Name: KEY

Date:

Section C D F

The Masters School
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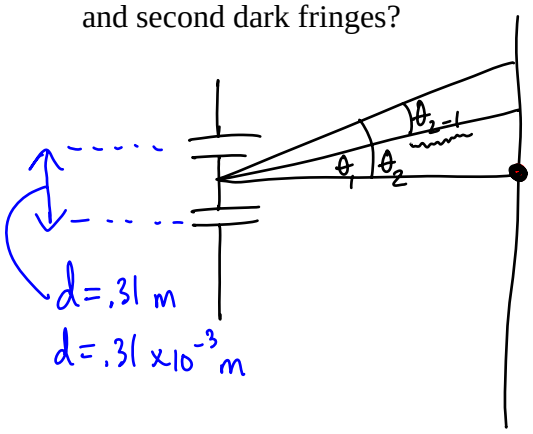
Physics

# Diffraction II

1. Light of wavelength 440 nm falls on two slits spaced 0.31 mm apart. What is the angle between the first and second dark fringes?




$\theta_2$: $d\sin\theta_2 = m\lambda$

$(.31\times10^{-3}\text{m})\sin\theta_2 = 2(440\times10^{-9}\text{m})$

$\sin\theta_2 = .00284°$

$\theta_2 = .1626°$

$\theta_1$: $d\sin\theta_1 = m\lambda$

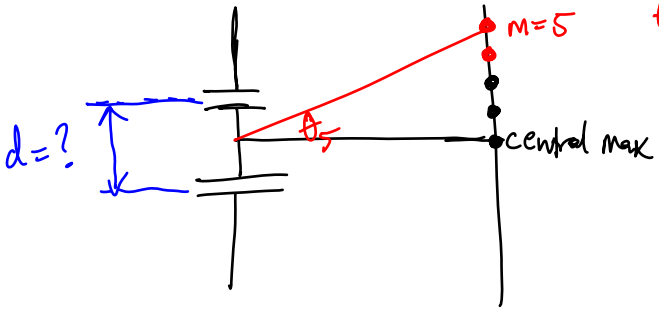
$(.31\times10^{-3})\sin\theta_1 = (1)(440\times10^{-9})$

$\sin\theta_1 = .00142$

$\theta_1 = .0813°$

$\theta_2 - \theta_1 = .0813°$

2. A double-slit interference experiment is performed using blue light from a hydrogen discharge tube ($\lambda$ = 460 nm). The fifth-order bright fringe in the interference pattern is 0.594° from the central maximum. How far apart are the two slits separated?




$\theta_5 = .594°$

$d\sin\theta = m\lambda$

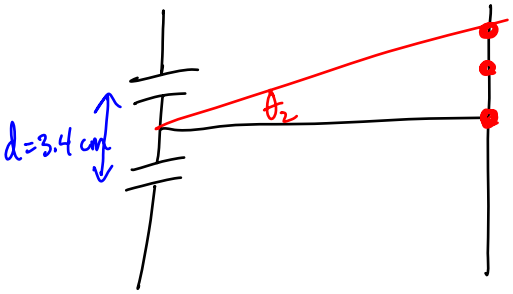
$d = \dfrac{m\lambda}{\sin\theta_5}$

$d = \dfrac{5(460\times10^{-9})}{(\sin .594)}$

$d = 2.22\times10^{-4}$ m

$d = .222$ mm

3. All but two gaps within a set of venetian blinds have been blocked off to create a double-slit system. These gaps are separated by a distance of 3.4 cm. Infrared radiation with a wavelength of 158 μm is then passed through the two gaps in the blinds. What is the angle between the central and the second-order maxima in the interference pattern?




$d\sin\theta = m\lambda$

$\sin\theta = \dfrac{m\lambda}{d}$

$\sin\theta = \dfrac{2(158\times10^{-6})}{(3.4\times10^{-2})}$

$\sin\theta = .00929$

$\theta_2 = .5325°$