



INDIAN SCHOOL MUSCAT
SECOND PRE - BOARD EXAMINATION
PHYSICS (042)

CLASS: XII

TERM- 2

Time Allotted: 2 hrs

06.04.2022

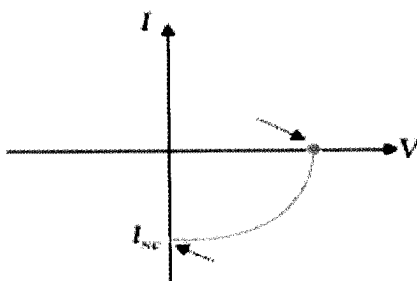
Max. Marks: 35

GENERAL INSTRUCTIONS

- (i) There are 12 questions in all. All questions are compulsory.
- (ii) This question paper has three sections: Section A, Section B and Section C.
- (iii) Section A contains three questions of two marks each, Section B contains eight questions of three marks each, Section C contains one case study based questions of five marks.
- (iv) There is no overall choice. However, an internal choice has been provided in one question of two marks and two questions of three marks.
- (v) You may use log tables if necessary but use of calculator is not allowed.

SECTION A

1. (a) Name the type of diode whose characteristics are shown in the following figure. 2
 (b) In the figure name the points along X and Y axes which are indicated by the two slanting arrows.



2. (a) Plot a graph showing the variation of photo electric current with collector plate potential at a given frequency and intensity of radiation. 2
 (b) What does the intercept of the graph with potential axis signify?

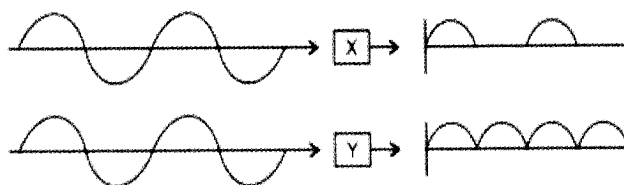
OR

- (a) Write two characteristic features of nuclear force which distinguish it from Coulomb's force.
- (b) What is the role of moderator in a nuclear reactor? Give an example.

3. (a) State with reason why a photodiode is operated in reverse bias. 2
 (b) State with reason why GaAs is most commonly used in making solar cell.

SECTION B

4. The ground state energy of hydrogen atom is -13.6 eV. If an electron makes a transition from an energy level -0.85 eV to -3.4 eV, calculate the wavelength of the spectral line emitted. To which series of hydrogen spectrum does this wavelength belong? ($R = 1.097 \times 10^7 \text{ m}^{-1}$) 3
5. An ac signal is fed into two circuits X and Y and the corresponding output in the two cases have the waveform as shown in figure. 3



- (a) identify the circuits X and Y
 (b) briefly explain the working of circuit X with a labelled circuit diagram.
6. a) Determine the distance of closest approach when an alpha particle of kinetic energy 4.5 MeV strikes a nucleus of $Z = 80$, stops and reverses its direction. 3
 (b) Give reason why in a nuclear reactor heavy water is the preferred moderator to ordinary water.
7. Define wave front. Using Huygen's constructions, draw a figure showing the reflection of a plane wavefront at the interface of the two media. Show that angle of incidence is equal to angle of reflection. 3
8. Draw a ray diagram to show refraction of ray of monochromatic light passing through a glass prism. Deduce the expression for the refractive index of glass in terms of angle of prism and angle of minimum deviation. 3

OR

- (a) Write the necessary conditions for the phenomena of total internal reflection to occur.
 (b) Derive the relation between the refractive index and critical angle for given pair of optical media with the help of a diagram.
9. An electron and a proton are accelerated through the same potential. Which one of the two has 3
 (a) greater value of de- Broglie wavelength associated with it
 (b) less kinetic energy? Justify your answer in each case.

10. Draw a ray diagram for formation of image of a point object by a thin double convex lens having radii of curvature R_1 and R_2 . Hence, derive lens maker's formula for a double convex lens. 3
11. (a) Name the electromagnetic waves which are produced during radioactive decay of a nucleus. 3
 (b) Welders wear special glass goggles while working. Why? Explain.
 (c) Which constituent radiation of electromagnetic spectrum is used in RADAR?

OR

- (a) Write two conditions for sustained interference pattern.
 (b) Derive a mathematical expression for the width of interference fringes obtained in Young's double slit experiment with the help of a suitable diagram

SECTION C: CASE STUDY

12. A prism is a portion of a transparent medium bounded by two plane faces inclined to each other at a suitable angle. A ray of light suffers two refractions on passing through a prism and hence deviates through a certain angle from its original path. The angle of deviation of a prism is,
 $\delta = (\mu - 1) A$, through which a ray deviates on passing through a thin prism of small refracting angle A . If μ is refractive index of the material of the prism, then prism formula is,

$$\mu = \frac{\sin \frac{(A + \delta_m)}{2}}{\frac{A}{2}}$$

- (i) When white light moves through vacuum 1
 (a) all colours have same speed (b) different colours have different speeds
 (c) violet has more speed than red (d) red has more speed than violet.
- (ii) For which colour, angle of deviation in prism is minimum? 1
 (a) Red (b) Yellow (c) Violet (d) Blue
- (iii) Two beams of red and violet color are made to pass separately through a prism (angle of the prism is 60°). In the position of minimum deviation, the angle of refraction will be 1
 (a) 30° for both the colors (b) greater for the violet color
 (c) greater for the red color (d) equal but not 30° for both the colors
- (iv) Refractive index of a medium depends upon 1
 (a) nature of the medium (b) wavelength of the light used (c) temperature (d) all of these
- (v) At the position of minimum deviation of prism 1
 (a) $i = e$, $r_1 = r_2$ (b) $i = r_1$, $e = r_2$ (c) $i = r_2$, $e = r_1$ (d) $i > e$, $r_1 < r_2$

End of the Question Paper



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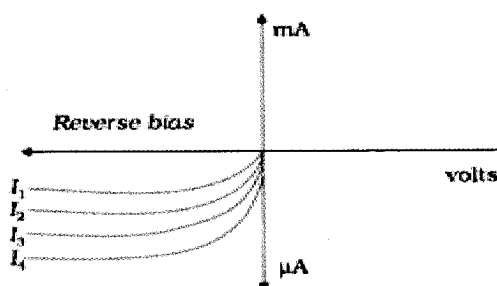
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SECTION A

1. (a) Name the type of diode whose characteristic is shown in figure.

2



- (b) In half-wave rectification, what is the output frequency if the input frequency is 50Hz? What is the output frequency of a full-wave rectifier for the same input frequency?

2. (a) Define the terms (i) work function and (ii) threshold frequency in relation to the phenomenon of photo electric effect.
- (b) Plot a graph showing the variation of stopping potential and frequency of incident radiation.

2

OR

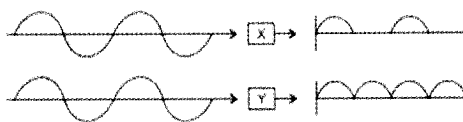
Show that the density of nucleus over a wide range of nuclei is independent of mass number A.

3. (a) What type of extrinsic semiconductor is formed when (i) germanium is doped with indium?
- (ii) silicon is doped with bismuth?
- (b) Distinguish between a metal and an insulator on the basis of energy band diagram.

2

SECTION B

4. The ground state energy of hydrogen atom is -13.6 eV . If an electron makes a transition from an energy level -0.85 eV to -3.4 eV , calculate the wavelength of the spectral line emitted. To which series of hydrogen spectrum does this wavelength belong? ($R = 1.097 \times 10^7 \text{ m}^{-1}$) 3
5. An ac signal is fed into two circuits X and Y and the corresponding output in the two cases have the waveform as shown in figure. 3



- (a) identify the circuits X and Y
- (b) briefly explain the working of circuit Y with a labelled circuit diagram.
6. a) Determine the distance of closest approach when an alpha particle of kinetic energy 4.5 MeV strikes a nucleus of $Z = 80$, stops and reverses its direction. 3
- (b) Give reason why in a nuclear reactor, heavy water is the preferred moderator to ordinary water.
7. (a) Define wave front. 3
- (b) Using Huygen's constructions draw a figure showing the propagation of a plane wave front at the interface of the two media when light travels from denser to rarer medium. Hence verify Snell's law of refraction.
8. Draw a ray diagram to show refraction of a ray of monochromatic light passing through a glass prism. Deduce the expression for the refractive index of glass in terms of angle of prism and angle of minimum deviation. 3

OR

- (a) Write the necessary conditions for the phenomena of total internal reflection to occur.
- (b) Derive the relation between the refractive index and critical angle for given pair of optical media with the help of a diagram.
9. A proton and an alpha particle have the same de Broglie wavelength. Determine the ratio of 3
- (a) accelerating potentials (b) their speeds
10. Draw a ray diagram for formation of image of a point object by a thin double convex lens having radii of curvature R_1 and R_2 . Hence, derive lens maker's formula for a double convex lens. 3
11. (a) How are electromagnetic waves produced? Explain. 3
- (b) A plane electromagnetic wave is travelling through a medium along the positive z-direction. Draw a sketch showing the propagation of the em- wave indicating the direction of the oscillating electric and magnetic fields.

OR

- (a) Write two conditions for sustained interference pattern.
- (b) Derive a mathematical expression for the width of interference fringes obtained in Young's double slit experiment with the help of a suitable diagram

SECTION C: CASE STUDY

12. A prism is a portion of a transparent medium bounded by two plane faces inclined to each other at a suitable angle. A ray of light suffers two refractions on passing through a prism and hence deviates through a certain angle from its original path. The angle of deviation of a prism is, $\delta = (\mu - 1) A$, through which a ray deviates on passing through a thin prism of small refracting angle A . If μ is refractive index of the material of the prism, then prism formula is,

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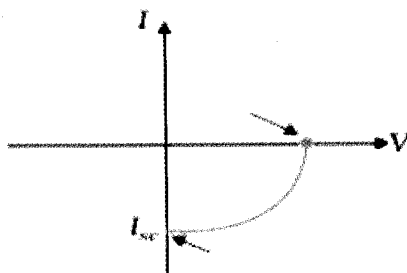
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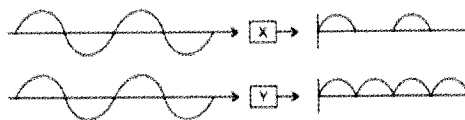
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