DPP 04

Fraunhofer & Single slit diffraction

Q.1 A single slit of width 0.20 mm is illuminated with light of wavelength 500 nm. The observing screen is placed 80 cm from the slit. The width (in mm) of the central bright fringe will be?

Q.2 A beam of light of wavelength 600nm from a distant source fall on a single slit 1mm wide and the resulting diffraction pattern is observed on a screen 2m away. The distance (in mm) between the first dark fringes on either side of the central bright fringe is?

Q.3 A single slit is of width 0.5 mm. Distance of screen from slit is 1m. Second maxima in diffraction pattern are at distance 2 mm from centre. What is wavelength of light (in nm)?

Q.4 A slit of width a is illuminated by white light. For red light (λ=6500Å), the first minima is obtained at θ=30°. Then the value of a will be _____ (in microns).

Q.5 What will be the angle of diffraction for the first minimum due to Fraunhofer diffraction with sources of light of wave length 550 nm and slit of width 0.55 mm?

(A) 0.001rad (B) 0.01rad (C) 1 rad (D) 0.1 rad

Q.6 What will be the angular width of central maxima in Fraunhofer diffraction when light of wavelength 6000 Å is used and slit width is 12×10^{-5}cm?

(A) 2 rad (B) 3 rad (C) 1 rad (D) 8 rad

Q.7 Direction of the first secondary maximum in the Fraunhofer diffraction pattern at a single slit is given by (a is the width of the slit)

(A) $a \sin\theta = \frac{\lambda}{2}$ (B) $a \cos\theta = \frac{3\lambda}{2}$ (C) $a \sin\theta = \lambda$ (D) $a \sin\theta = \frac{3\lambda}{2}$

Q.8 Visible light of wavelength 6000×10^{-8} cm falls normally on a single slit and produces a diffraction pattern. It is found that the second diffraction minimum is at 60° from the central maximum. If the first minimum is produced at θ_1, then θ_2 is close to

(A) 45° (B) 30° (C) 25° (D) 20°

Q.9 Light of wavelength 550 nm falls normally on a slit of width 22.0×10^{-5} cm. The angular position of the second minima from the central maximum will be (in radians)

(A) $\frac{\pi}{8}$ (B) $\frac{\pi}{12}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

Q.10 A single slit of width b is illuminated by a coherent monochromatic light of wavelength λ. If the second and fourth minima in the diffraction pattern at a distance 1m from the slit are at 3cm and 6cm respectively from the central maximum, what is the width of the central maximum? (i.e., distance between first minimum on either side of the central maximum)

(A) 6.0cm (B) 1.5cm (C) 4.5cm (D) 3.0cm

Q.11 A single slit of width 0.1mm is illuminated by a parallel beam of light of wavelength 6000 Å and diffraction bands are observed on a screen 0.5 m from the slit. The distance of the third dark band from the central bright band is

(A) 3mm (B) 1.5mm (C) 9mm (D) 4.5mm

Q.12 If I_0 is the intensity of the principal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled?

(A) I_0 (B) $I_0/2$ (C) $2I_0$ (D) $4I_0$

ANSWER KEY

1.	4	**2.**	2.40	**3.**	400	**4.**	1.24	**5.**	(A)	**6.**	(C)	**7.**	(D)
8.	(C)	**9.**	(C)	**10.**	(D)	**11.**	(C)	**12.**	(A)				

Home Work

Ex. 1	Q.
Ex. 2	Q.
Ex.3	Q.
Ex.4	Q. 8, 12
Ex.5	Q. 4,7,8,9