PHYSICS IN MOTION
gpb.org/physics-motion

Unit 6D

Sound Diffraction and Interference

Sound Diffraction and Interference Lab

Name:

Date:

In this activity, you will conduct a virtual lab to visualize how multiple sources of sound affect one another and how physical barriers diffract sound.

Virtual Labs: PhET Sound and PhET Wave Interference

Part One: PhET Sound

a. Open the simulation, and check that the Listen to a Single Source tab is chosen.

b. Click Audio Enabled on the right side of the window so that you can hear the sounds.

c. Test the simulation by clicking and dragging to adjust the frequency of the wave.

1. How are the pitch and the frequency of a sound related?

d. Now, keep the frequency constant and adjust the amplitude.

2. What other property of a sound changes as the amplitude changes?

e. Click on the Two Source Interference tab and set the frequency to around 250 Hz.

f. Slowly drag the person's head up and down so that you can hear what they are hearing.

3. As you move the person through the region where the waves overlap, what do you notice about the sound that is being observed?

4. What do you see on the diagram that relates to the regions of silence? What is happening at these locations?

g. Increase the frequency to around 500 Hz.

h. Again, drag the person's head up and down so that you can hear what they are hearing.

5. How is the number of loud and silent regions related to the frequency of the sound?

questions continued on next page

Unit 6D

Sound Diffraction and Interference

Sound Diffraction and Interference Lab

Name:

Date:

Part Two: PhET Wave Interference

a. Open the simulation and click on the Sound tab.

b. Increase the Amplitude so that the maximum and minimum values are clearer.

c. Click on Add Detector to show how the air pressure oscillates as the wave passes.

1. What do you notice about how the air pressure alternates from high to low under the initial conditions?

d. Click on One Slit under barriers.

e. Move the detector around the area that is on the same side of the barrier as the sound source.

2. Does the pressure oscillation difference stay the same? If not, what is causing the change to occur?

f. Now, move the detector to the opposite side of the barrier from the sound source.

3. How is the pressure oscillation difference related to where the detector is located in reference to the barrier?

4. Does the pressure ever reach zero? What does this tell you about how sound behaves with a barrier?

g. Increase the slit width to the near maximum value.

h. Slide the detector slowly down just to the right of the barrier.

questions continued on next page

Unit 6D

Sound Diffraction and Interference

Sound Diffraction and Interference Lab

Name:

Date:

Part Two: PhET Wave Interference

5. What do you notice about the pressure values as you move across the opening? What happens in the high and low pressure regions?

i. Click on Two Slits.

j. Click and drag the detector along the back wall of the window. The areas of high pressure are the maxima, and the areas of low pressure are the minima.

k. Set the Slit Separation to a very short distance.

l. Note the distance from the center of the back wall to the location of the first maximum value.

6. How is the wavelength related to the distance from the center of the back wall to the first maximum value?

m. Increase the frequency of the wave. Notice that the wavelength decreases.

7. With the smaller wavelength, are there more or less areas of constructive and destructive interference?

n. Now, slide the barrier closer to the source of the sound.

8. How does the distance between the maxima change when the distance between the barrier and the back wall increases?

Courtesy of:
PhET Interactive Simulations
University of Colorado Boulder
https://phet.colorado.edu