# CBSE EXAMINATION PAPER-2022

## PHYSICS

### (Solved)

Time allowed : 3 hours | Maximum Marks : 38

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**General Instructions :**

Read the following instructions carefully and follow them :

i. This question paper contains **14 questions.** All questions are **compulsory.**

ii. This question paper is divided into **2 sections.**

iii. **Section A** – questions number **1 to 4** are very short answer

iv. **Section B** – questions number **5 to 14** are short answer

v. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

vi. Use of calculator is NOT allowed.

## Section A

**Question 1.**

Draw energy band diagrams of n-type and p-type semiconductors at temperature T > OK, depicting the donor and acceptor energy levels. Mention the significance of these levels.

[2 Marks]

**Question 2.**

(a) Draw the graph showing the variation of the number (N) of scattered alpha particles with scattering angle (θ) in Geiger — Marsden experiment. Infer two conclusions from the graph.

[2 Marks]

**Question 3.**

Write the characteristics of a p-n junction which make it suitable for rectification.

[2 Marks]

**Question 4.**

(b) Plot suitable graphs to show the variation of photoelectric current with the collector plate potential for the incident radiation of

(i) the same intensity but different frequencies v1, v2, and v3, (v1 < V2 < V3)

(ii) the same frequency but different intensities I1, I2, and I3, (I1 < I2 <I3)

[2 Marks]

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## Section B

**Question 5.**

Define the term — Distance of closest approach. How will it be affected, for an α - particle, if kinetic energy of the particle is doubled ?

[3 Marks]

**Question 6.**

A point source in air is kept 24 cm in front of a concave spherical glass surface (aμg = 1.5) and radius of curvature 60 cm. Find the nature of the image formed and its distance from the point source.

[3 Marks]

**Question 7.**

Calculate the energy released in MeV in the following reaction :

[3 Marks]

Given : $_{1}^{2}H + _{1}^{3}H \longrightarrow _{2}^{4}He + n$

$m\left(_{1}^{2}H\right) = 2.014102\ u$

$m\left(_{1}^{3}H\right) = 3.016049\ u$

$m\left(_{2}^{4}He\right) = 4.002603\ u$

$m_n = 1.008665\ u$

**Question 8.**

Explain with the help of a suitable diagram, the phenomenon on which an optical fibre works. Mention any two uses of optical fibres.

[3 Marks]

**Question 9.**

a) A parallel beam of light of wavelength 600 nm is incident normally on a slit of width 0.2 mm. If the resulting diffraction pattern is observed on a screen 1 m away, find the distance of

(i) first minimum, and

(ii) second maximum, from the central maximum.

[3 Marks]

**Question 10.**

Photoelectrons are emitted from a metal surface when illuminated with UV light of wavelength 330 nm. The minimum amount of energy required to emit the electrons from the surface is 3.5 x 10^-19 J. Calculate :

(i) the energy of the incident radiation, and

(ii) the kinetic energy of the photoelectron.

[3 Marks]

**Question 11.**

State the working principle of an LED. Write any two important advantages and two disadvantages of LED.

[3 Marks]

**Question 12.**

(a) (i) Monochromatic light is incident on a surface separating two media. The frequency of the light after refraction remains unaffected but its wavelength changes. Why ?

(ii) The frequency of an electromagnetic radiation is 1.0 x 10^11 Hz. Identify the radiation and mention its two uses.

[3 Marks]

**Question 13.**

(b) A thin equiconvex lens of radius of curvature R made of material of refractive index μ1 is kept coaxially, in contact with an equiconcave lens of the same radius of curvature and refractive index μ2 (>μ1)

Find :

i) the ratio of their powers, and

i) the power of the combination and its nature.

[3 Marks]

**Question 14.**

(b) (i) Trace the path of a ray of light PQ which is incident at an angle i on one face of a glass prism of angle A. It then emerges out from the other face at an angle e. Use the ray diagram to prove

that the angle through which the ray is deviated is given by <δ =<i+<e - <A

(ii) What will be the minimum value of 6 if the ray passes symmetrically through the prism ?

[3 Marks]