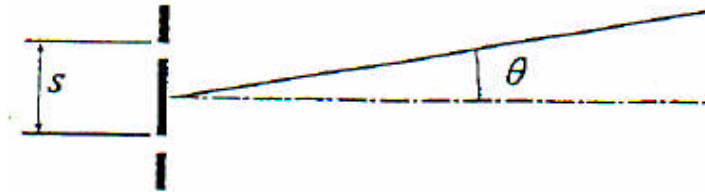


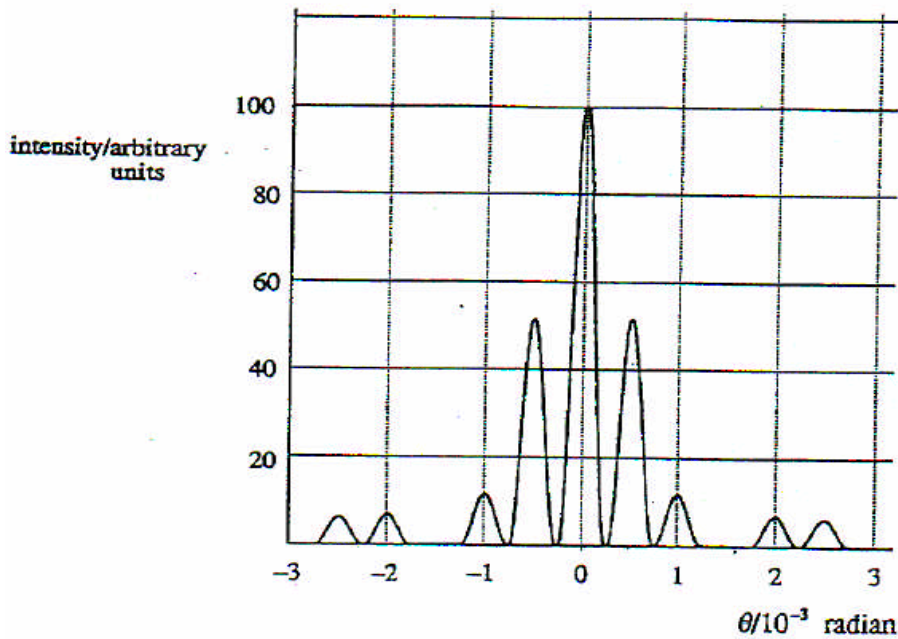
Chapter 6
Short Answer question

This question is about the diffraction and superposition of light.

A parallel beam of yellow light of wavelength 600 nm falls normally on two parallel slits, a distance s apart.



The graph above shows the way in which the intensity on a distant screen varies with the angle, θ .



- (a) Use measurements from the graph to show that the separation of the slits is 1.2mm.

Using Young's two slit formula,

$$n\lambda = d \sin \theta \quad \sin \theta \cong \theta \text{ rad small angle}$$

$$\therefore d = \frac{n\lambda}{\sin \theta}$$

$$\therefore d = \frac{1 \times 600 \times 10^{-9}}{0.5 \times 10^{-3}}$$

$$\therefore d = 1.2 \times 10^{-3} \text{ m}$$

(b) Why is there a maximum missing at $q = 1.5 \times 10^{-3}$ radian?

At 1.5×10^{-3} rad is the first minimum for the single slit diffraction envelope.

(c) Calculate the width of each slit.

$$\text{Single slit width} = \frac{1 \times ?}{\sin ?} \text{ for first minimum}$$

$$= \frac{1 \times 600 \times 10^{-9}}{1.5 \times 10^{-3}}$$

$$= 4 \times 10^{-4} \text{ m}$$

(d) One of the slits is covered up. On the axes below draw, as accurately as you can, the graph of the resulting intensity against q . (Use the same intensity scale as on the previous graph.)

