

Sound

Q	Z	M	V	I	B	R	A	T	I	O	N	S	P	E
A	I	R	R	R	D	E	C	I	B	E	L	S	V	W
Z	P	T	V	E	I	N	S	U	L	A	T	O	R	X
N	L	E	S	S	T	H	G	N	S	T	R	I	N	G
P	E	R	C	U	S	S	I	O	N	Z	D	K	S	G
W	D	V	I	O	L	I	Q	U	I	D	Y	E	W	Q
Y	L	M	V	L	O	Z	M	U	F	F	L	E	D	U
L	U	O	O	T	J	P	L	E	A	M	T	L	L	I
V	A	C	U	U	M	C	I	B	I	M	M	M	U	E
I	J	S	H	D	L	L	C	T	R	W	O	A	D	T
G	B	O	I	N	N	O	R	N	C	G	R	H	E	E
Y	L	L	G	J	W	E	W	T	P	H	E	M	A	R
A	C	I	H	T	F	I	S	E	K	O	I	U	R	E
G	G	D	E	W	I	N	D	S	R	L	O	Z	D	G
Q	V	K	R	P	J	K	I	B	L	O	U	D	E	R

pitch

vibrations

vacuum

solid

liquid

higher

lower

ear

air

loudness

louder

quieter

decibels

insulator

less

more

percussion

wind

string

muffle

Sound Investigation 1

Equipment -

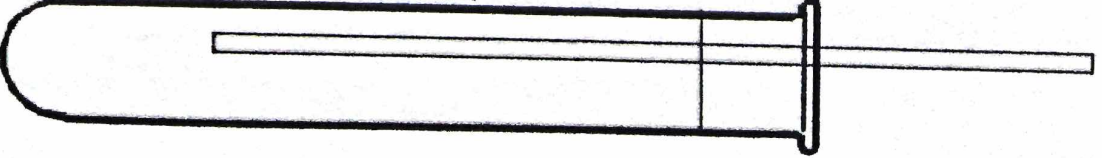
a test tube or empty water bottle, water and a short length of plastic straw

What to do -

1. Fill the test tube or water bottle with water.
2. Put the straw into the water.
3. Blow across the top of the straw and listen to the sound it makes.
4. Try moving the straw up and down as you blow across the top of it.

What effect did moving the straw up and down have on the sound produced when you blew across the top of the straw?

Why does this happen?





Changing Sounds

Sound is a form of energy. For sound to be produced vibrations must be set up by a source. This is done by hitting (drum), blowing (recorder), stroking (sand paper on wood) and electrical (loudspeaker).

The vibrations travel through a solid liquid or gas and reach our ears where it can be heard. If the vibrations have a lot of energy then they are loud. If they have little energy then the sound is quiet. Sometimes the vibrations can be seen or felt on the skin.

In air, sound travels at 1,160 km per hour, but speeds up in water to 5,400 km per hour. Things which travel faster than sound are called supersonic. The Concorde can travel faster than sound.

Dolphins communicate with each other under the sea. The sound can travel for hundreds of miles, much further than in air. Sound travels even more quickly through a solid metal than through the air or water. Standing near a railway line, a humming from the rails can be heard several minutes before a train itself can be heard directly.

Sound travels through solids and liquids as well as air. Sound cannot travel through a vacuum. Sound travels at different speeds in different substances. This is because different substances are made up of particles in different ways. The sound pushes the particles and as it travels it moves from one particle to another. In a gas the particles are far apart, so some of the sound energy is lost when trying to push one particle into another one. Therefore the speed of sound is slow so it will not travel as fast as it does in substances where the particles are closer together.

Pitch is the highness or lowness of a sound. A high pitch is caused by short vibrations and a low pitch is caused by long vibrations.

The pitch of a note produced by a guitar depends on the *length*, *thickness* and *tension* of the string. A shorter, thinner, tighter string produces a high pitch and a longer, thicker, looser string produces a low pitch. On a guitar the strings can be shortened by putting a finger on the fret board.

In a wind instrument a column of air is set vibrating and the pitch depends on the length of the column. A long column makes a low pitch and a short column makes a high pitch.

The loudness (volume) of the sound depends on the amount of energy the vibrations contain and the rate at which this energy is transmitted. If a string is plucked hard the vibrations will contain more energy and the sound will be louder than if it were plucked more gently.

Questions

1. What is sound?
2. How is sound produced?
3. What do sound vibrations travel through?
4. Through which substance does sound travel fastest?
5. Why is this?
6. Why do you think sound cannot travel through a vacuum?
7. What is pitch?
8. How would you create a high pitch on:
 - a. A guitar?
 - b. A recorder?
 - c. A drum?
9. What does the volume of sound depend on?
10. How would you play a drum quietly?
11. How much energy do you think the vibrations would have if you did this?
12. If the vibrations had lots of energy, what would the volume be like?



Sound Investigation 2

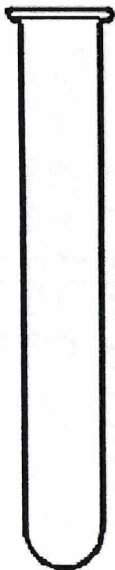
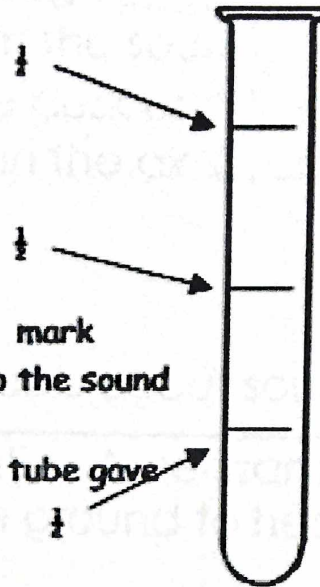
Like sound investigation 1 you could use empty plastic bottles too- just make sure they are the same size

Equipment -

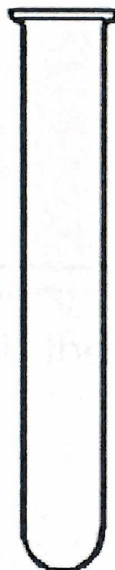
3 test tubes, water, a small spoon

What to do -

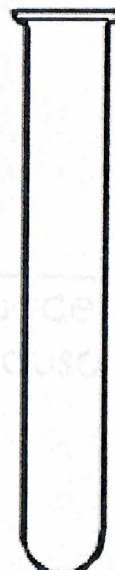
1. Put water in the three test tubes up to the $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ mark
2. Gently tap the sides of the test tubes and listen to the sound that is made.
3. On the test tube pictures below record which test tube gave the highest, lowest and middle sound.



Highest
Sound



Middle
Sound



Lowest
Sound

The test tube with the _____ water gave the highest sound. Why?

The test tube with the _____ water gave the lowest sound. Why?

Sound

Sound is made by _____. It travels through the air in _____. Sound can also travel through _____ and _____. If I cover my ears and hum the sound is travelling through _____. When I put my _____ on the desk and listen to a pencil tapping the sound is _____ than in the air. Sound travels better through _____ than _____.

Draw a picture to illustrate these four facts about sound.

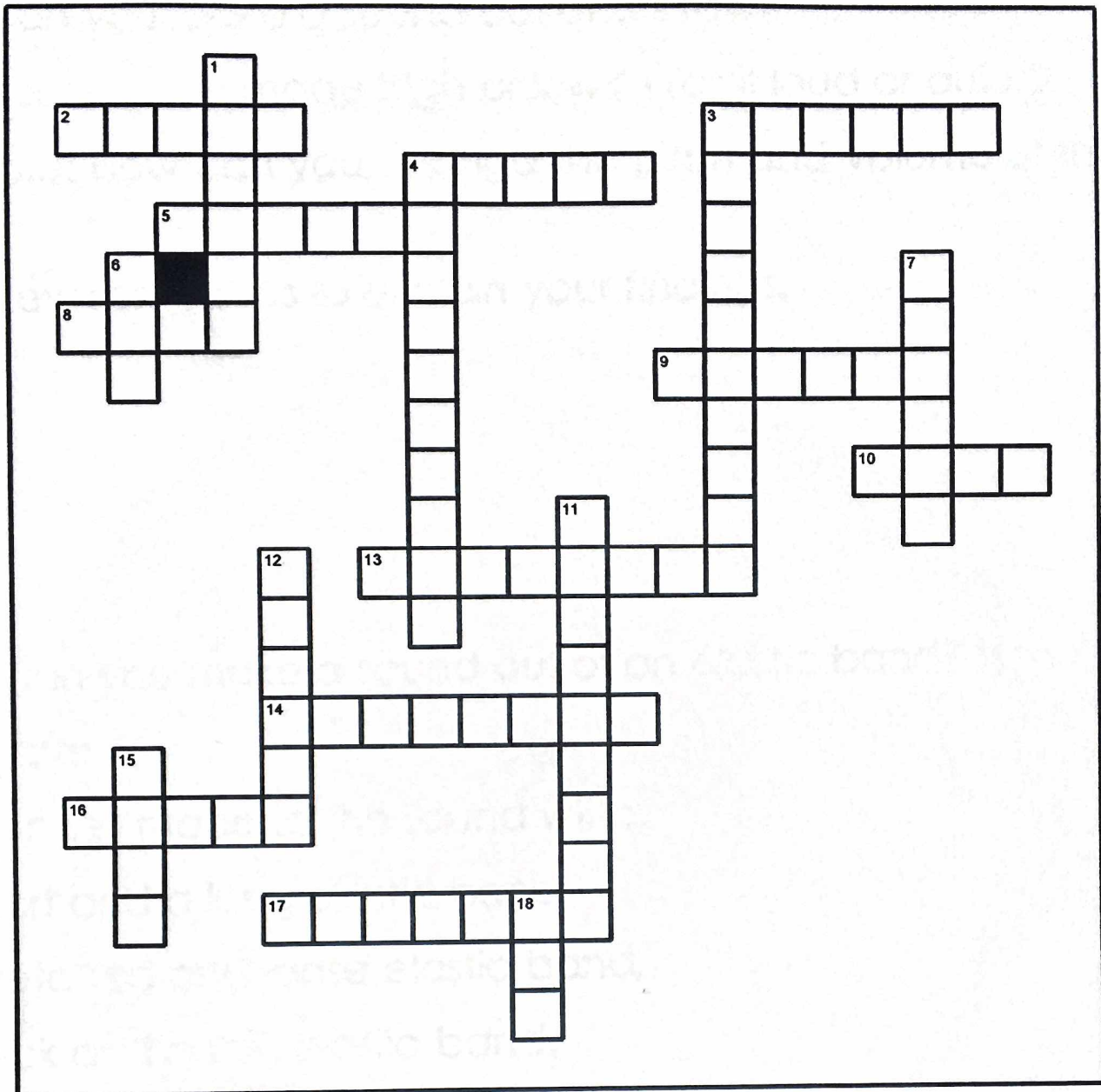
Divers hear better under water.

Native Americans put an ear to the ground to hear the enemy.

Whales don't have ears; they absorb sound through their skin.

In space there is no sound because there is no air.

Sound



Across

2. if you tap a pipe, you can hear sound because it travels through a _____
3. _____ sound cannot travel through this
4. how high or low a sound is
5. make a sound quieter
8. a type of instrument played by blowing into it
9. a type of instrument which is plucked or scraped with a bow
10. to get a lower pitch sound blow into a bottle with _____ water in
13. the volume of a sound
14. sound is measured in these
16. a loose drum skin gives a _____ note than a tight one
17. blowing a recorder gently will give a _____ sound

Down

1. you can hear sounds under water because sound travels in a _____
3. sound is caused by these
4. a type of instrument played by hitting or shaking it
6. sound travels through this mixture of gases
7. plucking a short string gives a _____ sound than a long string
11. carpet is a good _____ of sound
12. hitting a drum harder will give a _____ sound
15. to get a lower pitch sound tap a bottle with _____ water in it
18. the organ in our body which detects sound

Sound Quick Tasks

Task 1: Can you make a sound out of a straw?

Was the sound you made high or low? Was it loud or quiet?

Investigate: How can you change the pitch and volume of the sound?

Write a few sentences to explain your findings.

1) How is the sound made, when you blow into an old straw?

How is the sound made through an old straw made high or low?

Can you explain why this is?

Task 2: Can you make a sound out of an elastic band? How?

Investigate:

The changes made to the sound with:

- A short and a long elastic band,
- A stretched and loose elastic band,
- A thick and a thin elastic band.

What do you notice?

Task 3: If you have finished think carefully about what you have found out. Can you suggest reasons for any of the things you have observed?

These questions might help you:

1) How is the sound made, when you blow into an art straw?

How is the sound made through an art straw made higher or lower?

Can you explain why this is?

2) How do you get a loud sound from an elastic band? Why do you think this is?

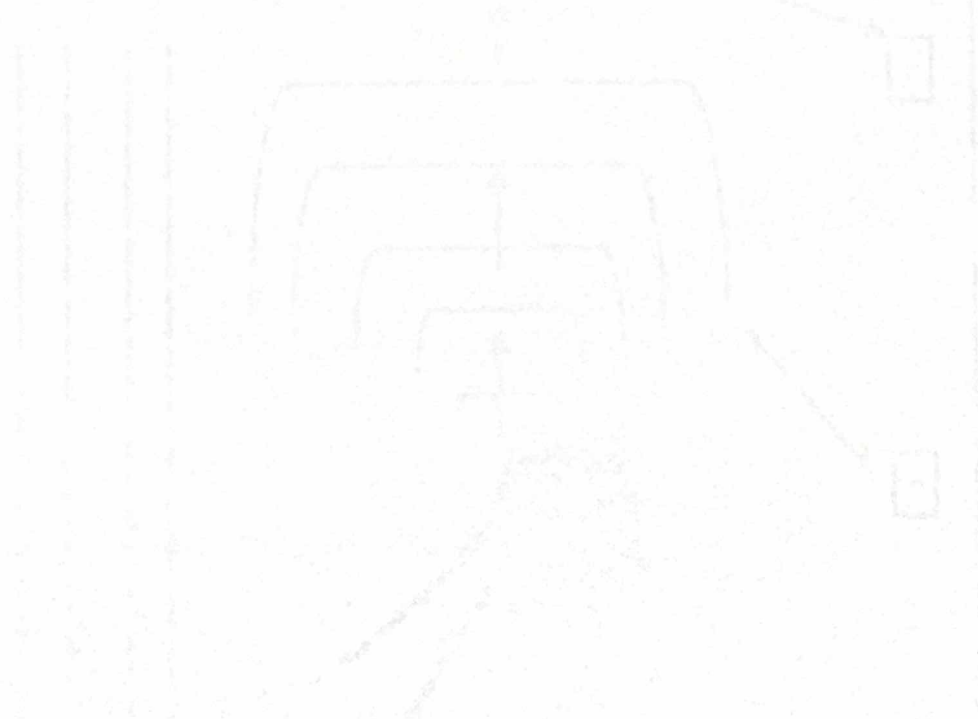
Is there more than one way to change the pitch? Why do you think this is?

Think back to when we made our string telephone. Using information from your findings today, can you explain why it was better to make sure the string was tight when using the string telephone?

The Human Ear

The outer part of the human ear helps to channel sound waves into the ear. The vibrations meet a thin, tightly stretched, skin called the ear drum. The ear drum then vibrates and the vibrations are amplified by the three tiny bones the anvil, the hammer and the stirrup. The vibrations then reach the inner ear which has a long tube with fluid in, called the cochlea. Inside the cochlea there are tiny nerves which send the messages about the vibrations to the brain. Having two ears helps us to locate the direction of sound more clearly as sounds are heard more loudly in one ear or the other ear, depending on where the sound is. When a sound is directly in front of you or behind you the sound reaches both ears at the same time and it is difficult to tell where it is coming from.

1. What does the outer ear do?
2. What is the tightly stretched skin called?
3. What is the name of the 3 tiny bones in your ear?
4. What two things does the cochlea have inside it?
5. Why is it useful to have two ears?
6. What things have eyes and ears got in common?



The Ear and Sound

