CBSE SAMPLE QUESTION PAPER-1
CLASS XII
PHYSICS THEORY
TERM II
SESSION 2021 – 22

MM : 35   **TIME : 2 Hours**

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 question 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. You have to attempt only one of the choices in such questions.

(v)   You may use log tables if necessary but use of calculator is not allowed.

SECTION-A

1.   What is the order of energy gap in a semiconductor ? Give the ratio of the number of holes and the number of conduction electrons in an intrinsic semiconductor.

2.   Two nuclei have mass number in the ratio 1 : 2. What is the ratio of their nuclear densities ? Four nuclei of an element fuse together to form a heavier nucleus. If the process is accompanied by release of energy, which of the two - the parent or the daughter nucleus would have a higher binding energy/nucleon ?

OR

Calculate the ratio of energies of photons produced due to transition of electron of hydrogen atom from its,

(i) Second permitted energy level to the first level, and

(ii) Highest permitted energy level to the second permitted level

3.   Draw a circuit diagram for p-n junction diode in forward bias and reverse bias. Sketch the voltage-current graph for the same.

SECTION-B

4. What is the Bohr's quantization condition of the angular momentum of an electron in the second orbit ? The total energy of an electron in the first excited state of hydrogen atom is about –3.4eV. What is the kinetic energy and potential energy of electron in this state ?

5. What is the working principle of a solar cell ? Explain the three basic processes which Take place inside it.

6. Calculate the energy equivalent of 1 g of substance. You are given two nuclides $_3^7X$ and $_3^4Y$

   (i) Are they the isotopes of the same element ? Why ?

   (ii) Which one of the two is likely to be more stable ? Give reason.

7. (a) What is meant by a wavefront? What is the shape of the wavefront of a beam of parallel rays ? Is the speed of light in glass independent of the color of light? If not, which of the two colours (red and violet) travels slower in a glass prism ?

   (b) What is the effect on the interference fringes in a Young's double slit experiment due to each of the following operations.

      (i) The screen is moved away from the plane of the slits.

      (ii) The source is replaced by another source of shorter wavelength.

8. A thin converging lens has a focal length f in air. If it is completely immersed in a liquid, briefly explain how the focal length of the lens will vary ? Draw a ray diagram showing the formation of image by a concave lens. Discuss the nature of the image.

   OR

   You are given three lenses having powers P and Apertures A as follows :

   $P_1 = 6 D, A_1 = 3 cm$

   $P_2 = 3 D, A_2 = 15 cm$

   $P_3 = 12 D, A_3 = 1.5 cm$

   Which two of these will you select to construct

   (i) a telescope and (ii) a microscope ?

   State the basis for your answer in each case.

9. (a) If the intensity of light falling on the emitting substance of a photoelectric cell be increased then what will be the effect on (i) Current flowing from the cell (ii) potential difference required to stop the current completely ?

   (b) What is meant by work function of a metal? How does the value of work function influence the K.E of electron emitted during photoelectric emission ?

10. The refractive index of the material of a concave lens is n_1. It is immersed in a medium of refractive index n_2. A parallel beam of light is incident on the lens. Trace the path of emergent rays when (a) $n_2 = n_1$ (b) $n_2 > n_1$ (c) $n_2 < n_1$

11. (a) Which part of electro-magnetic spectrum is used for eye surgery ?

(b) Which of the electro-magnetic wave capable of penetrating layers of dust ?

(c) Write the wavelength used to check metal surface or to study the crystal structure.

OR

(a) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency. Explain why ?

(b) When light travels from a rarer to a denser medium, the speed decreases. Does the reduction in speed imply a reduction in the energy carried by the light wave ?

(c) In a Young's double slit experiment, 12 fringes are observed to be formed in a certain segment of the screen, when light of wavelength 600 nm is used. If the wavelength is changed to 400 nm then what is the number of fringes observed in the same segment of the screen ?

SECTION-C

CASE STUDY

12. **Optical fibres :-** Now-a-days optical fibres are extensively used for transmitting audio and video signals through long distances. Optical fibres too make use of the phenomenon of total internal reflection. Optical fibres are fabricated with high quality composite glass/quartz fibres. Each fibre consists of a core and cladding. The refractive index of the material of the core is higher than that of the cladding. When a signal in the form of light is directed at one end of the fibre at a suitable angle, it undergoes repeated total internal reflections along the length of the fibre and finally comes out at the other end. Since light undergoes total internal reflection at each stage, there is no appreciable loss in the intensity of the light signal. Optical fibres are fabricated such that light reflected at one side of inner surface strikes the other at an angle larger than the critical angle. Even if the fibre is bent, light can easily travel along its length. Thus, an optical fibre can be used to act as an optical pipe.
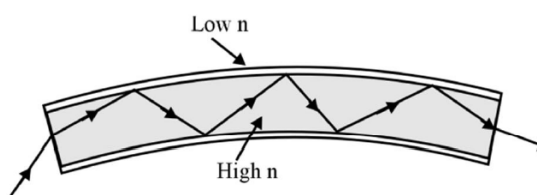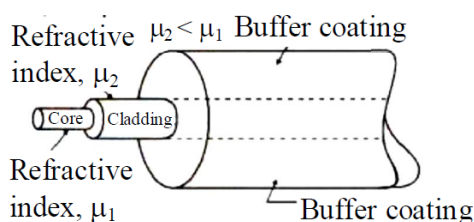
(i)   Which of the following statement is not true.

(1) Optical fibres is based on the principle of total internal reflection.

(2)   The refractive index of the material of the core is less than that of the cladding.

(3)   an optical fibre can be used to act as an optical pipe.

(4)   there is no appreciable loss in the intensity of the light signal while propagating through an optical fibre

(ii)   What is the condition for total internal reflection to occur ?

(1) angle of incidence must be equal to the critical angle.

(2) angle of incidence must be less than the critical angle.

(3) angle of incidence must be greater than the critical angle.

(4) None of the above.

(iii)   Which of the following is not an application of total internal reflection ?

(1) Mirage

(2) Sparkling of diamond

(3) Splitting of white light through a prism.

(4) Totally reflecting prism.

(iv)   Optical fibers are used extensively to transmit :-

(1) Optical Signal   (2) current

(3) Sound waves   (4) None of the above

(v)   Internet is reaching to you through optical fibre, and you become able to see different channels on TV set, in this process from relay station to you the sequence of energy transformations involved are :

(1) electric > optical > electric   (2) optical > electric > electric

(3) optical > electric > electric   (4) optical > electric > optical