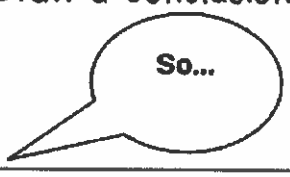
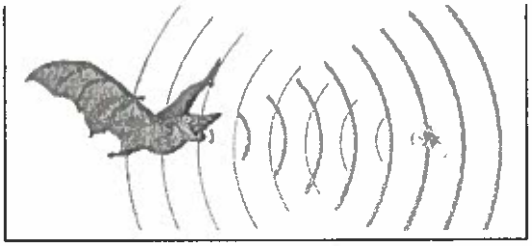
Name _____ Date _____

Scientific Method

Ask a Question 	**Purpose:** What theory are you testing, why are you doing this experiment (a reason)? Ask a question or outline the concept you are exploring.
Make a Prediction 	**Hypothesis**: before you perform or test theories predict what you think will happen or what the end result will be.
Make a Plan and Follow it 	**Materials**: in point form outline and organize what items you will need to perform the experiment. **Procedure:** write down each step in order of what you are to do (number each step in sequence) to perform the experiment. This is important so you may get the same results if you perform the same test again.
Observe 	Observations: write down what you observed, details of what happened and explain results in complete sentences.
Record the Results 	**Organize data** using pictures, charts, graphs and captions explaining the process and observations.
Draw a Conclusion 	**Conclusion**: end the lab by restating your prediction, confirming whether your original was correct (hypothesis) or incorrect and support why. Briefly end report by summarizing what happened to confirm or negate theory.



Glossary of Sound Terms

Natural sounds: one way to group sound is by identifying sounds that would be heard in nature like falling rocks, waterfalls, and birds chirping.

Artificial sounds: another way to group sound by identifying sounds made by people and our devices like buzzers, gears turning, and tires on the pavement.

Vibration: when an object moves back and forth quickly (moves many times per second).

Sound waves: energy that vibrates particles as it travels through matter, sensed by the brain as sound.

Frequency: is the number of vibrations an object makes per second.

Pitch: how high or low a sound is which is determined by how fast the sound wave vibrates.

Decibel: a unit used to measure the loudness of a sound (also called dB).

Hertz: a unit of measuring the frequency of sound; one hertz is one vibration per second.

Echo: a sound that bounces off an object and reflects back to the ear.

Amplify: to make sound louder.

Loudness: is how strong the sound seems when it reaches our ears.

Intensity: is defined as the amount of energy flowing in the sound waves.

Volume: the loudness or softness of a sound.

Cavity: a hollow space within an object.

Resonance: the strengthening of sound waves when they bounce off the walls of a cavity.

Compression*:* In air, the forward movement of vibrating objects pushes molecules together.

Rarefaction: When the vibrating object moves back in the opposite direction, the air is separated, causing molecules to move farther apart.

Cochlea: a shell-shaped part of the inner ear that is filled with liquid and lined with thousands of tiny hairs which transmit sound signals.

Eardrum: a thin delicate membrane in the middle ear, it vibrates when sound waves hits it.

Ear canal: a part of the ear that connects the outer ear to the inner ear; tunnel that sound travels through to the ear drum.

Lab Report Assessment name:

Lab name & number Date: Title:	Lab #1:	Lab #2:	Lab #3:	Lab #4:	Lab #5:
Lab Structure: lab components that are completed & in detail: purpose, hypothesis, materials, procedure, observations and conclusion					
Organization: communicates an appropriate title, lab partners, date, number of lab. Diagrams, charts, pictures are coloured and illustrated.					
Neatness & appearance: lab report is neat, legible, and easy to read/follow					
Mechanics: Lab is edited for punctuation, spelling, grammar, and uses point form (materials) and numbers (procedure)					
Experimental design: Has a complete conclusion that confirms whether the prediction was correct, supplies a summary of results.					
Date					

Lab Report Rubric outline

Report Skills	**Thorough understanding** **4**	**Good Understanding** **3**	**Is beginning to show understanding** **2**	**Needs more Work** **1**
Lab Structure	Has all components in detail: Purpose, hypothesis, materials , procedure, observations and conclusion -checklist for all labs (date, title, checks -self assesses honestly on rubric	Most lab components done or have some detail: Purpose, hypothesis, materials, procedure, observations & conclusion -most labs checked -most have titles and dates -marks self on rubric	Some parts of the lab are completed or done partially: Purpose, hypothesis, materials, procedure, observations & conclusion -a few labs checked -some have titles and dates - rubric not done	Many or all parts of the lab are incomplete: Purpose, hypothesis, materials, procedure, observations & conclusion -labs are not checked -do not have titles and dates -rubric not marked
Organization **Diagrams/ Data**	The number of lab & appropriate related title, date, student name and partners in group -All diagrams, charts, illustrations are neatly organized to provide data (if applicable)	Most key information is there: the number of lab & appropriate related title, date, student name and partners in group -Diagrams, charts, or graphs are neatly illustrated	Parts of lab are missing: The number of lab & appropriate related title, date, student name and partners in group -diagrams or charts are partially done	No name, no number, partners in the lab group or date was written -no illustration, data, charts or graphs
Neatness & appearance	The lab is easy to read, legible printing and pride was taken in the appearance of work	Lab is readable and printed legibly	Printing is hard to understand, words are spaced too close together, there may be unnecessary doodles or rips	Lab report paper is ripped, coloured on, crumpled and impossible to decipher any written print
Spelling, Punctuation & Grammar	Lab report was edited for all errors in spelling, grammar, and has clear logical explanations	There are just 1-2 errors in spelling, grammar, or meaning in the lab	There are 3-4 errors that need to be edited	Lab is flawed with numerous errors in spelling, punctuation or makes no sense at all when read
Experimental Design: Conclusion	Conclusion relates back to the hypothesis and denies or confirms if it was correct. Lab ends with a summary of evidence of observations taken in the conclusion	Conclusion gives some answer to whether prediction was correct or not. Lab is appropriately ended with a sentence explaining results or restating observations.	Conclusion is partially done. It either states just that the prediction was correct or just writes an ending in a sentence what happened.	Conclusion is left blank altogether or has absolutely nothing to do with what is being tested.

☐ student

☐ teacher

Sound Lab # **Sounds and Solids**

Date: **Name & Partners:**

Purpose: To observe that sound reflects or bounces off different surfaces (such as walls) and if it bounces back it is called an echo.

Hypothesis: I predict that certain surfaces like _____will absorb the sound and won't be heard as clear and other surfaces, like _____ will have sounds bounce back like an echo.

Materials:

-2 long paper rolls -5 books -measuring spoons -cardboard -cloth
-metal cookie sheet -clock/ ticking watch -cotton batting

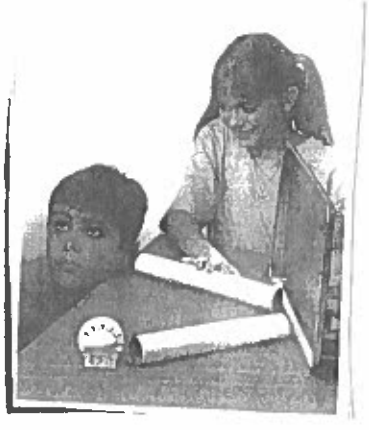
Procedure:

1. Pile the books on a table and lean the cookie sheet against the books.
2. Place 2 cardboard tubes in front of the cookie sheet as shown in the picture. Make sure the tubes are not touching each other and position them so they are about 3 cm away from the cookie sheet.
3. Put the clock or watch close to the end of one tube. This tube will now be your sound tube and the other tube will be your listening tube.
4. Put your ear near the end of the listening tube that is away from the cookie sheet. Listen for the ticking sound. Change angles of the tubes until you can hear clearly. Use pieces of tape to mark the placement of both tubes.
5. Now look at the angle each tube makes with the cookie sheet. What do you notice? Document in your observations.
6. Repeat the procedure by placing each item in front of the cookie sheet, adjusting tubes and noting the angle and clarity for each: cotton batten, cloth, cardboard, one solid of your choosing. Can you still hear the ticking? How loud? Soft? Clear? Muffled? Echo?

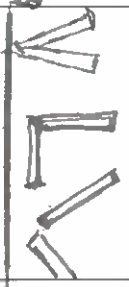
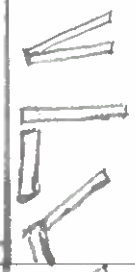
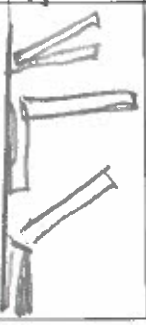
Observations: Answer the questions in complete sentences after filling out the chart.

Which materials insulated the sound (keep sound from absorbing through a material/ or wasn't heard clearly)?

What difference did the position of the card board tubes make? Were certain angles hitting the surface different sounding? How?



Conclusion: my prediction was

Materials (illustrate and colour each solid surface)	**Properties of sound** (Absorbed, echo or muffled, loud, soft, clear)	**Angle of listening tubes** (what degree or angle did they work best)	**Picture** (illustrate angle of tubes that worked best for each)
Metal cookie sheet		Pan acute less than 90° right 90° obtuse more than 90° 	
Cotton batten		acute right obtuse 	
Cloth		acute right obtuse 	
Cardboard		acute right obtuse 	
Your choice:		acute right obtus 	

Sound Lab # How Can Vibrations Be Musical?

Date: **Name & Partners:**

Purpose: To observe how music can be made by vibrations from the body or simulate how a kazoo can work like a woodwind instrument.

Hypothesis: I predict that the hole in the tube will cause sound vibrations of the paper, I think sound is made from _____

Materials:

-10 X 10 tissue paper -elastic bands
-hole punch -card board tubes
-colours (toilet paper or paper towel roll)

Procedure:

1. Punch a hole near the top of a cardboard tube.
2. Use an elastic band to hold the tissue paper over the end of the tube opposite of the hole.
3. Sing into the open end of the tube. Record you observations of what you hear and see. What causes those sounds?
4. The loudness of sound is called the volume. Sing louder into the tube. How does this change what you see and hear?

Observations: Answer the questions in complete sentences, draw and colour illustrations to support your understanding of concepts:

1. Explain how sound is like a wave.

2. What makes vibrations when you talk? Touch your neck, where do you feel the vibrations. Explain.

3. How did you make your kazoo sound louder and softer?

4. List and explain 2 ways you can make your kazoo sound louder and softer.

5. Describe how the kazoo is the same and different form regular instruments.

Illustrate, colour and show by using arrows and explaining by using a caption:

Draw you kazoo from a side view: label the parts of your instrument (include the hole)

Illustrate your kazoo when you sing into it: the air flow using arrows, where the kazoo is vibrating to make sound

Conclusion: My prediction was

Sound Lab # **Sound Vibrations Travel**

Date: **Name & Partners:**

Purpose: To observe that sound is made of vibrations that travel and cause movement.

Hypothesis: I predict that the sound vibrations of the tuning fork will affect the salt

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Materials:

-10 X 10 plastic wrap	-small yogurt container	-measuring spoons
-1 ml of salt	-tuning fork	-250 ml of water

Procedure:

1. Stretch a piece of plastic wrap over the top of a yogurt cup and tie with an elastic band.
2. Sprinkle a few grains of salt onto the plastic wrap.
3. Hit the tuning fork once on the edge of your shoe. Listen. Now hold the tuning fork close to the salt without touching it. What do you hear? What do you feel? Draw a picture of what you see.
4. Hit the tuning fork two times on the edge of your shoe. Listen. Now hold the tuning fork close to the salt without touching it. What do you hear? What do you feel? Draw a picture of what you see.
5. Hit the tuning fork once on the edge of your shoe. Listen. Now hold the tuning fork close and touch the plastic wrap with the tuning fork. What do you hear? What do you feel? Draw a picture of what you see.
6. Repeat these steps but this time fill the container with water (remove the salt). Fill out the chart.
7. Complete the table, illustrate observations and explain results.
8. Refer to your original hypothesis, confirm or refute whether correct or not and why in your conclusion

Observations: Answer the questions in complete sentences after filling out the chart.

How can sound make the salt or water move?

What difference did it make when you hit the tuning fork on your show more than once?

What happened when you touched the side of the yogurt container with the tuning fork? Explain why this happened?

What do you think makes the sound of the tuning fork?

Action	I heard:	I felt/saw	Picture
Tuning fork struck once and held close to salt (no touching)			
Tuning fork struck twice and held close to salt (no touching)			
Tuning fork struck once and touching plastic wrap			
Tuning fork struck twice and touching plastic wrap			
Tuning fork struck once and held close to water (no touching)			
Tuning fork struck twice and held close to water (no touching)			
Tuning fork struck once and touches container.			
Tuning fork struck twice and touches container.			

Conclusion: My prediction was

Sound Lab # **Yogurt Cup Telephones**

Date: **Name & Partners:**

Purpose: To investigate how string thickness can affect how sound resonates through a telephone receiver.

Hypothesis: I predict that _____ . string will make sound waves _____ and more clear.

Materials:

-2 plastic yogurt cups with a hole in the bottom
-one 2 metre string -one 2 metre of fishing wire
-one 2 metre of hemp line -one 2 metre of dental floss

Procedure:

1. Thread one end of string through the hole of one of the containers. Tie a large knot at the end of the string (so that the string cannot be pulled through the hole). Repeat the same to the other end through another cup.
2. Hold one end of this telephone. Have your partner take the other end and go as far as possible until the thread is stretched tight.
3. Take turns talking and listening on the telephone. Record the results of what you hear (clear, loud, soft, muffled?).
4. Repeat each of these steps with all the types of string: hemp line, fishing wire and floss. Record the results.
5. In your observations, which material receives the most clearly. Describe the properties of each material-how does the thickness affect the volume?

Observations: Answer the questions in complete sentences after filling out the chart.

Can you hear your partner talk through all the different types of string?

Is it louder or quieter when the string is not tight? Why or why not?

Which material resonates the best? Why do you think that is?

Conclusion: My prediction was

Material	**Describe properties & draw illustration**	**Describe** how loud, clear, and sound when **the string is tight** (taut ——)	**Describe** how loud, clear, and sound **when the string is loose** (‿)
string			
hemp line			
floss			
fishing line			