**SINDHI HIGH SCHOOL, HEBBAL**

**UNIT TEST III-2024-25**

**PHYSICS (042)**

**Grade: XII Max. Marks: 25**

**Date:20/11/2024 Reading time: 8.10am-8.20am**

**No of sides:3 Writing time: 8.20am-9.20am**

**General Instructions:**  
(1) There are 14 questions in all. All questions are compulsory.  
(2) This question paper has five sections: Section A, Section B, Section C, Section D and  
 Section E.  
(3) All the sections are compulsory.  
(4) Section A contains nine questions, seven MCQ and two Assertion Reasoning based of 1

mark each, Section B contains two questions of two marks each, Section C contains one

question of three marks, Section D contains one case study based question of four marks

and Section E contains one long answer questions of five marks.

(5) Use of calculators is not allowed.

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| **SECTION A** | | |
| 1. | In a Young's double slit experiment, the path difference at a certain point on the screen between two interfering waves is th of the wavelength. The ratio of intensity at this point to that at the centre of a bright fringe is close to  (a) 0.80 (b) 0.74 (c) 0.94 (d) 0.85 | **1** |
| 2. | In case of reflection of a wavefront from a reflecting surface,  I. points A and E are in phase difference of 90°.  II. points A and C are in phase difference of 0°.  III. points A and B are in phase difference of 0°.  IV. points C and E are in phase difference of 0°.  Which of the following is correct?  (a) Both I and II (b) Both II and III  (c) Both III and IV (d) Both I and IV | **1** |
| 3. | Photons of energy 3.2 eV are incident on a photosensitive surface. If the stopping potential for the emitted electrons is 1.5 V, the work function for the surface is  (a) 1.5 eV (b) 1.7 eV (c) 3.2 eV (d) 4.7 eV | **1** |
| 4. | Figure shows a plot of stopping potential Vo versus where is the wavelength of the radiation causing photoelectric emission from a surface. The slope of the line is equal to  a) 0 b) h/e c) hc/e d) h2c/e2 | **1** |
| 5. | If photons of frequency are incident on the surfaces of metals A and B of threshold frequencies and respectively, the ratio of the maximum kinetic energy of electrons emitted from A to that of B is  a) 2:3 b) 3:4 c) 1:3 d) : | **1** |
| 6. | The graph between 1/u and 1/v for a thin convex lens in order to determine its focal length is plotted as shown in the figure. The refractive index of the lens is 1.5 and both its the surfaces have the same radius of curvature R. The value of R will be  a) 5cm b) 10cm c) 15cm d) 20cm | **1** |
| 7. | A point source of light is placed 4m below the surface of water of refractive index 5/3. The minimum diameter of a disc, which should be placed over the source, on the surface of water to cut off all the light coming out of water is  a) infinite b) 6m c) 4m d) 3m | **1** |
| **For Questions 8 and 9, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.**  **a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.**  **b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.**  **c) If Assertion is true but Reason is false.**  **d) If both Assertion and Reason are false**  **e) If Assertion is false but Reason is true** | | |
| 8. | **Assertion (A):** In YDSE, the ratio of is infinite  **Reason** **(R**)**:** If width of any one of the slits is slightly increased, then this ratio will decrease | **1** |
| 9. | **Assertion (A):** If distance of the point source is increased from the photoelectric plate, then stopping potential remains unchanged  **Reason** **(R**)**:** Saturation current will decrease | **1** |
| **SECTION B** | | |
| 10. | A ray PQ is incident normally on the face AB of a triangular prism of refracting angle of 60° made of a transparent material of refractive index 2/√3 as shown in the figure. Trace the path of the ray as it passes through the prism. Also, calculate the angle of emergence and angle of deviation. | **2** |
| 11. | Photoelectric emission occurs when a surface is irradiated with the radiation of frequency (i) 1 and (ii) *2*. The maximum kinetic energy of the electrons emitted in the two cases are K and 2K respectively. Obtain the expression for the threshold frequency for the surface. | **2** |
| **SECTION C** | |  |
| 12. | (i) Draw a labelled ray diagram showing the formation of a final image by a compound  microscope at least distance of distinct vision.  (ii) The total magnification produced by a compound microscope is 20. The  magnification produced by the eyepiece is 5. The microscope is focused on a  certain object. The distance between the objective and eyepiece is observed to be  14 cm. If least distance of distinct vision is 20 cm. Calculate the focal length of the  objective and the eyepiece. | **3** |
| **SECTION D** | | |
| 13. | **Case Study**: Superposition of waves  The principle of superposition of waves tells us that when two or more waves overlap in space, the net resulting disturbance is equal to the algebraic addition of the individual disturbances of the respective waves.   * When two or more waves move through a similar medium, they are likely to interact. * They maintain their waveform after combining, although the resulting wave is generally distinct from both of the constituent waves. * The superposition concept aids in describing the resulting wave when two or more waves mix.   The diagram depicts two waves that cause displacement in the particles of the specified medium. The principle of superposition asserts that in this circumstance.Interference is the superposition of waves from two distinct sources, producing different wavefronts. Diffraction is the bending and spreading of waves around obstacles or through apertures, caused by secondary wavelets from different parts of the same wave  i) Consider the following waves:  (i) y1= asinωt (ii) y2= asin2ωt (iii) y3= asin(2ωt+φ) (iv) y4= asin(4ωt+)  Which pair of the waves coming from S1 and S2 will produce interference  a) (i) and (ii) b) (ii) and (iii) c) (iii) and (iv) d) (iv) and (i)  ii) Two waves of the same intensity I0 each, have a path difference λ/4, emanating from two coherent sources, meet at a point. The resultant intensity at that point will be  a) zero b) I0  c)2 I0  d) 4 I0  Page 2 of 3  iii) Angular width of central maximum in the Fraunhoffer’s diffraction pattern is measured. Slit is illuminated by the light of wavelength 6000Å. If slit is illuminated by light of another wavelength, angular width decreases by 30%. Wavelength of light used is  a) 3500 Å b) 4200Å c) 4700 Å d) 6000 Å  iv) In a single slit diffraction pattern, the distance between the first minimum on the left and the first minimum on the right is 5mm. The screen on which the diffraction pattern is displayed is at a distance of 80cm from the slit. The wavelength is 6000 Å. The slit width in mm is about  a) 0.0192 b)192 c)0.192 d)0.00192 | **1X4=4** |
| **SECTION E** | | |
| 14. | (i) Derive the mathematical relation between refractive indices μ1 and μ2 of two radii  and radius of curvature R for refraction at a convex spherical surface. Consider the  object to be a point source lying on the principal axis in rarer medium of refractive  index μ1 and a real image formed in the denser medium of refractive index μ2 .  Hence, derive lens maker's formula.  (ii) Light from a point source in air falls on a convex spherical glass surface of  refractive index 1.5 and radius of curvature 20 cm. The distance of light source  from the glass surface is 100 cm. At what position is the image formed? | **5** |

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