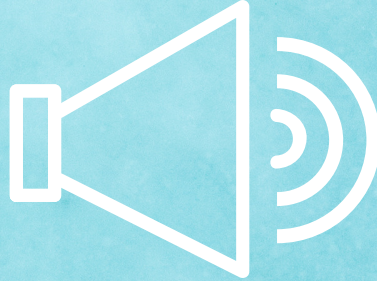


NGSS: MS-PS4-1, MS-PS4-2

SOUND



Name: _____

Sound Lab

Introduction

In this lab, you will explore sound and sound waves.

PreLab Questions

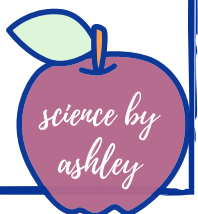
Answer the following questions before starting the lab.

- 1) What is a wave?

- 2) How does sound travel?

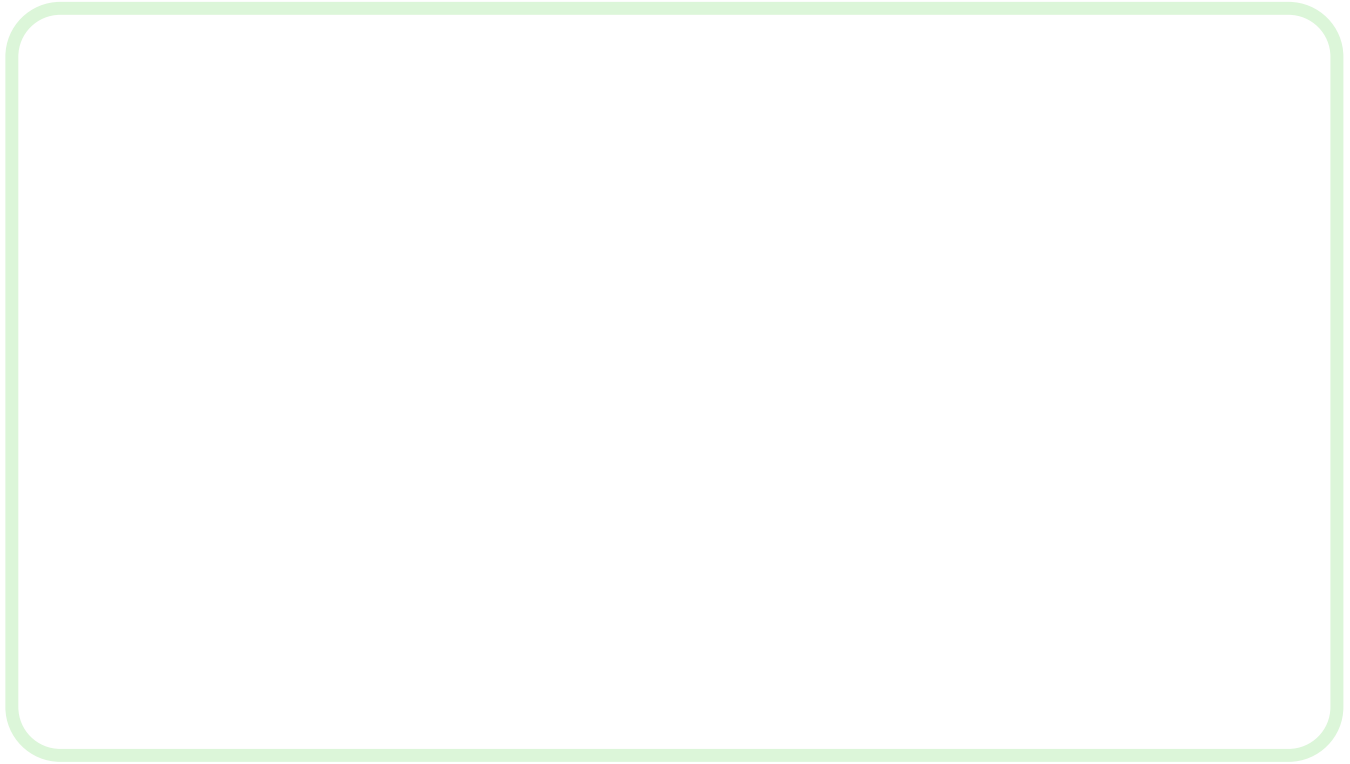
- 3) Can sound move through outer space? Why or why not?

- 4) How is the amplitude of a wave related to the amount of energy in a wave? Draw a wave with a low amplitude and a wave with a high amplitude to help explain your answer.



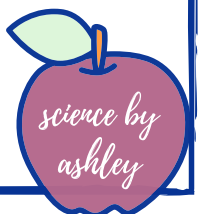
Station One: Water Cups and Pencils

1) Draw a picture of the lab set-up.



2) Lightly tap each cup with your pencil. Record your observations.

3) Why do you think each cup produced a different sound?



Station Four: Tuning Fork in Water

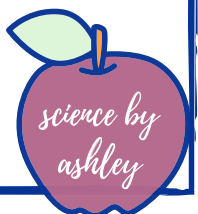
Hit the tuning fork with the mallet or rubber sole of your shoe then place it in the cup of water.

- 1) Record your observations.
- 2) What is the source of energy that produced sound from the tuning fork?
- 3) How do you think the tuning fork produced the sound?

Station Five: PVC Pipe

Tap each end of the different pipes with your hand.

- 1) Record your observations.
- 2) What do you think causes the different sounds?

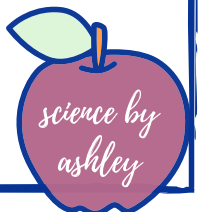


Station Six: Spoon on a String

Wrap the ends of the string around your finger and put your fingers in your ears. Hit the spoon on the side of the desk and listen.

1) Record your observations.

2) Why do you think this happens?



Teacher Guide

Teacher setup time: About 15 minutes

Student time: One class period

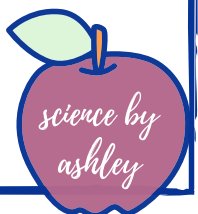
Materials:

- Cornstarch
- Water
- Glass beakers
- Plastic wrap
- Radio/Subwoofer
- Tuning forks
- String
- Ping pong ball
- Tape
- Paper towel
- Metal spoon
- Station labels (included!)

Teacher Demo:

Introduce this lab by presenting the following demo to students:

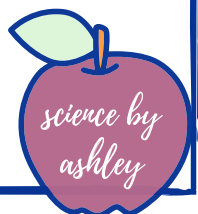
- Mix up a little cornstarch and water in a cup to make "oobleck"
- Cover stereo speakers (subwoofer) with plastic wrap to protect the speaker
- Pour the cornstarch/water mixture on the plastic wrap
- Turn the radio on for about 30 seconds so the kids can see the oobleck "dance"
- Click [here](#) to see this demo on YouTube



Teacher Guide

Teacher Setup:

- Cut the station labels and use them to identify each station.
- Station 1: fill up several glass beakers with different amounts of water and then have the kids use their pencils to “make music.”
- Station 2: Set out a variety of tuning forks available for students to explore.
- Station 3: Hang a ping pong ball from the ceiling (with string or fishing line). The kids strike the tuning fork then hold it steady next to the ball to see it move.
- Station 4: Set out 1 beaker of water (or plastic cup) and a tuning fork. **CAUTION:** The glass beakers will break if the students touch it with the vibrating tuning fork. Put some paper towel under the beaker because the water does splash and make a mess.
- Station 5: Set out a variety of different lengths of PVC pipes (all of the same diameter) to let the kids explore.
- Station 6: This looks silly but is so much fun! Tie a spoon to the middle of a piece of string (about 24 inches long). The kids will wrap the ends of the string around each index finger and stick their fingers in their ears. Then they strike the spoon on a desk to hear the sound travel through the string into their ears.



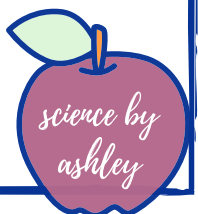
Teacher Guide

Suggestions:

- Set a timer for each station (about 5 minutes for a 45 minute class period).
- You may want to do the teacher demo the day before the students do the lab, depending on the length of your class period.
- For noise control - if you have a large class, you can split the class in 2 groups and complete this lab over two days. The first day, half of the class is working on the lab while the other half is doing something quiet at their desk, then the groups switch the next day.

Notes:

- Groups of 2-3 students work well for this activity.
- This paper can be filled out individually or as a group.
- Although this lab is aligned to the middle school NGSS standards, it is a great activity for high school ICP students as well!



Teacher Key

1) What is a wave?

A wave is a disturbance that travels through a medium (solids, liquids, gasses) from one location to another location. Waves carry energy.

2) How does sound travel?

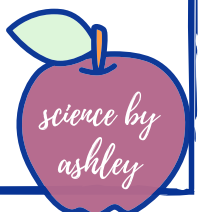
Sound waves move by vibrating the molecules of the material it is traveling through.

3) Can sound travel in outer space? Why or why not?

No, because there is no medium for the wave to move through.

4) How is the amplitude of a wave related to the amount of energy in a wave? Draw a wave with a low amplitude and a wave with a high amplitude to help explain your answer.

The more energy a wave has, the larger the amplitude. Student drawings will vary, but they should draw two different waves, one with a higher amplitude than the other, and explain that the wave with the lower amplitude has less energy than the wave with the higher amplitude.



**Station 1:
Water Cups
and Pencils**



**Station 2:
Tuning
Forks**



**Station 3:
Ping Pong
Ball**



**Station 4:
Tuning Fork
in Water**



Station 5:
PVC
Pipe



Station 6:
Spoon on
a String



NGSS Standards Covered in this Lab

Waves and their Applications in Technologies for Information Transfer

- **MS-PS4-1** Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
- **MS-PS4-2** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

