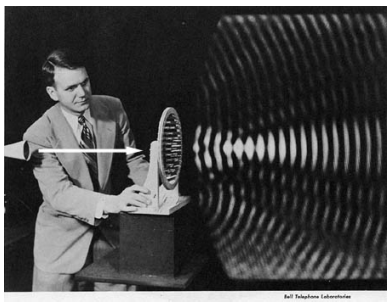
Name: _____ Date: _____



Exploring Sound

A series of self-guided labs

What do you KNOW about sound? What do you WONDER about it? And after exploring sound, what have you LEARNED?

KNOW	WONDER	LEARNED

Please be sure to read the directions carefully at each station and complete the tasks as well as the reflection questions with each task. If you have any questions, do not hesitate to ask for help.

This is how you will be graded on this activity:

Score	Requirements to earn that score
3	Students must answer all questions on their observation sheets accurately and thoroughly; diagrams must accurately demonstrate how sound traveled in each activity and be labeled according to directions.
2	Students must attempt to answer all questions with minor misunderstandings; diagrams are complete with minor errors.
1	Students did not attempt to answer all questions, and some answers show major misunderstandings or are not complete; students did not follow directions to label diagrams; and students have made no attempt to show how sound travels or one which demonstrates little understanding of how sound travels

NOTE: IF you finish your station early, please flip to the back and study the vocabulary and answer the extension questions. Make sure you leave your stations cleaner than you found them.

Name: _____ Date: _____

Station 1

Please view the U-tube film where scientists put sand onto a platform above a speaker that plays various pitches www.youtube.com/watch?v=Zkox6njJ1Wc. Draw a picture in the space below what the sand looked like in the beginning of the film, during the middle and at the end. In the space under each box, describe WHAT happened and WHY it happened.

Beginning of Film	**Middle of Film**	**End of Film**
What: Why:	What: Why:	What: Why:

What was the vibrating **source** that created the sound wave? _____

What do you **see**? _____

What do you **hear**? _____

If a **medium** is required to carry sound waves, what type of medium are the waves traveling through? _____

In what **direction** does the wave appear to travel? _____
What happens to the medium (sand) as the wave travels? _____

_____

What is one question you still have about waves after experimenting at this station? _____

_____

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Name: _____ Date: _____

Station 2

Please view the science fiction film clip of the explosion in space: www.youtube.com/watch?v=8OQ0lzwSlv0. Draw a picture in the space below what the images looked like in the beginning of the film, during the middle and at the end. In the space under each box, describe WHAT happened and WHY it happened.

Beginning of Film	**Middle of Film**	**End of Film**
What: Why:	What: Why:	What: Why:

What was the vibrating **source** that created the sound wave? _____

What do you **see**? _____

What do you **hear**? _____

If a **medium** is required to carry sound waves, what type of medium are the waves traveling through? _____

Can sound exist in space outside of the space craft? _____
Because we know that space is a vacuum with no solids, liquids, or gases can sound waves actually travel through or vibrate in space?_____ Explain why or why not. _____

_____

In what **direction** does the wave appear to travel? _____

What is one question you still have about waves after experimenting at this station? _____

_____

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Name: _____ Date: _____

Station 3

In front of you is a drum. Place a few clips on the top. Tap on the drum and observe what happens to the paper clips.

In the space below, draw a diagram of your experimenting and LABEL what happened.

Why do you think what happened happened? _____

_____

_____

What was the vibrating **source** that created the sound wave? _____

What do you **see**? _____

What do you **hear**? _____

If a **medium** is required to carry sound waves, what type of medium are the waves traveling through? _____

In what **direction** does the wave appear to travel? _____

What is one question you still have about waves after experimenting at this station? _____

_____

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Name: _____ Date: _____

Station 4

Touch side of your throat and say ahh.

What do you feel as you say ahh?

_____

What do you feel if you make a low pitched ahh?

_____

What do you feel if you make a high pitched ahh?

_____

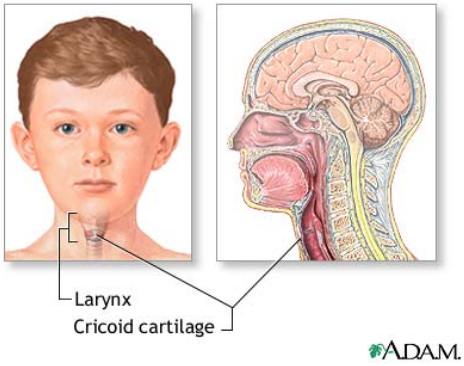
What do you feel if you make a quiet ahh?

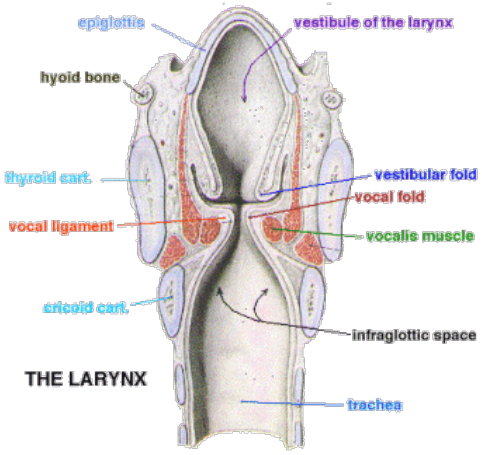
_____

What do you feel if you make a loud ahh?

What do you hear? _____

Below are some diagrams of the human anatomy of the throat—please incorporate some of the vocabulary into your answers below.





What do you think happened?

_____

Why do you think what happened happened? _____

_____

What was the vibrating **source** that created the sound wave? _____

What do you **see**? _____

What do you **feel**? _____

If a **medium** is required to carry sound waves, what type of medium are the waves traveling through? _____ _____

In what **direction** does the wave appear to travel? _____

What is one question you still have about waves after experimenting at this station? _____

Station 5

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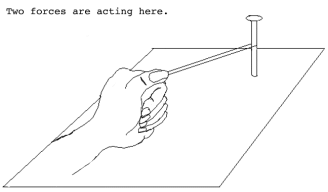
Name: _____ Date: _____



In front of you is a piece of wood with holes in it. Experiment with the rubber bands by stringing them between two nails. Pluck the rubber band.

Draw a diagram of your experiment in the space below.

Change ONE variable to your experiment. Draw and LABEL a diagram of your experiment in the space below.

What do you think happened? _____

_____

Why do you think what happened happened? _____

_____

_____

What was the vibrating **source** that created the sound wave? _____

What do you **see**? _____

What do you **hear**? _____

If a **medium** is required to carry sound waves, what type of medium are the waves traveling through? _____

In what **direction** does the wave appear to travel? _____

What is one question you still have about waves after experimenting at this station? _____

_____

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Name: _____ Date: _____

Station 6

In front of you are several items of which include 2 tin cans, 2 plastic cups, 2 paper cups and a series of connectors. Experiment with making a design that allows the sound waves from your voice travel through the connectors to your partner's ear WITHOUT traveling through the air molecules in the classroom.

What did you use? Draw a diagram of your experiment in the space below.

Change ONE variable of your experiment. Draw and LABEL a diagram of your experiment in the space below.

Change ANOTHER variable of your experiment. Draw and LABEL a diagram of your experiment in the space below.

What do you think happened? _____

_____

Why do you think what happened happened? _____

_____

_____

What was the vibrating **source** that created the sound wave? _____

What do you **see**? _____

What do you **hear**? _____

If a **medium** is required to carry sound waves, what type of medium are the waves traveling through? _____

In what **direction** does the wave appear to travel? _____

What is one question you still have about waves after experimenting at this station? _____

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Name: _____ Date: _____

Station 7

In front of you are 8 glasses and a pitcher of water. Your challenge is to simply fill a set of 8 glasses with different amounts of water in order to create an octave of eight notes (do-re-mi-fa-so-la-ti-do). Please use the ruler to measure the height of the AIR SPACE in the glasses and record them below.

See if you can play a tune with your glasses. Which one did you play? _____

What do you think happened? _____

_____

Why do you think what happened happened? _____

_____

What does the air above the column of water have to do with pitch? _____

_____

What was the vibrating **source** that created the sound wave? _____

What do you **see**? _____

What do you **hear**? _____

If a **medium** is required to carry sound waves, what type of medium are the waves traveling through? _____

In what **direction** does the wave appear to travel? _____

What is one question you still have about waves after experimenting at this station? _____

_____

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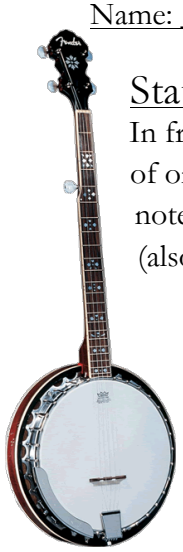
Name: _____ Date: _____



Station 8

In front of you is a banjo or a tincan-jo. Your challenge is to 1) determine the pitch of the note of one string on the banjo/tincan-jo and 2) see if you can use the tuner/your 'ear' to raise the note one pitch and lower the note one pitch. It might also be interesting to explore ½ steps (also known as sharps and flats on the scale).

In the space below, explain the **relationship** between how tight a string is and what note gets played. _____

_____

_____

Imagine you were a tiny creature that was small enough to see the atoms in the string. What would they look like as it was plucked? Draw what you imagine in the space below.

What do you think happened? _____

_____

Why do you think what happened happened? _____

_____

What was the vibrating **source** that created the sound wave? _____

What do you **see**? _____

What do you **hear**? _____

If a **medium** is required to carry sound waves, what type of medium are the waves traveling through? _____

In what **direction** does the wave appear to travel? _____

What is one question you still have about waves after experimenting at this station? _____

_____

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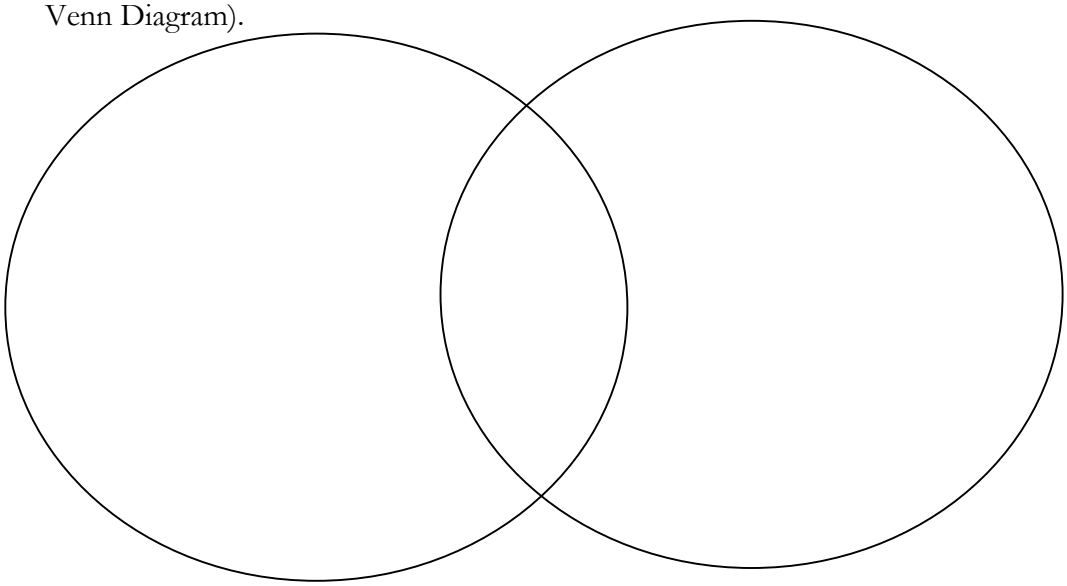
Name: _____ Date: _____

Extension/Homework Questions

1. How do ultra-sounds work? _____

   _____

2. Compare and contrast what you know about sound waves versus light waves. (Please use a Venn Diagram).



3. Hypothesize what happens to sound waves when they reach a wall or other solid, flat object. Use a diagram if it is helpful to explain your answer. _____

   _____

   _____

4. If sound can't travel in space, hypothesize what other modes of communication astronauts can use when they are outside the space shuttle?

   _____

   _____

5. Explain why, based on the behavior of sound waves, a classroom with a tile floor is louder than a library that is carpeted.

   _____

   _____

6. How does sound travel when you have a conversation with your friends?

   _____

   _____

7. Discuss why you see lightning before you hear thunder during storms.

   _____

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Name: _____ Date: _____

Key Points

- Sound is a form of energy that travels in invisible waves.
- Waves travel through a vibration through a medium.
- When a vibration travels through the air and into the ear canal it vibrates the eardrum, and they should understand that the vibration of vocal chords creates our voice.
- All waves continue to move outward and continuedin this manner unless they hit an object of a different density, especially a solid. The water in the pan hit the edges of the pan and bounced back. A real-world examples of this is an echo.
- *Transverse waves* carry light energy, *do not require* a medium through which to travel, and can travel through space or in a vacuum. Transverse waves on Earth can move through any medium. When transverse waves do travel through a medium, that medium will move at right angles to the direction the wave is traveling. Transverse waves carry different types of light energy, found in the electromagnetic spectrum, and they travel faster than the speed of sound.
- *Compressional waves* carry sound energy and *require* a medium through which to travel. Matter vibrates in the same direction as the wave is traveling, and waves travel slower than light or transverse waves.

Key Terms

acoustic

The total effect of sound, and the ability of an enclosed space, such as an auditorium, to reflect sound waves to produce distinct hearing.
Context: The acoustics in the building were superb, making it an ideal place for a concert.

compressional wave

Definition: A wave that carries sound energy.
Context: Compressional waves need a medium to travel.

echo

Definition: The repeating of a sound caused by reflection of sound waves off a surface.
Context: When they shouted into the canyon, their voices echoed back up to them from the rocks.

energy

Definition: The ability to perform work.
Context: The sun can be a powerful source of energy.

medium

Definition: A material (solid, liquid, or gas) through which a wave travels.
Context: Liquid mediums, like water, are good conductors of sound.

sound

Definition: Energy traveling away from a vibrating object.
Context: He was aware of a low sound, a hum, coming from the electric generator.

vibrate

Definition: To move rapidly back and forth.
Context: The string vibrated after being plucked.

wave

Definition: A transfer of energy as it travels away from the energy source.
Context: She threw a rock into the water, causing a ripple of waves to spread outward in all directions.
End the lesson by returning to the KWL chart. As a class, have students explain what they have learned about waves in the third column. Look at the first column. Did they make changes in what they initially knew about waves? Look at the second column. Which of their questions were answered? Which ones remain for another time?

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