of the two biasing)</td><td>½
½

½
½</td><td>2</td></tr>
<tr><td>2.</td><td>(a)
Definition/ Meaning of the two terms 1+1

<u>Definition of:</u>
<u>Distance of closest approach</u>: The minimum distance of the approaching particle from the nucleus.
<u>Impact parameter</u> : The perpendicular distance of the approaching particle from the centre of a nucleus when the particle is far away from the nucleus.

OR
(b)
Two features of Photoelectric effect 1+1</td><td>1
1</td><td>2</td></tr>
</table>

	The photoelectric current is directly proportional to the intensity of radiation incident on the photoelectric surface/for the radiation of particular frequency incident on the surfaces, photo electrons of different kinetic energies are emitted simultaneously/ for a photosensitive surface there is a minimum frequency of the incident radiation below which the photoemission is not possible/ there is no time lag between the incidence of radiations and the emission of the electron from the surface. (Any two)	1+1	**2**
3.	Formation of n-type and p-type semiconductors ½+½ Majority charge carrier for n-type and p-type semiconductors ½+½ • *n*- type semiconductors are obtained when the intrinsic semiconductor are dopped with a pentavalent impurity. • *p*- type semiconductors are obtained when the intrinsic semiconductors are dopped with a trivalent impurity. Majority charge carriers in (i) n-type----electrons (ii) p-type----holes	½ ½ ½ ½	**2**
	SECTION—B		
4.	• Explanation of many lines in the spectrum of hydrogen atom 1 • Spectral series in visible region of the spectrum 1 • Mentioning the conditions for spectral lines to have maximum and minimum wavelength ½+½ • The electron may remain present in different excited states of hydrogen atom and then it jumps back to the lower energy states or the ground state. • Balmer series • Maximum wavelength of the line in Balmer series corresponds to the transition from n=3 to n=2 • Minimum wavelength of the line corresponds to the transition from n=∞ to n=2	1 1 ½ ½	**3**
5.	Generation of electrons and holes in solar cells. 1 Seperation of electrons and holes in solar cells 1 Two use of solar cells ½+½ • When sunlight is incident on a solar cell, the electrons are ejected from its surface and holes are formed as vacancies	1	

	• Due to the electric field of the depletion region, the electrons are swept to the n-side and the holes to the p-side. • Use of solar cells : Street light/ solar batteries/ any other (Any two)	1 ½ + ½	3
6.	• Statement of the second postulate of Bohr's hydrogen atom — 1 • Kinetic energy of the electron in the ground and the 2^{nd} excited state of an atom — ½+½ • Potential energy of the electron in the ground and 2^{nd} excited state of an atom — ½+½ <u>Statement</u> The electron can revolve around the nucleus in an orbit in which its angular momentum is integral multiple of $\frac{h}{2\pi}$ In the ground state $KE = -E = +13\cdot6\ eV$ $PE = -2\ KE = -27\cdot2\ eV$ In the second excited state, $n = 3$ $E_2 = -\frac{13\cdot6}{n^2} = -\frac{13\cdot6}{3^2} = -1\cdot51\ eV$ $KE = -E_2 = +1\cdot51\ eV$ $PE = -2\ KE = -2\times1.51 = -3.02\ eV$	 1 ½ ½ ½ ½	3
7.	Calculating (a) Refractive index of the material — 1½ (b) Angle of incidence — 1½ (b) $\angle i = \frac{\angle A + \angle \delta m}{2} = \frac{60^\circ + 30^\circ}{2} = 45^\circ$ (a) $\mu = \frac{\sin\frac{(A+\delta m)}{2}}{\sin(\frac{A}{2})} = \frac{\sin(\frac{60^\circ + 30^\circ}{2})}{\sin\frac{60^\circ}{2}} = \frac{\sin 45^\circ}{\sin 30^\circ}$ $= \frac{\frac{1}{\sqrt{2}}}{\frac{1}{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$	 1½ 1 ½	3

<table>
<tr><td>8.</td><td>(a)
(i)Explanation for not being coherent sources 1
(ii)Calculation for ratio of intensities of light rays from two source(I_1/I_2) 1+1

(i) Explanation: Two different monochromatic sources can not act as coherent sources because they can not emit light waves having the same phase or having a constant phase difference.

$(ii)\frac{I_{\max}}{I_{\min}}=\frac{(a_1+a_2)^2}{(a_1-a_2)^2}=\frac{25}{9}$
$\therefore\frac{a_1+a_2}{a_1-a_2}=\frac{5}{3}$
$\therefore\frac{a_1}{a_2}=\frac{4}{1}$
$\therefore\frac{I_1}{I_2}=\left(\frac{a_1}{a_2}\right)^2=\frac{16}{1}$

OR</td><td>1

½

½

½ + ½</td><td>3</td></tr>
<tr><td></td><td>(b)
I. (i) Meaning /definition of total internal reflection ½
(ii)Two conditions ½+½
II. Calculation of speed of light in the medium 1½

I. (i) The phenomenon due to which the light entering from a optically denser to a rarer medium gets reflected to the denser medium.
(ii) Two conditions:
• Light should travel from a denser medium to rarer medium
• Angle of incidence should be more than the critical angle.

II.
$n=\frac{1}{\sin C}=\frac{c_o}{c}$
$c=c_o\sin C$ where c_o- speed of light in vacuum (3×10^8 m/s)
$=3\times10^8\text{ m/s}\times\frac{1}{\sqrt{2}}=\frac{3}{\sqrt{2}}\times10^8\text{ m/s}$</td><td>½

½
½

½

½ + ½</td><td>3</td></tr>
</table>

9.	Calculating (a) Work function of the surface 1½ (b) Maximum KE of photo electrons 1½		
	(a) $E = h\nu = h\dfrac{c}{\lambda}$	½	
	$= \dfrac{6{\cdot}63\times10^{-34}\times3\times10^{8}}{500\times10^{-9}}$ J	½	
	$= 3{\cdot}99\times10^{-19}$ J $= 2{\cdot}49$ eV	½	
	(b) $\therefore E_k = h\nu - W_0 = h\nu - \dfrac{hc}{\lambda_0}$	½	
	$=2.49\text{eV} - \dfrac{6{\cdot}63\times10^{-34}\times3\times10^{8}}{663\times10^{-9}\times1.6\times10^{-19}}$ eV	½	
	$=2{\cdot}49$ eV $-1{\cdot}89=0.6$ eV	½	**3**
10.	(a) Effect on the image formed. 1 (b) Time difference between actual sun rise and the apparent sun rise 1 (c) Use of concave mirror 1		
	(a) No change in the shape / size and position of the image formed but the intensity of the image decreases	½ + ½	
	(b) Due to atmospheric refraction the light coming from the sun keeps bending towards the normal, hence reaches earlier	1	
	(c) Use of mirror makes the image free form chromatic aberration / improves the quality of image / image is comparatively brighter (any other)	1	**3**

11.	**(a)** I. Wavelength range of three radiations ½ + ½ + ½ II. One use of each radiation ½ + ½ + ½ Gamma rays – less than 10^{-11} m Microwave – 10^{-1}-10^{-4} m Ultraviolet rays – 10^{-7}-10^{-9} m Use of gamma rays – in medicine/any other Use of microwave – in radar system / heating appliances / speed gun / any other Use of ultraviolet rays – UV lens / eye surgery / water purification / any other	 ½ ½ ½ ½ ½ ½	 3
	OR		
	(b) Statement of Huygen's principle 1 Explanation of secondary wavelets in backward direction 1 Shapes of wavefronts ½+½ • Each point on a wavefront acts as the new source of secondary wavelets which also travel with the speed of the original wavefront of the secondary wavelets • The amplitude of the secondary wavelet, according to Huygen's argument, is maximum in the forward direction and zero in the backward direction. • (i) spherical (ii) cylindrical	 1 1 ½ ½	 3
	SECTION—C		
12.	a-(i) b-(iii) c-(iii) d-(i) e-(ii)	1 1 1 1 1	 5