Name: _____

Class: _____

Due Date: _____

Physics Topic 32 – Diffraction and Two Slit Diffraction

Answer the following questions. The solutions to this worksheet can be found on the YouTube channel Go Physics Go.

1. C: Define *diffraction*. Give two examples.

2. C: What is the relationship between the slit width and wavelength of the wave which gives maximum diffraction?

3. C: What is the relationship between the slit width and wavelength of the wave which gives minimum diffraction?

4. C: Light passes through a slit which is equal to the lights wavelength. What happens to the intensity of the central maximum as the slit width decreases?

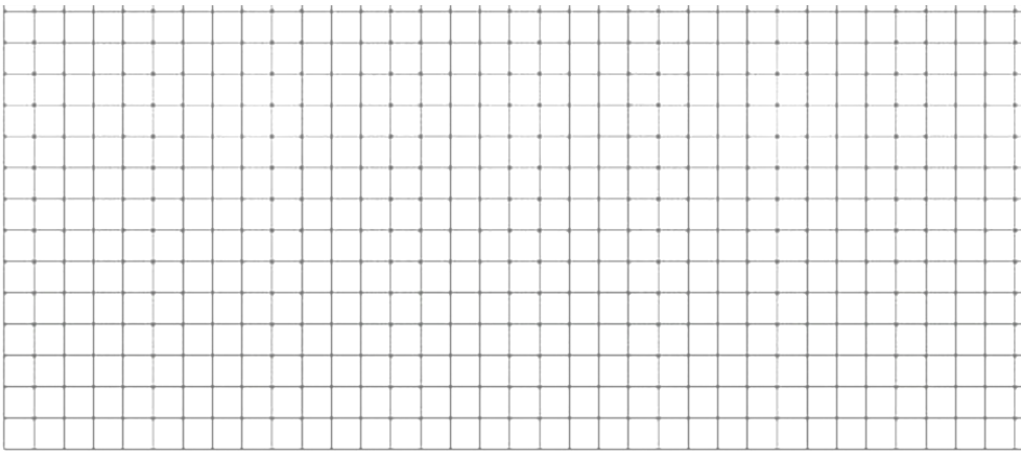
5. C: The equation for double slit wave interference is $s = \frac{\lambda D}{d}$. Define the following variables and draw a neat and detailed *intensity vs. displacement* graph for double slit interference:

   a. s:

   b. λ:

   c. D:

   d. d:



6. C: Play with the following simulations. Draw and record what you learn.

   a. https://sciencesims.com/sims/double-slit/
      - What happens to the distance between the nodes (regions of destructive interference) when the wavelength increases? Does this agree with the equation?
      - What happens to the distance between the nodes (regions of destructive interference) when the distance between the slits increases? Does this agree with the equation?
      - What happens to the distance between the nodes (regions of destructive interference) when the slit width increases? Does this agree with the equation?
      - Click on the "include diffraction" option. Vary the wavelength, distance between slits, and slit width. What do you observe about the antinodes (regions of constructive interference) and distance between the antinodes?

b. https://www.physicsclassroom.com/Physics-Interactives/Light-and-Color/Youngs-Experiment/Youngs-Experiment-InteractiveV1
   - Click on the laser pointer. What happens to the diffraction pattern as the color of the laser light (wavelength) varies? Does this agree with the equation?
   - Click on the slits. What happens to the diffraction pattern as the distance between the slits increase? Does this agree with the equation?
   - Drag the screen to the very left. What happens to the diffraction pattern as the distance between the slits and screen increases? Does this agree with the equation?

7. E: You are looking at a sodium discharge tube with $\lambda = 5{,}890$ Angstroms through a double slit which has a distance of 0.170 millimeters between the centers of the two slits. The light source is placed 1.20 m from the double slit. What will be the distance between the interference fringes visible on the screen?

8. E: Monochromatic laser light, which has a wavelength of 555 nm, is shone on two slits which are 0.125 mm apart. Calculate the distance the fringes are from each other on a screen which is placed 6.25 m away from the double slit.

9. Two slits are separated by 0.565 mm and the screen is placed 2.25 m from the two slits. The center of the first fringe ($s = 0$) and the center of the sixth fringe ($s = 5$) are separated by 8.75 cm. Calculate the wavelength of the monochromatic light.