PHYSICS IN MOTION
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Unit 6D

Sound Diffraction and Interference

Sound Interference and Diffraction Lab

Name:

Date:

In this activity, you will be conducting a virtual lab in order 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 1: PhET Sound

- Open the simulation, and be sure that the Listen to a Single Source tab is chosen.
- Click on Audio Enabled on the right side of the window so that you can hear the sounds.
- As a review, click and drag to adjust the frequency of the wave.

1. How does the pitch of the sound relate to the frequency?

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

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

- Next, click on the Two Source Interference tab and make the frequency around 250 Hz.
- 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 locations of silence? What is happening at these locations?

5. Increase the frequency to around 500 Hz. Again, drag the person's head up and down so that you can hear what they are hearing. How does the frequency of the loud and silent regions change as the frequency of the sound changes?

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Part 2: PhET Wave Interference

- Open the simulation and click on the Sound tab.
- Increase the Amplitude so that the maximum and minimum values are clearer.
- In the upper-righthand corner, click on Add Detector. This will 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?

- Click on One Slit under barriers.
- Move the detector around the area that is on the same side as the sound source.

2. Does the pressure oscillation difference stay the same? If not, what do you think is happening in order for these changes to take place?

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

3. What happens to the pressure oscillation differences based on where the detector is located?

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

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Part 2: PhET Wave Interference

- Increase the slit width to the near maximum value.
- Slide the detector slowly down just to the right of the barrier.

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

Now click on Two Slits. 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. When you set the Slit Separation at a very small distance, make note of the distance from the center of the back wall compare to the location of the first maximum value.

6. How does the distance between the center of the back wall and the first maximum value compare to when the wavelength was greater?

- 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?

- 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
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https://phet.colorado.edu