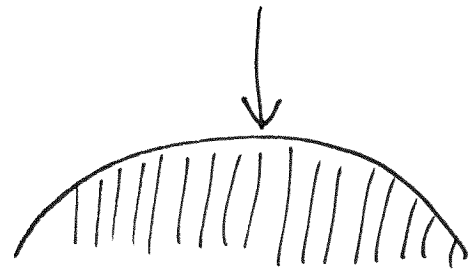


Ch. 4 Prob. 49

$$d = 8 \mu\text{m}$$



Assume the opal acts like a diffraction grating, look for the first maximum for each of the colors.

a) Find the angle that <sup>red</sup> light has a first maximum.

from page 25

$$\lambda_R = 660 \text{ nm}$$

$$d \sin \theta = m \lambda = \lambda$$

$$\theta = \sin^{-1} \left( \frac{\lambda}{d} \right) = \sin^{-1} \left( \frac{660 \times 10^{-9} \text{ m}}{8.0 \times 10^{-6} \text{ m}} \right)$$

$$\theta_R = 4.73^\circ$$

b) Find the angle that blue light has a first maximum

from page 25

$$\lambda_B = 470 \text{ nm}$$

$$\theta = \sin^{-1} \left( \frac{\lambda}{d} \right) = \sin^{-1} \left( \frac{470 \times 10^{-9} \text{ m}}{8.0 \times 10^{-6} \text{ m}} \right)$$

$$\theta_B = 3.37^\circ$$