

# Reflection and Absorption

**Estimated Time:** 60 minutes.

## SUMMARY

Sound waves are like other waves. They bounce off hard surfaces and can be absorbed by other surfaces. In this experiment, students will test how to different surfaces reflect and absorb sound waves.

## WHAT YOU'LL LEARN

1. Students will learn that sound waves can be reflected and absorbed.
2. Students will learn what type of objects reflect sound waves and what type of objects absorb sound waves.

Materials Used	Resources Used
<ul style="list-style-type: none"> <li>• Smartphone with the Decibel X app</li> <li>• Device to play music or other sounds</li> <li>• Pencil and paper</li> <li>• Notebook for journaling</li> <li>• Hard surfaces</li> <li>• Soft surfaces</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=59Rs135rz">https://www.youtube.com/watch?v=59Rs135rz</a></li> </ul>

## WHAT TO DO

1. One of the interesting principles of waves, including sound waves, is their property of reflection and absorption. When a sound wave is created, the wave travels through the air or other medium, until it is reflected or absorbed. When a sound wave is reflected, it bounces off that surface and back to the origins of the sound. When a sound wave is absorbed, the object in the wave's path is able to absorb the energy of the wave and the wave does not bounce back.
2. For this activity, we are going to use the Decibel X app. Download the app from the App Store for iPhones and in the Google Play store for android phones.
3. Once you have the app downloaded, look over the features of the app. Note that the app will immediately start recording once the app is opened. Pause the app as you set up the experiment.
4. We are going to measure the effect of wave reflection and absorption. Using a device other than the phone using Decibel X app, find a song or noise to play. A computer, tablet, or another smartphone will work great for this.
5. Find a corner in your home that you can face. You do not want to have a lot of things in this corner like furniture or bedding.
6. With the corner located, set up your device that is going to play the sound and face the speakers of that device towards the wall. Set up the phone with Decibel X on and recording behind the device playing the noise. Play the sound and record the decibels using the Decibel X app. You will want the volume on the device playing the noise to be relatively loud, but not too loud that it hurts your ears. Make an observation of the decibels about every 15 seconds. Once you have those recorded, find the average, maximum, and minimum values.

7. Now, we are going to see what happens when we add soft objects to that corner. Grab some pillows, blankets, and other soft objects and place them in the corner where you conducted your first experiment.
8. Play the same song or noise you played for the first experiment. Make sure you put both the phone and the device playing the music in the same place as the first experiment and make sure the device playing the music or sound is set on the same volume level as the first experiment.
9. Again, play the sound and record the decibels using the Decibel X app. Make an observation of the decibels about every 15 seconds. Find the average, maximum, and minimum values.
10. Compare the average, maximum, and minimum values from the first experiment when you played the music or noise without soft objects in the corner to those values when you added the soft objects. Do they differ and if they do, how so? What do you think caused the differences?

### **TIPS**

- The hard surface of the wall should cause the sound waves to be reflected back to the origins of the sound and towards the phone recording the decibels. The soft objects should absorb the sound waves, resulting in lower decibels.
- Experiment with the set up. How close do you need to be to the wall to measure the effects of sound wave reflection and absorption? How far away can you sit from the wall and still measure the effect?
- Experiment with different objects. Place objects in the corner that might increase reflection like metal baking sheets and see what happens. Place more objects in the corner that will absorb the sound waves like additional pillows, towels, and blankets. At what point does the addition of more objects no longer affect sound wave absorption?
- The reflection of sound waves is why you hear echoes. It might be helpful to relate the concepts of sound reflection to the student's prior experiences with echoes. What types of environments have students found to be great for producing echoes? What were some of the features of these environments? Now, think about those environments where the student knows you will not get an echo. What are the features of an environment where you cannot get echoes?