CBSE EXAMINATION PAPER-2022

PHYSICS

(Solved)

Time allowed : 3 hours | Maximum Marks : 38

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **15 questions.** All questions are **compulsory.**

ii. This question paper is divided into **3 sections.**

iii. **Section A** – questions number **1 to 4** are very short answer Each question carries **2 marks.**

iv. **Section B** – questions number **5 to 14** are short answer Each question carries **3 marks.**

v. **Section C** – questions number **15 to 15** are case based questions

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

vii. Use of calculator is NOT allowed.

Section A

Question 1.

What is meant by doping of an intrinsic semiconductor ? Name the two types of atoms used for doping of Ge/Si.

[2 Marks]

Question 2.

(a) (i) Distinguish between isotopes and isobars.

(ii) Two nuclei have different mass numbers A1, and A2. Are these nuclei

necessarily the isotopes of the same element ? Explain.

[2 Marks]

Question 3.

Explain the formation of the barrier potential in a p-n junction.

[2 Marks]

Question 4.

(b) (i) Name the factors on which photoelectric emission from a surface

depends.

(ii) Define the term 'threshold frequency' for a photosensitive material.

[2 Marks]

Section B

Question 5.

State Bohr's postulate to explain stable orbits in a hydrogen atom. Prove that the speed with which the electron revolves in nth orbit is proportional to (1/n).

[3 Marks]

Question 6.

Briefly explain how emf is generated in a solar cell. Draw its I-V characteristics.

[3 Marks]

Question 7.

A narrow beam of protons, each having 4.1 MeV energy is approaching a

sheet of lead (Z = 82). Calculate :

i) the speed of a proton in the beam, and

ii) the distance of its closest approach

[3 Marks]

Question 8.

In a diffraction pattern due to a single slit, how will the angular width of

central maximum change, if

i) Orange light is used in place of green light,

ii) the screen is moved closer to the slit,

iii) the slit width is decreased ?

Justify your answer in each case.

[3 Marks]

Question 9.

(a) Write two necessary conditions for total internal reflection.

(b) Two prisms ABC and DBC are arranged as shown in figure.

The critical angles for the two prisms with respect to air are 41.1° and 45°

respectively. Trace the path of the ray through the combination.

[3 Marks]

Question 10.

An electron is accelerated from rest through a potential difference of 100 V.

Find :

i) the wavelength associated with

ii) the momentum of and

iii) the velocity required by, the electron.

[3 Marks]

Question 11.

In a Young's double slit experiment using light of wavelength 600 nm, the slit separation is 0.8 mm and the screen is kept 1.6 m from the plane of the slits.

Calculate :

(i) the fringe width

(ii) the distance of (a) third minimum and (b) fifth maximum, from the central maximum.

[3 Marks]

Question 12.

(a) Electromagnetic waves of wavelengths λ1, λ2, and λ3 are used in radar systems, in water purifiers and in remote switches of TV, respectively.

(i) Identify the electromagnetic waves, and

(ii) Write one source of each of them.

[3 Marks]

Question 13.

(a) An object is placed in front of a converging lens. Obtain the conditions under which the magnification produced by the lens is (i) negative and Gi) positive.

(b) A point object is placed at O in front of a glass sphere as shown in figure. Show the formation of image by the sphere.

[3 Marks]

Question 14.

(b) (i) State two conditions for two light sources to be coherent.

(ii) Give two points of difference between an interference pattern due to a double — slit and a diffraction pattern due to a single slit.

[3 Marks]

Section C

Question 15.

A compound microscope consists of two converging lenses. One of them, of smaller aperture and smaller focal length is called objective and the other of slightly larger

aperture and slightly larger focal length is called eye-piece. Both the lenses are fitted in a tube with an arrangement to vary the distance between them. A tiny object is placed in front of the objective at a distance slightly greater than its focal length. The objective produces the image of the object which acts as an object for the eye-piece. The eye piece, in turn produces the final magnified image.

(1)

In a compound microscope the images formed by the objective and the eye-piece are respectively

(A) virtual, real (B) real, virtual

(C) virtual, virtual (D) real, real

[1 Marks]

(2)

The magnification due to a compound microscope does not depend upon

(A) the aperture of the objective and the eye-piece

(B) the focal length of the objective and the eye-piece

(C) the length of the tube

(D) the colour of the light used

[1 Marks]

(3)

Which of the following is not correct in the context of a compound microscope ?

(A) Both the lenses are of short focal lengths.

(B) The magnifying power increases by decreasing the focal lengths of

the two lenses.

(C) The distance between the two lenses is more than (fo + fe).

(D) The microscope can be used as a telescope by interchanging the two

lenses.

[1 Marks]

(4)

A compound microscope consists of an objective of 10X and an eye-piece of 20X. The magnification due to the microscope would be

(A) 2 (B) 10

(C) 30 (D) 200

[1 Marks]

(5)

The focal lengths of objective and eye-piece of a compound microscope

are 1.2 cm and 3.0 cm respectively. The object is placed at a distance of

1.25 cm from the objective. If the final image is formed at infinity, the

magnifying power of the microscope would be

(A) 100 (B) 150

(C) 200 (D) 250

[1 Marks]