



Seeing Sound

Suggested Grades: 6–12

Activity Overview

In this activity, you will use a laser pointer to display the waveform of a sound against a flat surface.

Note: For this activity you will be using a low power laser pointer. It is important that the laser never be pointed in anyone's eye. You will need adult supervision when using the laser pointer.

STEPS

1. Begin by cutting off the top of a balloon as shown in *Figure 1*. If needed, ask an adult to help you make the cut.



Figure 1. Cut the top off.

2. Stretch the balloon over one end of the PVC pipe coupler as shown in *Figure 2*. Having someone help with this makes it much easier.



Figure 2. Stretch the balloon over one end of the PVC pipe coupler.

Time: 30 minutes

Materials:

- 3 inch PVC pipe coupler
- Large balloon
- Scissors
- Duct tape
- Strong glue
- Small mirror square
- Large sheet of white paper (optional)
- Low power laser pointer

3. Use duct tape to secure the balloon in place as shown in *Figure 3*.



4. Glue the small mirror square to the center of the balloon as shown in *Figure 4*.



Figure 4. Glue the mirror to the center of the balloon

Hold the mirror in place so the glue can dry.



5. Once the glue has dried, turn the device on its side with the balloon end facing a light-colored wall or large sheet of white paper taped to the wall as shown in Figure 5.

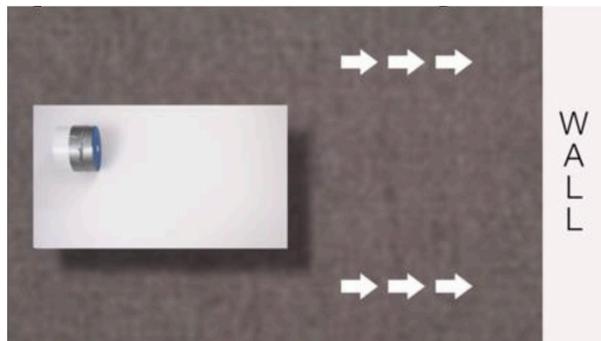


Figure 5. Position the device on its side with the balloon end facing a wall

6. Use the tape to secure the device in place as shown in Figure 6. This should prevent it from moving.



Figure 6. Firmly attach the PVC set-up to a table or other flat surface.

7. This step should only be done with the help of an adult. It is important to make sure the laser is never pointed in anyone's eye.

Position the laser pointer so that it reflects off the mirror onto the light colored wall or large piece of white paper as shown in Figure 7. The laser needs to stay on and motionless. If it has a push button instead of an on/off switch, use a piece of tape to keep the button pushed so the laser stays on.



Figure 7. Align the laser so the light beam reflects off the mirror onto the wall

8. The laser pointer should produce a dot of light on the wall. Make noise into the open end of the PVC pipe coupler by clapping, talking, singing, or playing music. Observe the light on the wall while the sound is being made. You should see the light moving similar to what is shown in Figure 8.

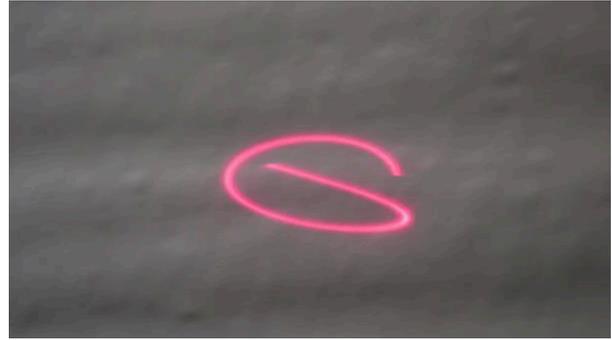


Figure 8. The light should move on the wall in response to the sound

Background Information

What is sound? All sounds are produced by vibrating objects. One of the reasons there are so many different sounds is that there is an endless variety of materials that can vibrate and produce them. If these vibrations are combined together, it can increase the loudness of the noise being created.

X-59 (QueSST) One of NASA's newest experimental aircraft, the X-59 (QueSST) is designed to lower the noise created by planes flying faster than the speed of sound. When planes fly supersonic (faster than the speed of sound), the pressure waves they create combine together and produce a very loud noise called a sonic boom. This noise is so loud that it can damage property and disturb animals.

The unique design of the X-59 is engineered to change the movement of the pressure waves so they don't combine and form the loud sonic boom. Instead, the plane creates a series of sonic thumps which are much quieter than the boom.

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