Answer on Question 52231, Physics, Optics
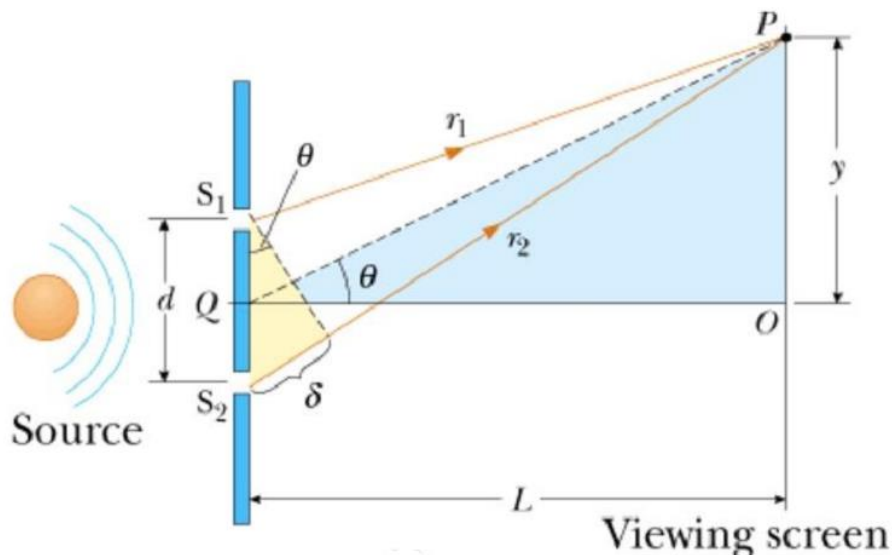
Question:

Light of wavelength $620\ nm$ falls on a double slit, and the first bright fringe of   the interference pattern is seen at an angle of 15 degrees from the central maximum. Find the separation between the slits.

Solution:

Let's write the diffraction grating equation:

$$dsin\theta = m\lambda,$$

where, $dsin\theta = r_2 - r_1$ is the path difference of rays, that come from the slits.

If this path difference is exactly one wavelength λ or an integer number of wavelengths, then the two waves arrive at the screen in phase and there is a constructive interference, resulting in a bright area on the screen. For the first bright fringe, $m = 1$, and we obtain:

$$d = \frac{\lambda}{sin\theta} = \frac{620 \cdot 10^{-9}m}{sin15^\circ} = 2.4 \cdot 10^{-6}m = 2.4\mu m.$$

Answer:

$d = 2.4\mu m.$