

Sound and hearing 1

How sounds get to our ears

1. *What are some of the sounds you would hear if you were camping on a quiet night?*
2. *How would you feel if you couldn't hear anything?*

When you listen to something the sound comes through the ear and it hits the eardrum, then it goes to your brain. Your brain quickly thinks about it and then you will know what to do.

Sound is made by something that vibrates. Vibrate means to move quickly backwards and forwards.

Science experiment:

If you stretch a rubber band between your hands and pluck it, the rubber band will move back and forth and make a humming sound.

The hum you hear comes from the vibrations of the rubber band. If you touch the rubber band while it is still humming the hum will stop. This is because you have stopped the vibrations.

Place your finger on your throat and hum. You will feel the vibrations. Sound vibrations travel to your ears through the air around us. Sound vibrations traveling through the air are called sound waves.

3. *What are vibrations?*
4. *How do sound vibrations get to our ears?*

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The outside of the ear

On the outside, we see the ear flaps. They are the sound collectors. They are called the *pinnae*.

Why do we have two ears?

The sound from one direction reaches one ear a tiny bit sooner than the other. Our brain tells us which direction the sound has come from. Then we can turn in that direction.

Try cupping your hand around your ear while you are listening to something. By doing this you will make a larger sound collector and hear the sound more clearly.

Many animals have bigger and better sound collectors than we do.

Animals can turn their ear flaps to the direction of the sound. If you clap your hands near your dog or cat when it's having a sleep, it will turn the ear flaps to pick up the sound.

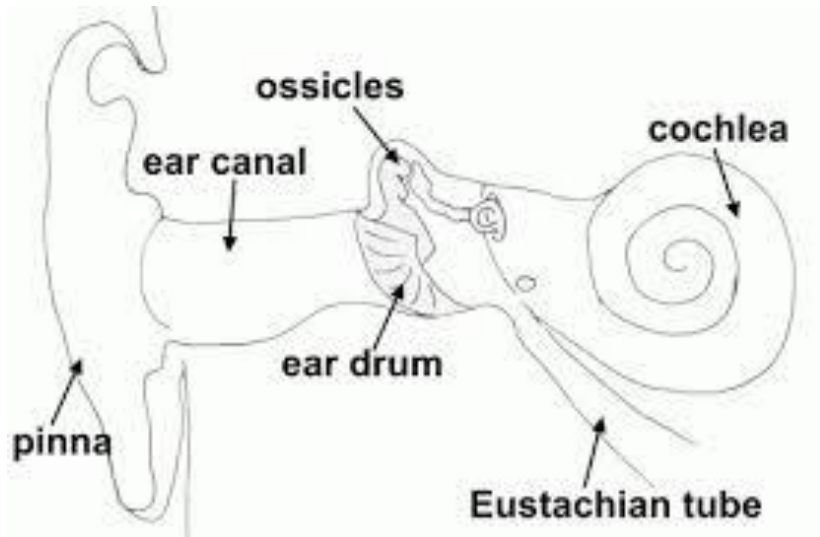
1. *What are the ear flaps called?*
2. *Write and draw two animals that have bigger ear flaps than we do. Show the ears.*

The sense of hearing 3 Inside the ear

There are hairs in our ears that are connected to nerves. The nerves carry the sound to the brain. That's when we 'hear' sound.

Never poke anything into your ear because it could get stuck in your ear or you could make a hole in the ear drum. Then it couldn't vibrate properly and you couldn't hear properly.

Draw and label this picture of the ear.



Sound and hearing 4 Inside the ear

The inside of the ear has different rooms and pathways. The pathways take twists and turns. It begins with the *ear canal*. The ear canal has some hairs and sticky ear wax to trap dirt and stop insects from getting in.

It leads to the *middle ear*.

Stretched across the entrance to the middle ear is the *ear drum*.

The ear drum is a thin piece of skin that vibrates (shakes) when sound reaches it. Behind the ear drum is an open space filled with air. Three tiny bones go across this space. These bones make the sound louder. They are called the *hammer*, the *anvil* and the *stirrup*. Together they are known as the *ossicles*.

The stirrup touches another piece of thin skin called the *oval window*. It covers the entrance to the *inner ear*.

Inside the inner ear is a twisty tube called the *cochlea*. It is shaped like a snail shell. It is filled with liquid and also has thousands of tiny hairs which move back and forth as sound vibrations make the liquid move.

The hairs are connected to nerves which carry sound messages to your brain. That's when you 'hear'.

1. Which two parts are made of thin skin?
2. What do the three little bones do?

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Vibrations

All sounds are made by something vibrating (shaking back and forth very fast). Sound vibrations are called sound waves. They travel through the air, through water and through solid things. When the vibrations reach our ears, we hear the sound.

When you play a musical instrument, part of the instrument vibrates. That makes the air vibrate. The vibrating air travels to your ear and the inside of your ear vibrates. That's when you hear.

Most sounds reach us through the air. We hear voices this way. We make a sound when our vocal cords vibrate. If you put your hand on your throat and make a sound you can feel the vibration.

Did you know that your voice sounds different to you compared with the way other people hear it? This is because you hear your own voice not just through air, but through the bones in your head.

1. *Draw a picture to show this: a guitar string is vibrating. This makes the air vibrate and it reaches your ear.*
2. *What can sound travel through?*

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Types of sounds

Sounds can be very high-pitched, like a high singing voice. Sounds can be low-pitched like a low singing voice.

Sounds can be loud or soft. Very loud noises make the tiny parts inside your ear vibrate too much. This can cause you to become deaf. Never shout in someone's ear. Keep the volume turned down if you are listening to music through headphones. A loud music concert can make your ears ring for hours afterwards. That's a sign that the loud sound was damaging your ears.

Think of all the beautiful sounds we can hear. God gave us the gift of music. Birds make beautiful music. Think of sounds that make us happy. Laughter makes us happy.

We need to take good care of our ears.

1. Which animal can make a high-pitched sound?
2. Which animal can make a low-pitched sound?
3. How can we damage our ears?
4. What are some of the beautiful sounds God has given us?
5. What sound makes you happy?

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Questions and answer about ears

Work with a partner. One can ask the questions. The other can guess the answers.

Where are the tiniest bones found in our bodies?

Answer: in our ears

Why do our ears have flaps on the outside?

Answer: They are sound collectors.

Try cupping your hands around your ear while you are listening to something. You will make a larger sound collector and hear the sound more clearly.

Which animals have bigger sound collectors than humans?

Answer: many animals, e.g. elephant

What is the inside of your ear like?

Answer: It is like a set of rooms with entryways which take twists and turns.

What is the entry way closest to the outside?

Answer: the ear canal

What is in the middle of your ear?

Answer: an ear drum

How does an ear drum help us to hear?

Answer: It has a thin piece of skins stretched across it that vibrates, (shakes) when the sound reaches it.

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Make a drum

What you will need:

A balloon

Scissors

A strong elastic band

A can with both ends removed

What to do:

Blow up the balloon and leave it for at least 2 hours so that it can stretch.

Carefully cut the end off the balloon. Try not to burst it. Let the air out slowly.

Cut a large circle out of the balloon with scissors, Stretch the circle over the tin can and secure it with an elastic band.

The balloon is like a skin on a drum. It vibrates as you hit it with your fingers. This makes the sound.

1. What other materials are used to make different types of drums?
2. Why does the skin need to be stretched?
3. The vibrations are travelling through the _____ to our ears.



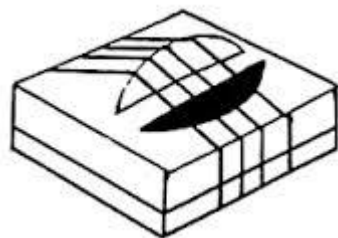
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Make a guitar and a xylophone

Guitar:

What you need:

A small cardboard box
Rubber bands



What to do:

- Cut the front out of the box.
- Stretch the rubber bands across the open part of the box.
- Watch the rubber bands vibrating to make the sound.

The rubber bands vibrate the air and travel to our ears.

Xylophone:

What you will need:

5 glasses
A jug of water

What to do:

- Fill 5 glasses with different amount of water.
- The first has only a little, the next has a bit more, the next one has a bit more and the last one is full.
- Use a metal spoon to hit the glasses.

1. Which glass makes the highest sounds?
2. Which makes the lowest?
3. What is vibrating this time?

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Make some pan pipes

What you need:

8 straws
Tape

What to do:

Cut the straws into different lengths.
Place them in order of shortest to longest and tape the together at one end.

To play your pan pipes, blow gently across the top of each pipe. You will find that the longer pipes make a lower sound than the shorter pipes.

1. Which musical instruments are played by blowing?
2. What is vibrating?

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Make a shaker

What you need:

Paper cups
Plastic bottles with lids
Rice, lentils, dried beans or peas, sand or pebbles

What to do:

To make a paper-cup shaker, put a handful of rice or lentils into one cup. Turn another cup upside down and tape the two cups together rim to rim.

To make plastic bottle shakers, pour a handful of dried peas or beans into the bottle and put the lid on tight.

Try making shakers with different sized bottles. You will find that the larger bottles which hold more make deeper sounds.

Experiment with the different fillings. You will find that paper cup shakers with lentils or rice make a softer sound than the plastic bottles with dried beans or peas.

1. Which shaker made the louder sound?
2. Which shaker made the lower sound?

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Make some telephones

What you need:

2 clean, empty cans
A nail
A hammer
A piece of string about 6 metres long

What to do:

- Ask an adult to help you make a hole in the bottom of each can using a hammer and nail.
- Push one end of the string through the hole through the open end of the can to the outside.
- Tie a very big knot (or several knots) to stop the string slipping through.
- Take the other end of the string and thread it through the other can. Tie a knot in the end.
- Give one can to a friend. Walk apart from each other until the string is pulled tight. The string must be very straight and must not touch anything.
- Take turns in talking to each other. One person listens by holding the can to the ear and the other person speaks softly into his/her can.

1. What is vibrating?
2. The sound is of your voice is traveling along the

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Animal communication

Mammals use their sharp sense of hearing to find food, keep out of danger, attract mates and to guard their homes.

Bats hunt at night, using sound to find food, and to find their way around. A bat makes lots of high squeaking sounds, which hit objects, such as insects. The sounds then send back echoes, which the bat picks up with its sharp sense of hearing. It can tell from the echoes what and where the object is. This is called radar.

Dolphins use a similar method of sending messages through the water. This is called sonar.

Whales send messages to each other by singing underwater. They have very loud, but very low voices.

Monkeys get together in groups and make loud noises to keep other monkeys away from their trees.

Choose three animals and describe the sounds they make. Explain why they make these sounds.

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People who cannot hear

Our ears are a special gift from God. But sometimes people are born unable to hear. They are born deaf. This is not how God intended it to be in His perfect creation, but because sickness and suffering came into the world after Adam and Eve sinned, not everything is perfect anymore.

Jesus healed many people who were deaf. How wonderful it was for them to hear for the first time!

People who are born deaf are unable to speak, because to learn to speak we have to be able to hear and repeat the sounds we hear. These people use a special sign language to communicate. They can also learn to understand what people are saying by lip reading.

Some people lose their hearing after sickness, an accident or exposing their ears to very loud noise. They may still have a little bit of hearing, but things sound very soft. These people can use a hearing aid, which is an electronic device placed in the ear to make the sound louder and clearer. If we know that someone cannot hear very well, we should always make sure that we are looking directly at them before speaking.

1. How can people who have hearing problems be helped?
2. How can we communicate with someone who cannot hear, or cannot hear very well?