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| **PB-T2/PHQP/1221/B 14-APR-2022** | | | | | | |
| **PREBOARD EXAMINATION 3 – TERM II (2021-22)** | | | | | | |
| **Subject: PHYSICS**  **Grade: XII** | | Max. Marks: 35Time: 2 Hrs | | | | |
| **Name:** | | | **Section:** | | **Roll No:** | |
| **General Instructions**:   1. There are 12 questions in all. All questions are compulsory. 2. This question paper has three sections: Section A, Section B and Section C. 3. 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. 4. 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. 5. You may use log tables, if necessary, but use of calculator is not allowed. | | | | | | |
|  | **SECTION A** | | | | | |
| 1 | Distinguish between pure semiconductor and n-type semiconductor on the basis of their energy band diagram. | | | | | 2 |
| 2 | A proton and an alpha particle are accelerated from rest through the same potential difference V. Which one of the two has (i) greater value of de Broglie wavelength associated with it and (ii) less kinetic energy? Justify ? | | | | | 2 |
|  | **OR** | | | | |  |
|  | State Bohr’s quantization condition of angular momentum. Calculate the shortest wavelength of the Bracket series and state to which part of the electromagnetic spectrum it belongs. | | | | |  |
| 3 | Name the device which converts the incident light into electric current .Plot I-V characteristics of this device. State any two applications of this device | | | | | 2 |
|  | **SECTION B** | | | | |  |
| 4 | Using Bohr's postulates of the atomic model, derive the expression for radius of nth electron orbit. Hence, obtain the expression for Bohr's radius. | | | | | 3 |
| 5 | An a.c. signal is fed into two circuits X and Y and the corresponding output in the two cases have the waveforms as shown.   1. Name the circuits X and Y. 2. Briefly explain the working of circuit Y with the help of circuit diagram. 3. Compare input and output frequencies of y. | | | | | 3 |
| 6 | When four hydrogen nuclei combine to form a helium nucleus, estimate the amount of energy in MeV released in this process of fusion (Neglect the masses of electrons and neutrinos) [Given: Mass of -1H1 = 1.007825 u , Mass of He nucleus = 4.002603 u, 1u = 931Mev/c 2 | | | | | 3 |
| 7 | 1. Two monochromatic waves emanating from two coherent sources have the displacements represented by   y1 = a cos ωt and y2 = a cos (ωt +φ)  where φ is the phase difference between the two displacements. Show that the resultant amplitude at a point due to their superposition is given by A2 = 4a2 cos2(φ /2).   1. Hence obtain the conditions for constructive and destructive interference. | | | | | 3 |
| 8 | 1. A ray of light incident on face AB of an equilateral glass prism, shows minimum deviation of 30°. Calculate the speed of light through the prism. 2. Find the critical angle if the emergent ray grazes along the face AC. | | |  | | 3 |
|  | **OR** | | | | |  |
|  | * 1. (a) Draw a ray diagram to show refraction through a prism in minimum deviation condition. Use it to prove that , where symbols have their usual meaning.   2. (b) An equilateral glass prism has a refractive index 1.6 in air. Calculate the angle of minimum deviation of the prism, when kept in a medium of refractive index of 4√2/5. | | | | |  |
| 9 | 1. Light of wavelength 2000 Å falls on a metal surface of work function 4.2 eV. What is the kinetic energy (in eV) of the fastest electrons emitted from the surface? 2. What will be the change in the energy of the emitted electrons if the intensity of light with same wavelength is doubled? 3. If the same light falls on another surface of work function 6.5 eV, what will be the energy of emitted electrons? | | | | | 3 |
| 10 | The focal length of a convex lens made of glass of refractive index(1.5) is 20cm.  What will be its new focal length when placed in a medium of refractive index 1.25?  Is focal length positive or negative ?What does it signify? | | | | | 3 |
| 11 | In the diffraction due to a single slit experiment, the aperture of the slit is 3 mm. If monochromatic light of wavelength 620 nm is incident normally on the slit, calculate the separation between the first order minima and the 3rd order maxima on one side of the screen. The distance between the slit and the screen is 1.5 m | | | | | 3 |
|  | **OR** | | | | |  |
|  | 1. Identify the electromagnetic waves whose wavelengths vary as   (a) 10–11 m < l < 10–14 m  (b) 10–4 m < l < 10–6 m   1. Which of the following electromagnetic waves has (a) minimum wavelength, and (b) minimum frequency?   Infrared waves, Microwaves, g-rays and X-rays   1. The oscillating magnetic field in a plane electromagnetic wave is given by   **By = 8 × 10 –6 sin (2 × 10 11 t + 300πx) T.**  Write the expression for oscillating electric field | | | | |  |
|  | **SECTION C** | | | | |  |
| 12 | **CASE STUDY: ASTRONOMICAL TELESCOPE**  It is used to observe distinct images of heavenly bodies. It consists of 2 lenses, the objective lens O and the eyepiece E. In the normal adjustment of the telescope, the final image is formed at infinity. Magnifying power of an astronomical telescope is defined as the ratio of the angle subtended at the eye by the final image of the angle subtended at the eye, by the object directly. | | | | | 5 |
| 1. | In astronomical telescope ,compare to eye piece, objective lens has   1. A) negative focal length 2. B) zero focal length 3. C) small focal length 4. D) large focal length | | | | |  |
| 2. | If fo is the focal length of the objective and fe is the focal length of the eyepiece, then magnification of a refracting (M) telescope can be determined as   1. A) M = fo/fe 2. B) M = fo + fe 3. C) M = fo - fe 4. D) M = fe/fo | | | | |  |
| 3. | The length (L) of the astronomical telescope, for normal adjustment is  A) fo + fe  B) uo + ve  C) fo – fe  D) fo/fe | | | | |  |
| 4. | The magnitude of magnifying power of an astronomical telescope is 5, the focal power of its eyepiece is 10 diopters. The focal power of its objective (in diopters) is A) 1  B) 2  C) 3  D) 4 | | | | |  |
| 5. | The magnifying power of an astronomical telescope for normal adjustment is 10 and the length of the telescope is 110 cm. The magnifying power of the telescope when the image is formed at the least distance of distinct vision for normal eye is A). 12 B). 14 C). 16 D). 18 | | | | |  |
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