

Tuning Forks and Sound

Purpose

To observe the effect of sound on objects by using sight and touch

Process Skills

Observe, collect data, interpret data, draw conclusions

Background

Sound is a type of energy that allows us to hear. Sound is made when an object **vibrates**, or moves back and forth very quickly. These vibrations move away from the object and cause other things to vibrate. In this way, sound travels through air, water, and even solid objects.

Sometimes we can see something vibrating when it is making sound, such as when we pluck a rubber band. But often the vibrations are too small or are moving too fast to see. In these cases, we may be able to feel the vibrations. We can also tell that an object that makes sound is vibrating because it can cause something else to vibrate.

In this experiment, students will observe how a vibrating tuning fork makes sound and causes other things to vibrate. They will use their senses of hearing, touch, and sight to make observations and come to understand the cause-and-effect relationship between sound and vibration.

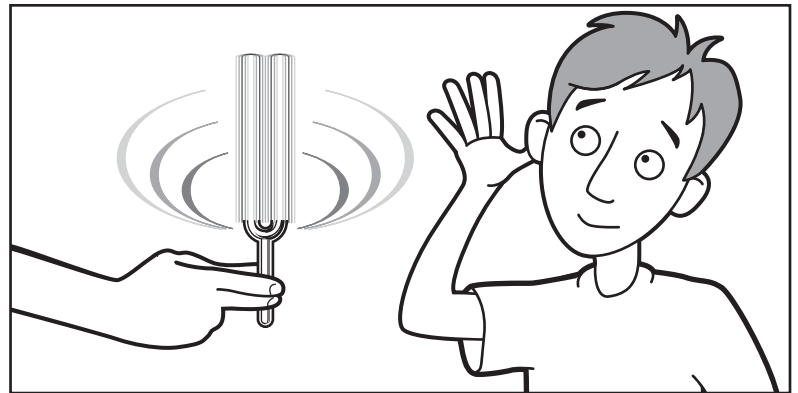
Time – 30 minutes

Grouping – Small groups

Materials

(per group)

- data sheet
(one per student)
- tuning fork
- rubber hammer or other hard rubber object
- shallow pan
- water



Procedure

Preparation

1. Prepare a station for each group with a tuning fork, a rubber hammer, and a shallow pan.



Tuning forks and rubber hammers can be obtained from your school's science resource center or purchased from local music stores. Rubber hammers can also be found in hardware stores. Alternatively, students may strike the tuning fork against a baseball, softball, or other object of similar firmness.

2. Instruct group members to take turns so that each student has a chance to experiment with the tuning fork and can record observations on his or her own data sheet.
3. Before beginning the experiment, demonstrate how to carefully strike the tuning fork so that it produces sound. Ask students to describe what they hear as you strike the tuning fork in different ways. They should observe that when the tuning fork is hit harder, it produces a louder sound.

- ! Safety:** Stress the importance of not making loud noise near anyone's ears.

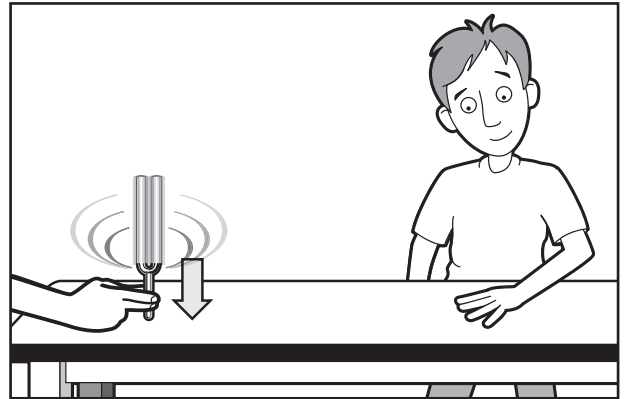
Part 1: Listening to Sound

1. Activate prior knowledge by asking students what they think sound is and how it helps them hear. Guide the discussion to include how they think the sound of you talking reaches their ears.
2. Introduce the concept of *vibration*. Write the word *vibration* on the board and ask students what they think it means. Explain that vibration is a very fast shaking motion and that things make sound when they are vibrating. Invite students to share examples of things they have seen vibrate.
3. Have one member of each group hold the handle of the tuning fork and gently strike the other end with the rubber hammer. Then have them move the tuning fork so it is close enough to one of their ears to hear the sound it is making.
4. Allow each student in the group to strike the tuning fork and listen to the resulting sound.
5. Instruct students to describe what they heard. Have them use the first row of the table on their data sheet to record their observations from this test.

Part 2: Feeling Sound

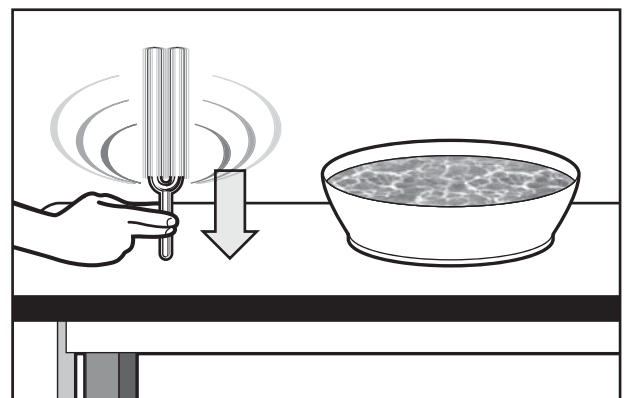
1. Next, have one student in each group strike the tuning fork with the rubber hammer and place it in an upright position, with the handle touching a table.
2. At the same time, instruct the other group members to put a hand on a different part of the table and observe what they can feel with their hand.
3. Have each group repeat the experiment with a different student striking the tuning fork and holding it against the table.

4. Instruct students to use the second row of the table on the data sheet to describe what they felt in this test.



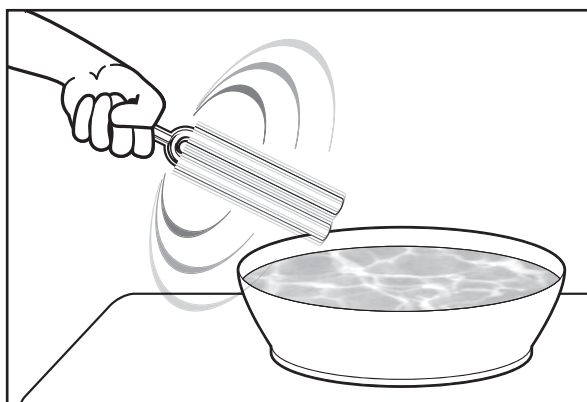
Part 3: Watching Sound

1. Fill the pan of water at each group's station. Explain to students that this time they will be watching to see what the water does when the tuning fork is vibrating nearby.
2. Have one student from each group strike the tuning fork and place the handle of the vibrating fork on the table next to the pan of water while the other students are observing the water.
3. Have groups repeat the experiment with a different student striking the tuning fork and holding it against the table.
4. Instruct students to use the third row of the table on the data sheet to describe what they saw in this test.



Part 4: Vibrating Water

1. Have one student from each group strike the tuning fork and then hold the vibrating end of the tuning fork near the surface of the water while the other students observe the water.
2. Have each group repeat the experiment with a different student striking the tuning fork and holding it near the water.
3. Have students repeat steps 1 and 2, but this time the student holding the tuning fork should slowly touch the surface of the water with the vibrating end.
4. Instruct students to use the fourth row of the table on the data sheet to describe what they saw in this pair of tests (above and in the water).

**Discussion Questions**

Use these questions to guide a discussion about sound and vibration.

1. What caused the tuning fork to make sound?
The tuning fork made sound when we hit it with the rubber hammer. The rubber hammer made the end of the tuning fork vibrate really fast.

2. Why were you able to feel vibrations from the tuning fork when it was held against the table?

The vibrations from the tuning fork moved through the table and caused the table to vibrate. Then the vibrations moved from the table to my hand, and I could feel them.

3. Why were you able to see the water moving when the tuning fork was held on the table near the pan?

The tuning fork made the table vibrate. Then the table made the water in the pan vibrate.

4. How was the vibrating tuning fork able to splash water out of the pan?

When the tuning fork was placed in the water, the vibrations went right into the water and caused the water to vibrate. The tuning fork was vibrating very fast and caused some of the water to splash out.

Conclusion

1. Why can we sometimes feel and see sound?

Sound is a kind of energy. It is made when something is vibrating. Something that is making sound can cause other things to vibrate. When something is vibrating, we can sometimes feel the movement. Sometimes we can also see the vibration, such as when the water was vibrating in the pan.

2. How does sound get from something that is vibrating to your ears?

When an object is vibrating and making sound, it also makes the air around it vibrate. These vibrations move through the air until they reach my ears.


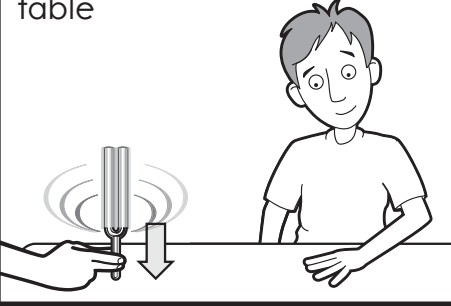
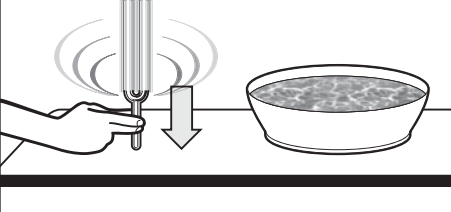

Extensions and Variations

- *Variation:* Encourage students to try this experiment again using larger tuning forks and with firmer or weaker hammer strikes.
- *Inquiry Science:* Allow students to select other materials—such as dry sand, flour, or confetti—to place in the pan and observe how vibrations from the tuning fork affect these materials. They might also think of alternative sources of sound to test, such as the speaker from a smartphone or whistling and humming using their mouth. Have students wear safety goggles during this investigation.
- *Research/Fine Arts:* Have students research how different types of percussion instruments make sound. They might read books, conduct online research, or watch videos. Then bring several percussion instruments into the classroom for student exploration. Invite students to create a “vibration band” that plays songs by combining instruments.
- *ELL/ESL:* Create a word wall that includes vocabulary relevant to the lesson, such as *energy, sound, vibration, hearing, tuning fork, senses, and observe*. For more vocabulary resources, visit [Vocabulary A-Z](#).
- *Guest Speaker:* Invite a musician, sound technician, audiologist, or other professional to visit the classroom to talk about sound and vibration.
- *Guest Speaker:* Invite a doctor to visit the classroom to talk about sound and hearing, and how students can protect their ears from the damaging effects of loud sounds. Ask them to relate their discussion to vibrations.
- *Home Connection:* Challenge students to conduct their own sound experiments at home using different materials. Be sure adults supervise the activities for safety. Ask students to share their results with the class.
- *Research:* See Using the Internet in the [Unit Guide](#) for suggested websites to extend the learning.

Data Sheet: *Students should fill in each row on the data sheet with observations from that particular test. In the first row, students should describe that they heard a high humming or ringing sound when they held the tuning fork up to their ear. In the second row, students should describe that they felt the table vibrating when the tuning fork was held against it. In the third row, students should describe that they saw the water moving a little bit when the vibrating tuning fork was held against the table near the pan. In the last row, students should describe that they saw the water move a little when the tuning fork was held above it and that the water moved a lot or even sprayed out of the pan when the tuning fork was touching the surface of the water.*

Name _____ Date _____

Collect Data

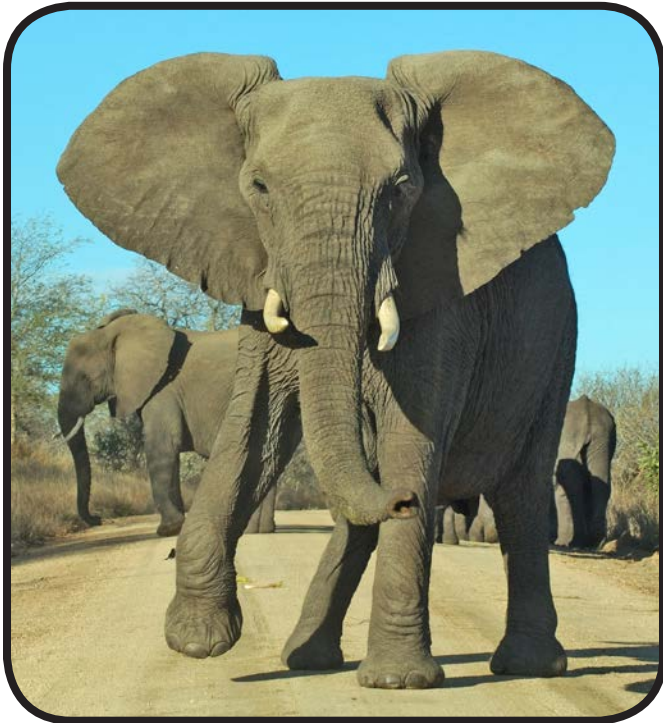
Test	Observation
<p>Part 1: Tuning fork in the air</p> 	<p>What I heard:</p>
<p>Part 2: Tuning fork on the table</p> 	<p>What I felt:</p>
<p>Part 3: Tuning fork on the table near the water</p> 	<p>What I saw:</p>
<p>Part 4: Tuning fork above and in the water</p> 	<p>What I saw:</p>

Elephants Make Sounds

Elephants make many **sounds**. They often make low rumbles. When they are angry or scared, they make loud, high sounds like a trumpet. Elephants use their long trunk to make these sounds louder.

Do You Know?

African elephants are the biggest animals on land. A full-grown African elephant can be 4 meters (13 ft.) tall!



An elephant stomps its foot to warn others.



This elephant is making loud sounds with its trunk.

Some elephant sounds are too low for people to hear. When elephants stomp and make low rumbles, the ground shakes, or **vibrates**. Other elephants can feel the ground vibrate. Elephants can “talk” this way from 3 to 16 kilometers (2–10 mi.) away.

✓ Brain Check

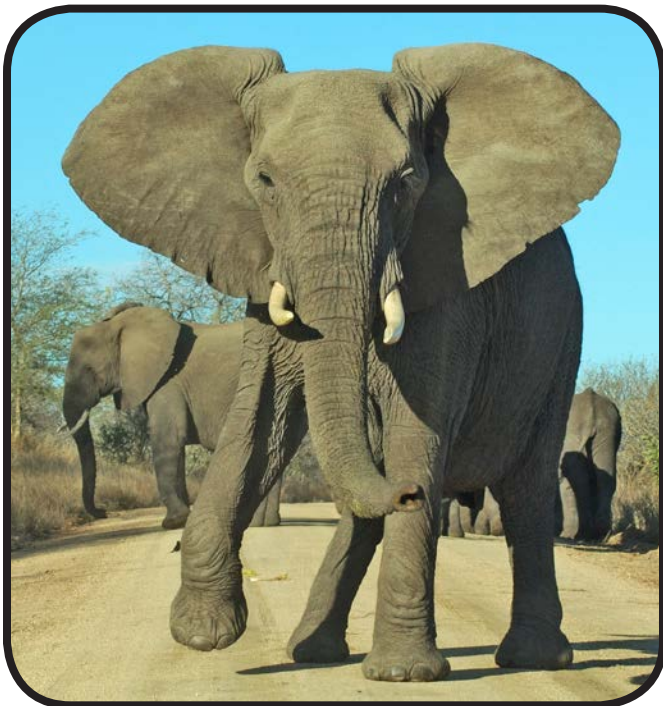
How do elephants make sounds?

Elephants Make Sounds

Elephants make many **sounds**. They make sounds that are low like thunder. They make sounds that are high like a trumpet. Elephants use their trunk to make these sounds loud.

Do You Know?

African elephants are the biggest animals that live on land!



This elephant is stomping its foot to warn others.



This elephant is making loud sounds with its trunk.

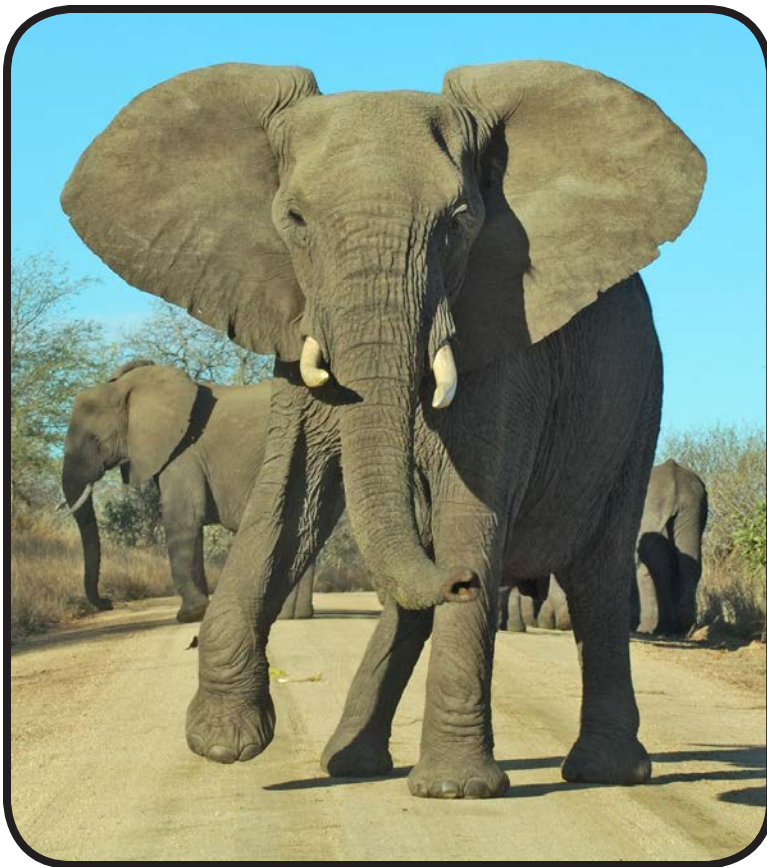
When elephants make low sounds, the ground **vibrates**. That means it moves back and forth. When elephants stomp their feet, the ground vibrates. Other elephants can feel the ground shake. Elephants do this so they can “talk” to each other from far away.

✓ Brain Check

How do elephants make sounds?

Elephants Make Sounds

Elephants can make low sounds. Elephants can make high sounds. They use their trunk. They use their feet.



Elephant sounds make the ground shake. Other elephants can feel the ground move. Elephants do this so they can “talk” from far away.

Name _____ Date _____

Part 1: Use the Evidence

Read the sentences. Underline the sentences that tell how sound can make things vibrate. Then answer the questions.

You are at a parade. You put a cup of water on the ground. People playing drums march by. You can hear loud sounds. You can feel the sounds with your feet. The water in the cup moves.



1. What does sound move through to get to your ears? Circle the best answer.

the ground

the air

the drums

2. How could you feel sound with your body?

Teacher Instructions: Read the directions and questions aloud for students who cannot yet read independently. Accept oral responses as needed.

Name _____ Date _____

3. What caused the water in the cup to move?

4. What would happen to the cup of water if the people stopped playing the drums? Why?

Name _____ Date _____

Part 2: Plan an Investigation

Read these steps for an investigation about sound. They are in the wrong order. Put a number in front of each step to show the steps in the right order. Use numbers 1, 2, 3, 4, and 5.



- I put plastic wrap over the bowl. I put salt on the wrap. Then I hit the drum near the bowl.
- The sound from the drum makes the salt move.
- I want to find out if sound can make things move.
- I get some salt, plastic wrap, a bowl, and a drum.
- I listen for a sound from the drum. I watch the salt to see if it moves.

Part 3: Make a Claim

Fill in the blank to finish the sentence.

Sound causes objects to _____.

ANSWER KEY AND TEACHING TIPS**Connections to the Next Generation Science Standards*****Target Science and Engineering Practice:** *Planning and Carrying Out Investigations*

- Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question.

Associated Performance Expectation: *1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.*

All questions in this assessment relate to the Disciplinary Core Ideas **DCI** of this Performance Expectation. Look for the **SEP** and **CCC** symbols for questions that specifically address Science and Engineering Practices and Crosscutting Concepts.

Summary

Students answer questions to identify cause-and-effect relationships between sound and the vibration of objects. They also recognize the sequence of steps that occur during an investigation and make a claim about sound and vibration.

CCC Part 1: Use the Evidence

Students should underline the sentences in the reading passage that describe how sound is causing something to move. See example. Students may or may not recognize that sound moving through the air hits the ears and causes parts of them to vibrate, as described in the fourth sentence.

You are at a parade. You put a cup of water on the ground. People playing drums march by. You can hear loud sounds. You can feel the sounds with your feet. The water in the cup moves.

1.

the air

2. *The sound from the drums made the ground move (or vibrate). I could feel the ground vibrating with my feet.*
3. *The sound from the drums caused the water in the cup to move (or vibrate).*
4. *If the people stopped playing the drums, the sound would stop. When the sound stopped, the water would stop moving.*

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SEP Part 2: Plan an Investigation

- 3 I put plastic wrap over the bowl. I put salt on the wrap. Then I hit the drum near the bowl.
- 5 The sound from the drum makes the salt move.
- 1 I want to find out if sound can make things move.
- 2 I get some salt, plastic wrap, a bowl, and a drum.
- 4 I listen for a sound from the drum. I watch the salt to see if it moves.

Part 3: Make a Claim

Sound causes objects to vibrate (or move or shake).

Teaching Tips

If students have trouble performing the tasks on this assessment, ask them look back at the *Process Activity Data Sheet* they completed during Lesson 2. As a class, discuss how the sound from the tuning fork caused the air, the table, and the water to vibrate. Compare that to how sounds from the drums caused objects to vibrate in Part 1. Work with students as they answer the questions. Then review the important features of planning and carrying out an investigation and discuss how students can use observations of salt vibrating on top of the bowl to understand the relationship between sound and the vibration of objects.

Extensions

For students who complete their work early or are ready for an extra challenge, assign additional resources related to this topic found on the [Grade 1 Waves: Light and Sound NGSS page](#) on Science A-Z.