ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

SOLUTION TO WORK SHEET: 46.

Subject : PHYSICS

Date : 18.01. 2021

CLASS : XII

Topic: Huygens' principle, constructive & destructive interference, maximum & minimum intensity.

Chapter-Huygens' principle and interference

Multiple choice questions : **1 X 15 = 15**

1. In Young's double slit experiment distance between sources is 1 mm and distance between the screen and the source is 1m. If the fringe width on the screen be 0.06 cm, then λ is

   (a) 6000Å (b) 4000Å (c) 1200Å (d) 2400Å

   Ans. (a) 6000Å

2. In Young's double slit experiment, using sodium light (λ= 5898 Å), 92 fringes are seen. If given colour (λ = 5461 Å) is used, how many fringes will be seen λ

   (a) 62 (b) 67 (c) 85 (d) 99

   Ans. (d) 99

3. In Young's double slit experiment, the central maxima is observed to be of intensity I_0. If one of the slits be covered, then the intensity at the central maxima will become

   (a) $I_0/2$ (b) $I_0/\sqrt{2}$ (c) $1_0/4$ (d) I_0

   Ans. (c) $I_0/4$

4. A Young's double slit experiment uses a monochromatic source. The shape of the interference fringes formed on the screen is

   (a) parabola (b) straight line (c) circle (d) hyperbola

   Ans. (b) straight line

5. The displacements of interfering light waves are $y_1 = 4 \sin \omega t$ and $y_2 = 3 \sin (\omega t + \frac{\pi}{2})$, What is the amplitude of the resultant wave λ

   (a) 5 (b) 7 (c) 1 (d) zero

   Ans. (a) 5

6. In Young's double slit experiment, the intensity on screen at a point with path difference λ is K. What will be intensity at the point where path difference is $\frac{\lambda}{4}$ λ

   (a) $\frac{K}{4}$ (b) $\frac{K}{2}$ (c) K (d) zero

   Ans. (b) $\frac{K}{2}$

7. In Young's double slit experiment, intensity at a point is $\frac{1}{4}$ th of the maximum intensity. Angular position of this point is

   (a) $\sin^{-1}[\frac{\lambda}{d}]$ (b) $\sin^{-1}[\frac{\lambda}{2d}]$ (c) $\sin^{-1}[\frac{\lambda}{3d}]$ (d) $\sin^{-1}[\frac{\lambda}{4d}]$

   Ans. (c) $\sin^{-1}[\frac{\lambda}{3d}]$

8. In the ideal double slit experiment, when a glass plate of refractive index 1.5 and thickness *t* is introduced in the path of one the interfering beam of wavelength λ. the intensity at the position of central maximum remains unchanged. Minimum thickness of glass plate is

(a) 2λ (b) $\frac{2}{3}\lambda$ (c) $\frac{\lambda}{3}$ (d) λ

Ans. (a) 2λ

9. In two separate set ups of the Young's double slit experiment, fringes of equal widths are observed when lights of wavelengths in the ratio 1: 2 are used. If the ratio of the slit separation in two cases is 2 : 1. the ratio of distances, between the plane of slits and the screen, in the two set ups is

(a) 1 : 1 (b) 4 : 1 (c) 1 : 4 (d) 2 : 1

Ans. (b) 4 : 1

10. In the Young's double slit experiment, a mica sheet of thickness *t* and refractive index μ introduced in the ray from first source S_1. By how much distance fringe pattern will be displaced λ

(a) $\frac{d}{D}$ (μ - 1) *t* (b) $\frac{D}{d}$ (μ - 1) *t* (c) $\frac{d}{(\mu - 1) D}$ (d) $\frac{D}{d}$ (μ - 1)

Ans. (b) $\frac{D}{d}$ (μ - 1) *t*

11. Two waves of intensities I and 41 superimpose, then maximum and minimum intensities are

(a) 5I and 3I (b) 9I and I (c) 9I and 3I (d) 5I and I

Ans. (b) 9I and I

12. In an experiment to demonstrate interference of light using Young's double slit, separation of two narrow slits is doubled in order to maintain same spacing of fringes. The distance 'D' of screen from slits must now be altered to about

(a) 2*D* (b) *D* (c) $D/\sqrt{2}$ (d) *D* / 2

Ans. (a) 2*D*

13. A thin mica sheet of thickness 2 x 10^{-6}m and refractive index (μ = 1.5) is introduced in the path of one of the waves. The wavelength of the wave used is 5000 Å. The central bright maxima will shift

(a) 2 fringes (b) 0.2 fringes (c) 10 fringes upward (d) none of these

Ans. (a) 2 fringes

14. In Young's experiment the ratio of maximum to minimum intensities of the fringe system is 4 : 1. The amplitudes of the coherent sources are in the ratio

(a) 4:1 (b) 3:1 (c) 2:1 (d) 1:1

Ans. (b) 3:1

15. In Young's double slit experiment, distance between two sources is 0.1 mm. The distance of screen from the sources is 20 cm. Wavelength of light used is 5460Å. Then angular position of first dark fringe is

(a) 0.08 (b) 0.16^{O} (c)0.20° (d) 0.32°

Ans. (b) 0.16^{O}