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Senior Secondary School Term II Examination, 2022

Marking Scheme – PHYSICS (SUBJECT CODE – 042)

(PAPER CODE – 55/1/1)

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 totaling 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 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.
- 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 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.

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 totaled and written in figures and words.

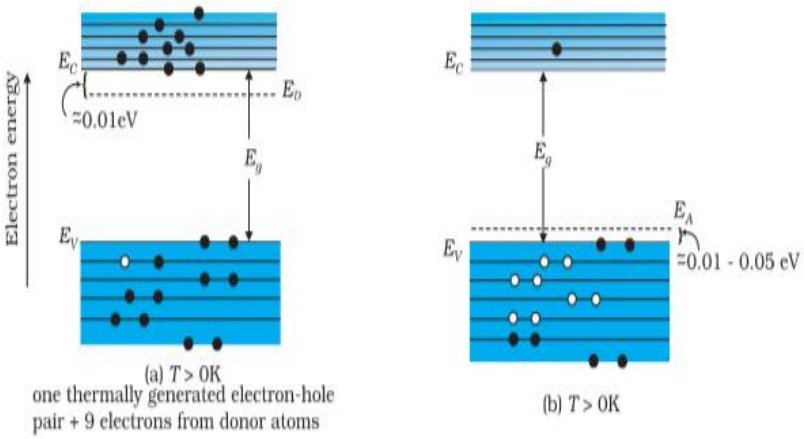
17. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

MARKING SCHEME

Senior Secondary School Examination TERM–II, 2022

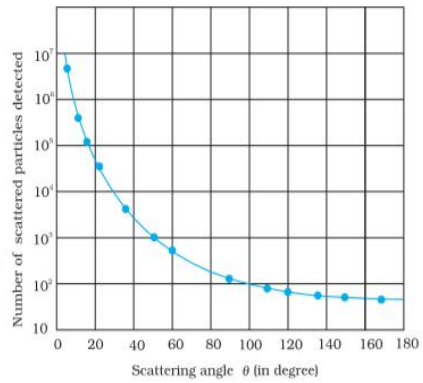
PHYSICS (Subject Code–042)

[Paper Code : 55/1/1]

Q. No.	EXPECTED ANSWER / VALUE POINTS	Marks	Total Marks
	SECTION—A		
1.	Energy band diagram ½ + ½ Significance 1  **n-type** **p-type** **Significance** n-type semiconductors – small energy gap between donor level and conduction band which can be easily covered by thermally excited electrons. p- type semiconductors - small energy gap between acceptor level and valence band which can be easily covered by thermally excited electrons. **Alternatively** The conductivity of semiconductor is improved with the creation of donor and acceptor levels.	½ + ½ ½ ½	2

2(a).

Graph	1
Conclusions (any two)	½ + ½



1

(Give full credit if axis are marked and values are not given)

Conclusions

- Most of the alpha particles pass undeviated through the gold foil.
- A few alpha particles, get deflected through 90° or more.
- Only about 0.14% of the incident alpha particles are reflected by large angle.
- A very few alpha particles retrace their path.

Any other two conclusions

½+½

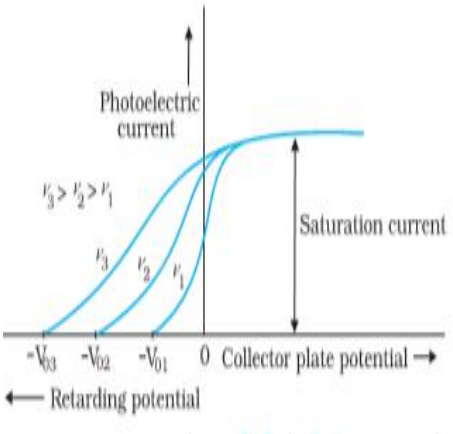
2

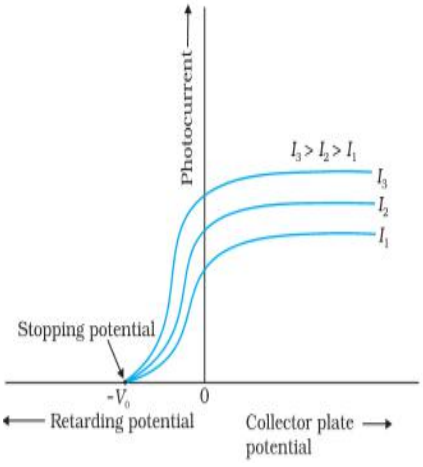
OR

2(b).

i) Same intensity different frequency	1
ii) Same frequency different intensity	1

(i) **(ii)**

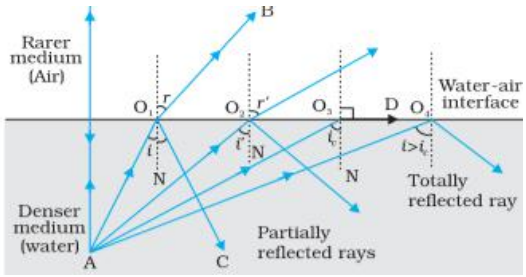
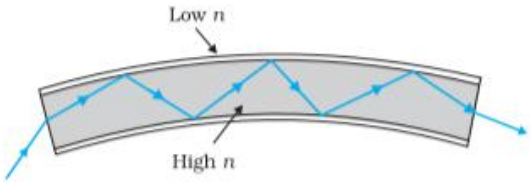




1+1

2

3.	Explanation 2 The unidirectional property of a diode makes it suitable for rectification. **Alternatively** The diode conducts when forward biased and does not conduct when reverse biased. **(Award 1 mark if a student draws the forward and reverse characteristics of a diode.)**	2	2
	SECTION- B		
4.	Definition of distance of closest approach 1 ½ Effect on distance of closest approach due to change in K.E. 1 ½ The minimum distance up to which an alpha particle travel along the central line of the nucleus before it rebounds is called distance of closest approach. **Alternatively** An alpha particle travelling directly towards the centre of a nucleus slows down as it approaches the nucleus due to repulsive force. At a distance r_0 from the nucleus, the α- particle stops and its total kinetic energy converts into electrostatic potential energy. This distance r_0 is called distance of closest approach. $r_0 = \frac{2Ze^2}{4\pi \in_0 K.E.}$ i.e., $r_0 \propto \frac{1}{K.E.}$ as K is doubled , r_0 is halved. **(Award full 1½ marks if a student writes r_0 is halved without writing formula)**	1 ½ ½ ½ ½	3
5.	Finding distance from source 2 Finding nature of image 1 Relation for concave spherical surface $\frac{\mu_1}{-u} + \frac{\mu_2}{v} = \frac{\mu_2 - \mu_1}{R}$ $\frac{1}{-u} + \frac{\mu}{v} = \frac{\mu - 1}{R}$ $\frac{1}{-(-24)} + \frac{1{\cdot}5}{v} = \frac{1{\cdot}5 - 1}{-60}$ $\therefore v = -30$ cm	½ ½ ½	

	Distance of image from point source = $-24-(-30)=6$ cm Nature of image = Virtual image	½ 1	3
6.	Calculation of mass defect 2 Calculation of energy released 1 $^2_1\mathrm{H}+{}^3_1\mathrm{H}\rightarrow{}^4_2\mathrm{He}+n+Energy$ Mass defect = mass of reactants – mass of products $\Delta m=m(^2_1\mathrm{H}+{}^3_1\mathrm{H})-m(^4_2\mathrm{He}+{}^1_0n)$ Mass defect $=(2\cdot014102+3\cdot016049)-(4\cdot002603+1\cdot008665)$ $=5\cdot030151-5\cdot011268$ $=0\cdot018883u$ Energy released = Δm × 931.5 MeV = 0.018883 × 931.5 MeV $=17\cdot58$ MeV	½ ½ ½ ½ ½ ½	3
7.	Principle of optical fibre 1 Diagram of TIR 1 Use of optical fibre ½ +½ An optical fibre works on the principle of Total internal reflection.  **Alternatively**  Uses of optical fibres(any two) i) Medical and optical examination (endoscopy). ii) Transmission and reception of signals iii) Photometric sensors.	1 1 ½+½	3
8(a).	Calculation of distance of first minimum 1 ½ Calculation of distance of second maximum 1 ½		

(i) $y = \frac{\lambda D}{a}$ ½

$= \frac{600\times10^{-9}\times1}{0.2\times10^{-3}}$ ½

$= 3\times10^{-3}\text{ m} = 3\text{ mm}$ ½

(ii) $y = (n+\frac{1}{2})\frac{\lambda D}{a}$ ½

$y = (2+\frac{1}{2})\frac{\lambda D}{a}$ ½

$y = \frac{5}{2}\frac{\lambda D}{a}$

$y = \frac{5}{2}\times\frac{600\times10^{-9}\times1}{0.2\times10^{-3}}$ 3

$= 7.5\times10^{-3} = 7\cdot5\text{ mm}$ ½

OR

8(b).

Finding the ratio of powers	1½
Finding the power of combination and nature	1½

(i) From $P = (\mu-1)\left(\frac{1}{R_1}-\frac{1}{R_2}\right)$ ½

$P_1 = P_{convex} = (\mu-1)\left(\frac{1}{R_1}-(-\frac{1}{R_2})\right)$ ½

$= (\mu-1)(\frac{2}{R})$

$P_2 = P_{concave} = (\mu-1)\left(-\frac{1}{R_1}-\frac{1}{R_2}\right)$

$= -(\mu-1)(\frac{2}{R})$

$\therefore \frac{P_1}{P_2} = \frac{(\mu_1-1)}{-(\mu_2-1)} = \frac{(\mu_1-1)}{(1-\mu_2)}$ ½

(ii) $P = P_1 + P_2$ ½

$= (\mu_1-1)\left(\frac{2}{R}\right)+(-(\mu_2-1))\left(\frac{2}{R}\right)$

$P = \frac{2(\mu_1-\mu_2)}{R}$ ½

As $\mu_2 > \mu_1$, P is negative

$\therefore$ Nature is diverging ½ 3

9.	i) Calculation of energy of Radiation 1 ½ ii) Calculation of kinetic energy of photoelectron 1 ½ i) Energy of incident radiation $E = h\nu = h\frac{c}{\lambda}$ $= \frac{6\cdot63\times10^{-34}\times3\times10^{8}}{330\times10^{-9}}$ $= 6\cdot027\times10^{-19}$ J ii) Kinetic energy of photoelectron K.E. $= E - \phi_0$ $= (6\cdot027\times10^{-19} - 3\cdot5\times10^{-19})$ J $= 2\cdot527\times10^{-19}$ J	½ ½ ½ ½ ½ ½	3
10.	Statement of working principle of LED 1 Advantages ½ + ½ Disadvantages ½ +½ When the diode is forward biased, electrons are sent from n region to p region and holes are sent from p region to n region. At the junction the concentration of minority carriers increases. Thus at the junction, the excess minority carriers recombine with majority carriers and energy is released in the form of photons. **Advantages (any two):** *(i)* Low operational voltage *(ii)* Less power consumption *(iii)* Fast action *(iv)* Long life and ruggedness **Disadvantages (any two) :** *(i)* High cost *(ii)* Can get damaged due to overheating *(iii)* Excess of voltage or current can damage LED **(Note: Award last 1 mark, even if disadvantages are not given.)**	1 ½+½ ½+½	3
11(a).	i) Reason 1 ii) Identification of radiation 1 Uses ½ + ½ i) Refraction arises through interaction of incident light with the atomic constituents of matter. Atoms may be viewed as oscillators which take up the frequency of the external agency causing forced oscillations. Thus the frequency of refracted light equals the frequency of incident light.	1	

Alternatively

Frequency is the characteristic of the source of light. So it remains unaffected. But λ depends on refractive index (μ) of the medium as —

$$\lambda_m = \frac{\lambda_o}{\mu}$$

ii) Infrared/ Microwaves/ Radio waves — 1

Uses of Infrared rays (any two)

- Remote control
- Green house effect
- Photography in foggy condition
- To reveal secret writings
- Infrared lamps

½ + ½

Uses of Microwaves (any two)

- Radar System
- Geostationary satellite
- Microwave ovens

Uses of Radiowaves (any two)

- TV transmission
- Radio broadcast
- Mobile transmission

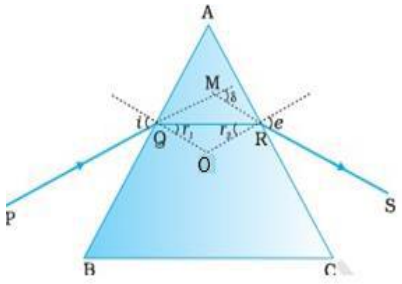
3

11(b).

OR

i)Diagram	1
Proof of relation $\delta = (i+e) - A$	1 ½
ii)Finding minimum deviation	½

i) Diagram



1

$\delta = (i - r_1) + (e - r_2)$

$\delta = (i+e) - (r_1 + r_2)$ — ½

In Quadrilateral AQOR

$\angle Q = \angle R = 90^\circ \quad \therefore \angle A + \angle O = 180^\circ$ ---------(1) — ½

In ΔQOR

$O + r_1 + r_2 = 180^\circ$ ---------(2)

Comparing (1) and (2)

$\therefore A = r_1 + r_2$

$\therefore \delta = (i+e) - A$ — ½

	ii) If a ray passes symmetrically through a prism (parallel to base of prism), the value of angle of deviation is minimum. At this angle $\angle i = \angle e$ and $\angle r_1 = \angle r_2$	½	3
	SECTION- C		
12.	I (B) II (C) III (D) IV (C) V (C)	1 1 1 1 1	5

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