

Sound Lab

How well can you match sounds?

- Shake each container and listen to the noise it makes.
- Can you hear the different sounds they make?
- Describe each of the sounds you hear on your lab sheet.
- Do two or more of the containers make the same sound?
- Decide which containers are pairs and record the information on your lab sheet.

Sound Lab

What sounds can you make with a shoe box?

- Stretch four or five rubber bands of different thicknesses and lengths around a shoe box with the lid removed.
- Pluck the rubber bands with your finger. What do you see? What do you hear?
- Try different lengths and thicknesses. Look and listen.
- What happened? What can you say about this?
Put the lid on the shoe box and repeat the activity. What happened? What do you think made the difference?

Sound Lab

How do you make sounds with your voice?

- Hold your fingers on the front of your throat.
- Hum and talk. Make high sounds and low sounds. Make soft sounds and loud sounds. What happened? Can you feel a difference?

Sound Lab

How can you make bottled music?

- Pour water to different levels in the bottles.
 - Blow gently across the tops of the bottles until a sound is produced for each one. Arrange the bottles in a row according to the pitch of the sound from low to high.
 - You may want to add or remove water from the bottles to make a musical scale.
 - In front of each bottle place the numbers 1-8, lowest to highest pitch.
 - Try to play a simple tune by blowing across the tops of the bottles. Can you decide what is vibrating to make the sound?
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- Use a pencil to tap the side of each bottle near the top. What happened? Check the numbers from low to high.
 - What is vibrating to make the sound?
 - What can you say about this?

*In steps one through four, blowing across the bottle causes the **air** to vibrate. This is the way pipe organs and musical wind instruments produce sound. **A longer column of air will cause a slower vibration and a lower pitch.***

*When the bottles are **struck** in step 5, it is the glass that vibrates to produce the sound. **Water**, (a liquid), will slow the rate of vibration of the **glass**, (a solid). Therefore, the greater amount of water, the more slowly the glass vibrates, and the lower the pitch.*

Sound Lab

How can a thread help carry your voice?

Materials: Two paper cups, toothpick, cotton thread, about 4 m long

- Use the toothpick or your pencil to punch a small hole in the center of the bottom of each cup.
- Push one end of the thread through the hole of each cup.
- Break the toothpick in half and tie each end of the thread to one piece of toothpick so the thread cannot pull out of the hole in the cup.
- Keep the thread tight and be sure it doesn't touch anything.
- Put the cup to your ear and have your friend talk into his or her cup. Now you talk and have your friend listen. Now whisper.
- What happened? What happens when you touch the thread? Explain why you think this happens. Make a set of telephones at home and demonstrate them to your family.

The telephone works in a very simple way. Sound waves cause the bottom of the first cup to vibrate. These vibrations, in turn, cause the thread to vibrate. The vibrating thread causes the bottom of the other cup and the air inside to vibrate. The sounds you hear are a result of these vibrations; the air in the second cup strikes your eardrums in nearly the same way it struck the bottom of the first cups as your partner spoke into them.

Sound Lab

How well does sound travel through wood?

- Have a partner tap an object on the wooden plank loudly enough for you to hear.
 - Put your ear on the wooden plank and have your partner tap again.
 - What happened?
 - What can you say about this?
 - Send one partner outside the classroom with the door closed. The remaining partner should gently strike a tuning fork against the table and place the end against the door. Switch places and do it again.
 - What did you hear?
 - What can you say about sound traveling through solid objects? Can you think of a reason for this?
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- Gently strike a tuning fork. Bring the tuning fork to your ear. What do you hear?
 - Now strike the tuning fork and place the vibrating end into the water. What do you see?

Sound Lab

How can you make a coat hanger sing?

- Tie the strings to the wide ends of the hanger.
- Hold the ends of the strings and hit the hanger against a solid object such as your desk. Listen to the sound it makes.
- Wrap the ends of the string around each of your index fingers. Put your fingers in your ears and tap the hanger on the solid object again.
- Compare the first sound with the one you just heard.
- What caused the sound? Discuss your ideas with your group.

When struck without the fingers in the ears, the hanger will sound flat and metallic. When the fingers are placed in the ears, the sound will be a loud gong because sound travels better through the relatively solid string than the air.

Sound Lab

How fast does sound travel?

- Take your drum or other object out on the school grounds with your class.
- Move about 100 meters or more away from the other students.
- Strike the object several times so the others can see the movement of your arm and hear the sound.
- Remember, when you see an object move at a distance, you are seeing reflected light travel. When you hear the sound, you are hearing sound vibrations.
- Tell what you observed. What can you say about the speed of light and the speed of sound?

*Light travels very rapidly—over 186,000 miles per second. By comparison, sound is a slow-poke, moving at about 760 miles per hour at sea level. (Speed of sound is affected by temperature and density of the air. The speed of sound is **not** affected by loudness (amplitude) or pitch (frequency). Sound travels at about 330 meters per second in dry air at freezing point. Water vapor in the air speeds it up slightly. In water sound travels about four times as fast as it does in the air, and in steel it travels about 15 times as fast as in air.*

Sound Lab

How can sound be controlled?

Materials: Box, absorbing fabric or foam rubber

- Cut a 2 cm hole in each end of the box. Attach a paper cup with the bottom cut out over the hole to collect the sound.
- Have a friend speak into one side of the box while you are listening at the other end. Next, you speak into the box so your friend can listen.
- Now fill the box with absorbing materials such as foam rubber or fabrics.
- Have a friend speak into one side of the box while you are listening at the other end. Next, you speak into the box so your friend can listen.
- What happened? What changed? What can you say about this?

Sound waves traveling through the air, strike the many holes in the fabric. The sound is reflected in many directions by the distorted surface, and the result is a muffling sound. Sound traveling through the filled box will be mostly absorbed, while it will transfer clearly through the empty box, or even be amplified by it.

Sound Lab

How can you make a goblet sing?

TEACHER DEMONSTRATION

Materials: Four to six good-quality glass goblets; water; vinegar

- Check the goblets carefully to be certain they have no cracked or chipped edges.
- Add different amounts of water to each goblet (no more than half full). Put a few drops of vinegar into the water.
- Firmly hold the goblet by the base with one hand. Moisten the fingers of your other hand with the vinegar water and rotate your fingers lightly around the rim of the goblet. What happened? Can you think why?
- Try the other goblets. Can you describe what is happening?

(Sympathetic vibration) The vibrations of one goblet will travel through the air and cause another glass to vibrate and produce the same tone. In order for this to occur, the condition of each glass must be almost exactly the same. Both should be dry, empty, and at the same temperature. Their physical appearance should be the same. Sympathetic vibration may also be experienced by singing into a piano while holding the sustain pedal down. The vibrations of the voice will cause strings, tuned to the same pitch in the piano, to vibrate.

Moist fingers cause the glass to vibrate and produce a beautiful, clear tone. The combination of water and vinegar seems to produce just enough lubricant and friction to make the demonstration easier.

Sound Lab

Steel Ruler

- Hold one end of a steel ruler firmly against the top of the table. Snap the other end.
- What did you see?
- What did you hear?

Sound Lab

Can you make salt dance?

- Place some salt in a pie tin.
- Place the pie tin on a speaker and play some music containing different amplitudes and frequencies.
- Watch the salt closely.
- What did you see?
- What did you hear?

Sound Lab

Dancing paper clips

- Place some paper clips on a drum.
- Tap on the drum.
- What did you see?
- What did you hear?

Sound Lab

Good, good, good, good vibrations.

- Coat a string with chalk dust. Stretch it out over the hooks on the wooden plank and tie it on.
- Place a sheet of black construction paper under the string, but on top of the board.
- Pluck the string. What do you see?
- What did you hear?