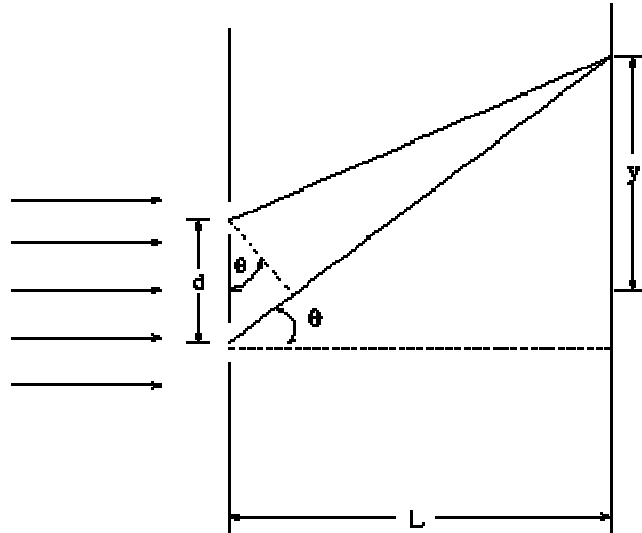


Young's Double Slit Experiment

This is a classic example of interference effects in light waves. Two light rays pass through two slits, separated by a distance d and strike a screen a distance, L , from the slits, as in Fig. 1.

Figure 1: Double slit diffraction



If $d \ll L$ then the difference in path length is $d \sin \theta$

If the rays were in phase when they passed through the slits, then the condition for constructive interference at the screen is: $d \sin \theta = m \lambda$, $m = \pm 1, \pm 2, \dots$ whereas the condition for destructive interference at the screen is: $d \sin \theta = (m + 1/2) \lambda$, $m = \pm 1, \pm 2, \dots$

The points of constructive interference will appear as bright bands on the screen and the points of destructive interference will appear as dark bands. These dark and bright spots are called *interference fringes*.

- In the case that y , the distance from the interference fringe to the point of the screen opposite the center of the slits (see Fig.1) is much less than L ($y \ll L$), one can use the approximate formula:

$$\sin \theta \approx y/L$$

- If $d \ll L$ then the spacing between the interference can be large even when the wavelength of the light is very small (as in the case of visible light). This gives a method for (indirectly) measuring the wavelength of light.
- The above formulas assume that the slit width is very small compared to the wavelength of light, so that the slits behave essentially like point sources of light.

Name _____

Data:

Slit distance $d =$ _____

Bright spot number $m =$ _____

Bright spot distance $y =$ _____

Slit to wall distance $L =$ _____

Calculations. (You have two formulas for $\sin \theta$.)

Find the wavelength of light from the laser. _____

Calculate d for Slit ____.