11. A diffraction pattern forms when light passes through a single slit. The wavelength of the light is 675 nm. Determine the angle that locates the first dark fringe when the width of the slit is **(a)** 1.8 x 10^{-4} m and **(b)** 1.8 x 10^{-6} m.

For diffraction from a single slit, dark fringes are found from the relationship

$$W\sin(\theta) = m\lambda$$

Solving for θ

$$\theta = \sin^{-1}\left(\frac{m\lambda}{W}\right) = \sin^{-1}\left(\frac{\lambda}{W}\right)$$

m is 1 for the first dark fringe.

$$\theta_a = \sin^{-1}\left(\frac{\lambda}{W_a}\right) = \sin^{-1}\left(\frac{675\ x\ 10^{-9}m}{1.8\ x\ 10^{-4}m}\right) = \sin^{-1}(3.75\ x\ 10^{-3}) = 0.215°$$

$$\theta_b = \sin^{-1}\left(\frac{\lambda}{W_b}\right) = \sin^{-1}\left(\frac{675\ x\ 10^{-9}m}{1.8\ x\ 10^{-6}m}\right) = \sin^{-1}(3.75\ x\ 10^{-1}) = 22.02°$$

$$\theta_a = 0.21°$$
$$\theta_b = 22°$$

Dr. Donovan's Classes Page	Dr. Donovan's PH 202 Homework Page
NMU Physics Department Web Page	NMU Main Page

Please send any comments or questions about this page to ddonovan@nmu.edu

This page last updated on January 7, 2021