Simulation Worksheet: Interference and Diffraction

Name: _____ Date: _____

1. Different colors are associated with different wavelengths, which is why the patterns change when you change to a light source of a different color. Rank the colors red, green, and blue in terms of their wavelengths, from largest to smallest.

2. With the single-slit pattern, what happens to the pattern when the width of the slit is increased? What happens to the pattern when the wavelength of the waves incident on the slit is increased?

Explain how the observations above are consistent with the equation that gives the angles at which destructive interference occurs for a single slit of width *a*,
$a \sin\theta = m\lambda, \quad m = 1, 2, 3...$

3. With the double-source or double-slit patterns, what happens to the pattern when the distance between the sources or slits is increased? What happens to the pattern when the wavelength is increased?

Explain how the observations above are consistent with the equation that gives the angles at which constructive interference occurs for a double slit with a distance *d* separating the slits: $d \sin\theta = m\lambda, \quad m = 0, 1, 2,...$

Worksheet to accompany the Interference and Diffraction simulation

On this page in particular, sketch some diagrams or some graphs that help to illustrate your descriptions.

4. For any of the patterns, what happens to the pattern observed on the screen when the distance to the screen is increased? Why?

5. With the double-slit pattern, what is the effect of changing the slit width? What is the effect of changing the slit separation?

6. With the double-slit pattern, do you observe any missing orders? If the ratio of d/a (slit separation to slit width) is 4, for instance, do you observe missing orders for all bright lines corresponding to $m = 4, 8, 12$, etc.? If so, why?