

PHET WAVE INTERACTION SIMULATION

Part 1: Diffraction

PhET Wave Interaction Simulation: <https://phet.colorado.edu/en/simulation/wave-interference>

-Click the play button on the simulation.

-Click on the “Diffraction” option

-Hit the red button on the laser to shine it through the hole and hit the screen.

Diffraction is the spreading out of light as it passes through a small opening or around an object, which is why the circle of light on the screen is larger than the hole that it passed through.

1) Use constructive and destructive interference to explain the dark and light circles centered around the central light spot.

2) Adjust the diameter of the hole and write down the relationship between the size of the hole and the amount of diffraction (how big the circle of light on the screen gets).

3) Adjust the wavelength of the light and write down the relationship between the wavelength and the amount of diffraction.

Hit the red button on the laser to turn it off and hit the square button to change the aperture (opening) to a square shape.

4a) Write down a prediction of what will happen if you minimize the width and maximize the height.

4b) Minimize the width and maximize the height and write down the result when the laser is turned back on.



5a) Write down a prediction of what will change if you maximize the width and minimize the height.

5b) Maximize the width and minimize the height and write down the result.

6a) Write down a prediction of what will change if you minimize the width and minimize the height.

6b) Minimize the width and minimize the height and write down the result.

7a) Write down a prediction of what will change if you maximize the width and maximize the height.

7b) Minimize the width and minimize the height and write down the result.



Part 2: Double Slit Interference

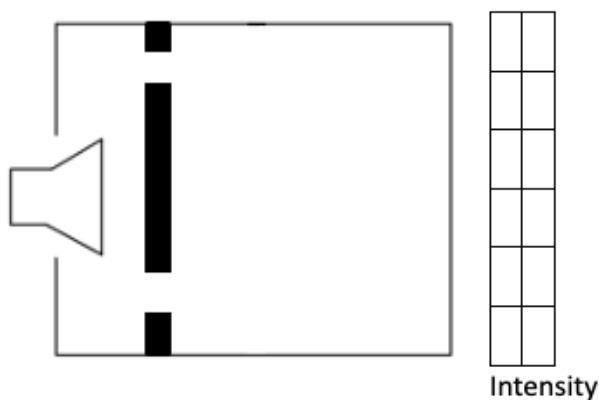
PhET Wave Simulation: <https://phet.colorado.edu/en/simulation/wave-interference>

- Click the play button on the simulation.
- Click on the “Slits” option.
- Click on the light icon in the toolbar on the right.
 - Drag the green arrow at the bottom under the slit all of the way to the right.
 - Drag the slit separation bar all the way to the right (3,200nm).
 - Change the drop-down menu in the tool bar from “One Slit” to “Two Slits.”
 - Click next to the screen in the toolbar so that a checkmark appears.
 - Click next to intensity in the toolbar so that a checkmark appears.
 - Click the green button to turn the light generator on.

1) Wait a few seconds for the light to reach the screen. Adjust the intensity graph so that the peaks do not leave the graph.

a) Draw the pattern on the screen and the intensity graph.

b) Explain why this pattern appears.

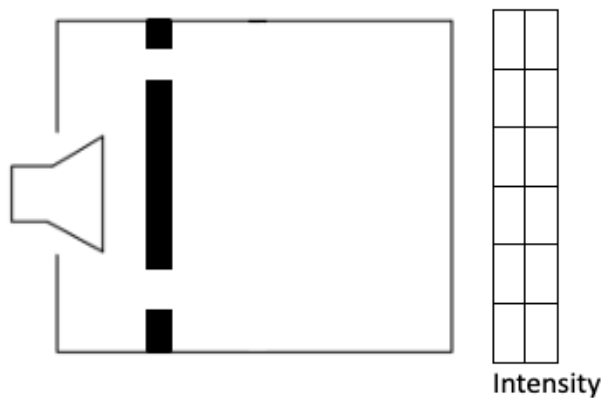


- Drag the green arrow at the bottom under the slit all the way to the right.

2) Wait a few seconds for the light to reach the screen. Adjust the intensity graph so that the peaks do not leave the graph.

a) Draw the pattern on the screen and the intensity graph.

b) This is called an interference pattern. Use constructive and destructive interference to explain why the pattern is different from the pattern in question 1.



3) Change the wavelength of light to determine how it changes the separation of the bright and dark fringes. Use the “Wavelength” slide bar on the left.

4) Change the distance between the slits (see diagram to left) and record how it changes the separation of the bright and dark fringes. Use the “Slit Width” slide bar on the right toolbar. Be aware that if d is too big, the interference pattern will disappear when the waves no longer overlap.

5) Change the distance between the double slit barrier and the screen (L) and record how it changes the separation of the bright and dark fringes. Use the “Barrier Location” slide bar on the right toolbar. Be aware that if L is too small the interference pattern will disappear when the waves no longer overlap.