**Single and Double Slit Worksheet** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Show your work**.

1. A single slit of width 0.20 mm is illuminated by light of 400 nm wavelength. The diffracted light falls on a screen. In the pattern formed on the screen, the second minimum of the diffracted light is a distance of 2.5 mm from the central maximum. What is the distance between the slit and the screen?
2. Calculate the wavelength of light that produces its first minimum at an angle of 36.9∘ when falling on a single slit of width 1.00 μm.
3. At what angle is the first minimum for 550-nm light falling on a single slit of width 1.00 μm?
4. A microwave of an unknown wavelength is incident on a single slit of width 6.0 cm. The angular width of the central peak is found to be 25∘. Find the wavelength.
5. Find the wavelength of light that has its third minimum at an angle of 48.6∘ when it falls on a single slit of width 3.00 μm.
6. What part does diffraction play in Young's double slit experiment?

The diagram below shows the intensity curve for a double slit interference pattern. The dotted line shows the diffraction effects that result from the diffraction that occurs at each of the two slits



Describe and/or sketch how the pattern would change if the slits were:

(a) closer together without any change in their size.

(b) kept the same distance apart but made thinner.

1. The five diagrams below represent the double slit interference patterns (we could also call them diffraction patterns) obtained using the same source of monochromatic light. In each case the distance to the screen was the same.



(a) In which case was the distance between the slits the largest?

(b) In which case was the distance between the slits the smallest?

(c) In which case were the slits the thinnest?

(d) In which case is the fourth order interference maximum missing?

1. In a double slit experiment the distance between slits is d = 5.0 mm and the distance to the screen is D = 1.0 m. There are two interference patterns on the screen: one due to light with λ1 = 480 nm and another due light with λ2 = 600 nm. What is the separation between third order (m=3) bright fringes of the two patterns?
2. In a Young’s double slit experiment, sodium light of wavelength 0.59 x 10-6 m was used to illuminate a double slit with separation 0.36mm. If the fringes are observed at a distance of 30.0 cm from the double slits, calculate the fringe separation.
3. In an experiment using Young’s slits, six fringes were found to occupy 3.0mm when viewed at a distance 36 cm from the double slits. If the wavelength of the light used is 0.59 μm, calculate the separation of the double slits. (None fringe means one fringe separation.)
4. When red monochromatic light of wavelength 0.70 μm is used in a Young’s double slit experiment, fringes with separation 0.60 mm are observed. The slit separation is 0.40 mm. Find the fringe spacing if (independently):
   1. yellow light of wavelength 0.60 μm is used;
   2. the slit separation becomes 0.30 mm;
   3. the slit separation is 0.30 mm and the slits-fringe distance is doubled.