

Introducing Particles and Waves

Activity 1 - Particles

Everything is made up of tiny **particles**.

The **particles** are so tiny, we can't see them - Even if we use a microscope.

discuss **write**



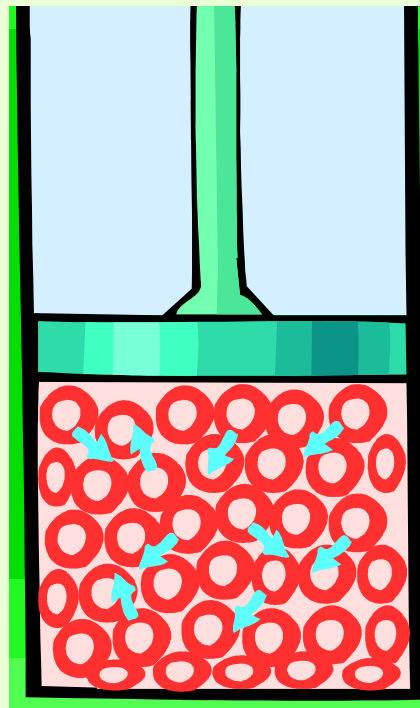
- What do we call these **particles**?
- Do the **particles** stay still? - Or do they move about?

teacher demo **write**



Your teacher will show you a "particle demonstration".

- Describe what you see.



discuss **write**



The **particles** in the demonstration have **energy**.

- How do you know the **particles** have energy?

Activity 2 - Waves

People don't realise that **waves** are all around us all of the time.
Waves carry **energy** from one place to another.

discuss **write**



- Where have you observed **waves**?
- Give as many examples as you can.
- How do we know that **waves** carry **energy**?
(Hint - Think of a "natural disaster").

Waves travel in **2** different ways.

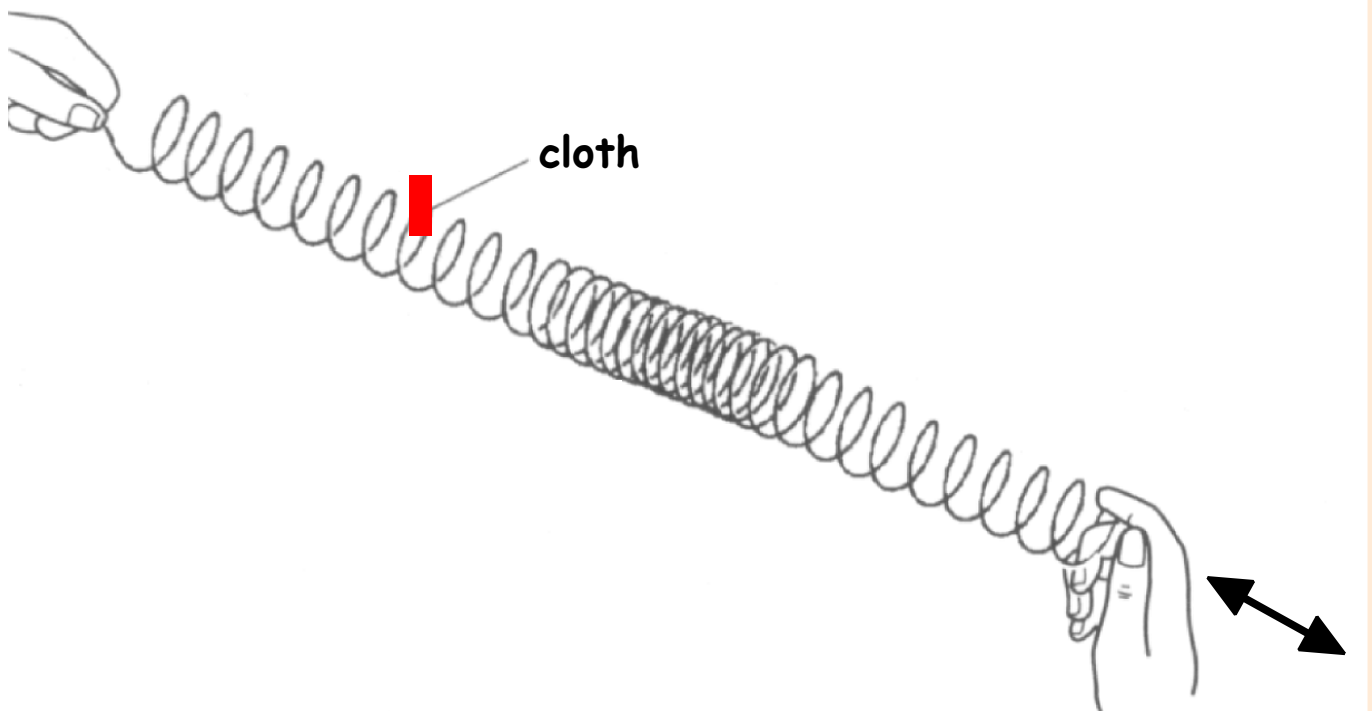
1) Longitudinal Waves

experiment



You will be given a long spring with a piece of cloth tied to it.

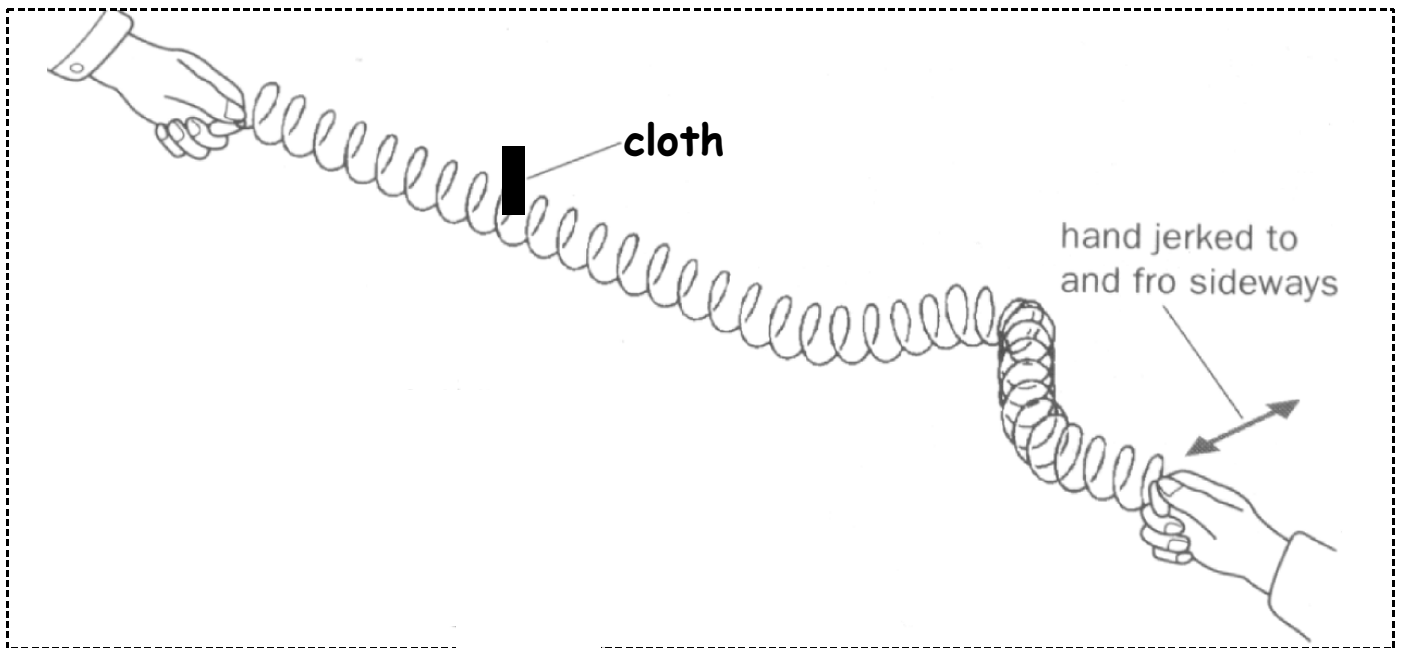
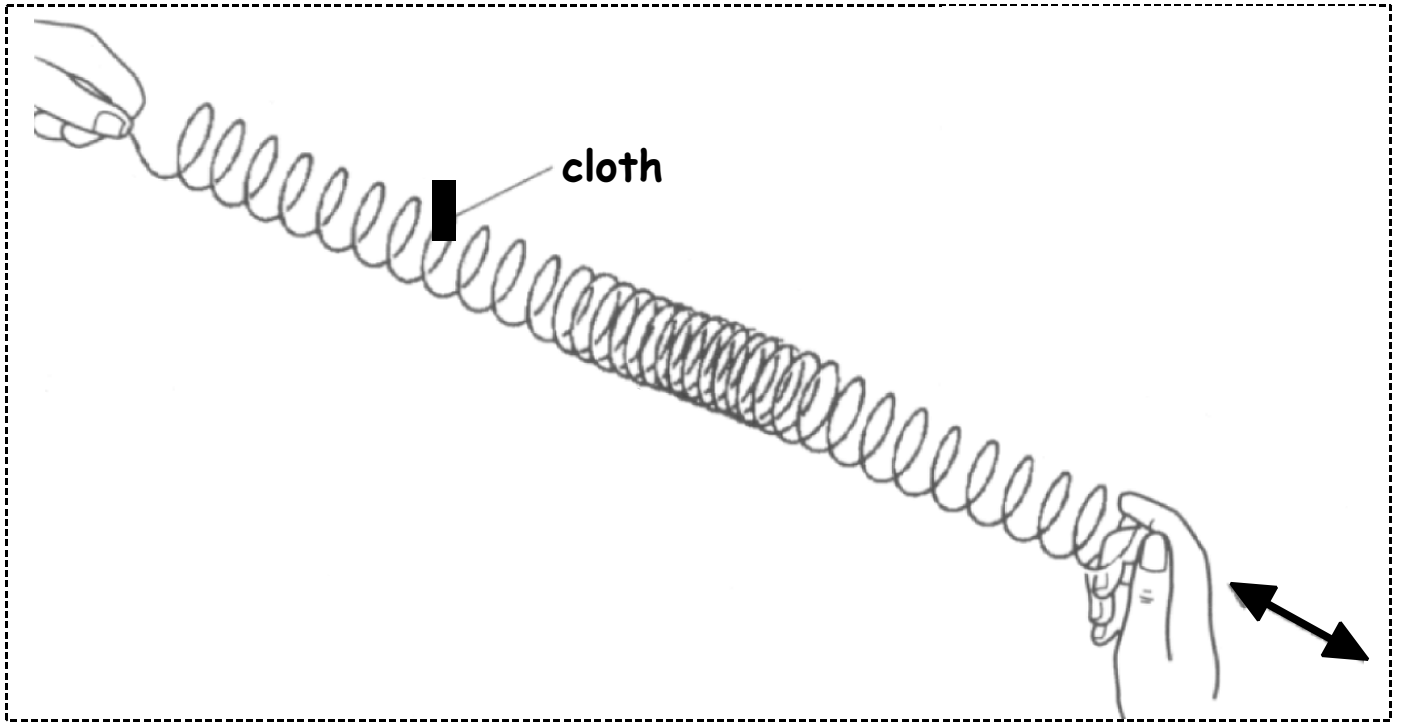
- With a partner, move one end of the spring "back and forward", as shown in the diagram. This sends "pulses" of **energy** along the spring.



discuss **write**



- In which **direction** do the pulses of **energy** travel?
- How do the **particles** in the spring **move**?
(HINT - Watch how the piece of cloth moves).



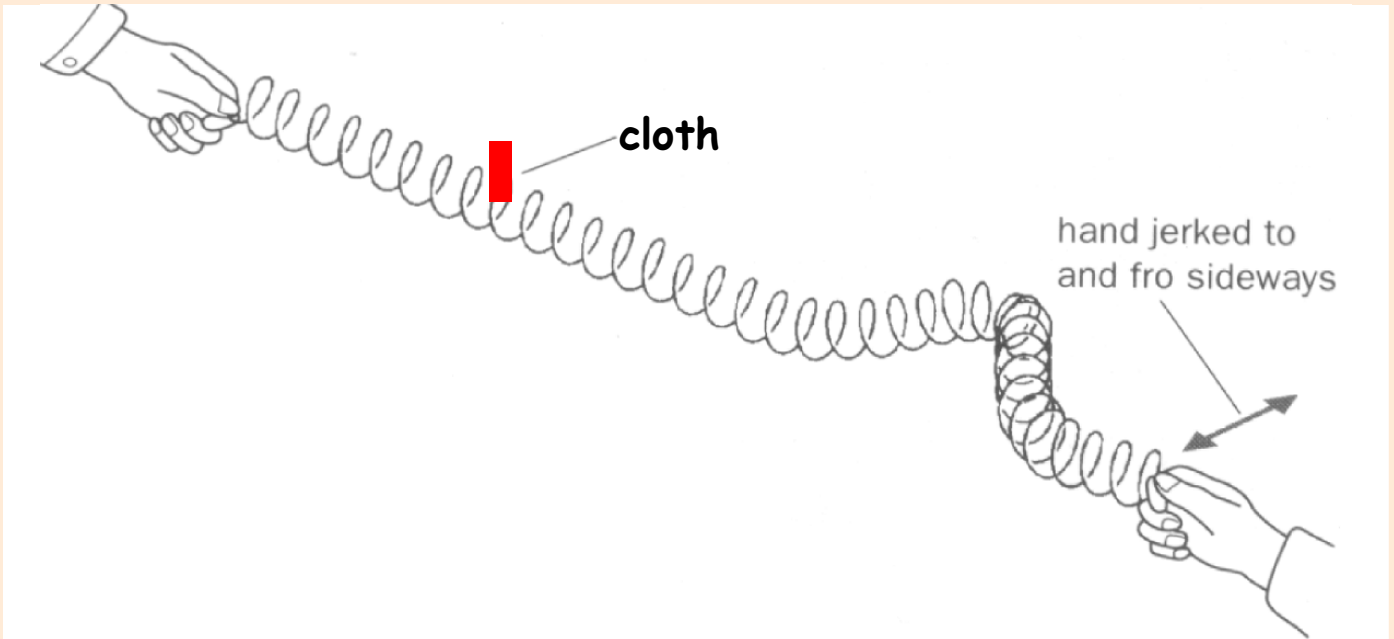
2) Transverse Waves

experiment



Use the same long spring with the piece of cloth tied to it.

- With a partner, move one end of the spring "to and fro sideways", as shown in the diagram. This sends "pulses" of **energy** along the spring.



discuss write

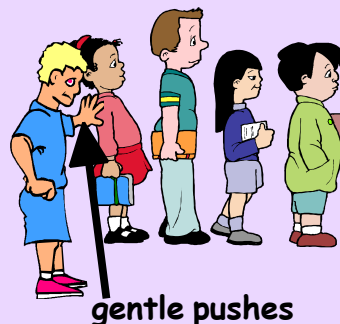


- In which **direction** do the pulses of **energy** travel?
- How do the **particles** in the spring **move**? (HINT - Watch how the piece of cloth moves).

experiment



- Model **longitudinal wave motion** with a line of pupils.



discuss write



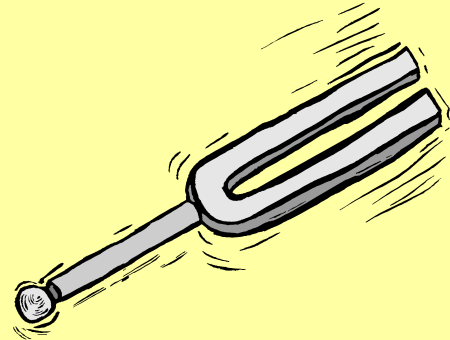
- In which **direction** do the pulses of **energy** travel?
- How do the **pupils** in the line move?
- How could you model **transverse wave motion** with a line of pupils? (HINT - "Mexican Wave").

Try out your idea.

Vibrating Objects and Sound Waves

When an object **vibrates**, it moves **back and forward** about the same place.

Activity 1 - Tuning Fork



experiment **discuss** **write**



You will need a **tuning fork**, **cork** and **beaker of water**.

1) Tap the **tuning fork** gently on the **cork**.

- What do you hear?

2) Tap the **tuning fork** again, then gently touch the prongs.

- What do you feel?

3) Tap the tuning fork again, then gently put the prongs onto the surface of the water in the beaker.

- What do you see?
- What is the tuning fork giving to the water?

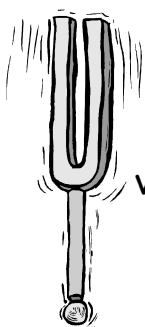
discuss **copy**



When an object **vibrates**, it makes the **air particles** next to it **vibrate**.

These **air particles** **bump into** the **air particles** next to them, making them **vibrate**.

In this way, **sound energy** is carried through the **air** - The **vibrating air particles** form a **sound wave**.



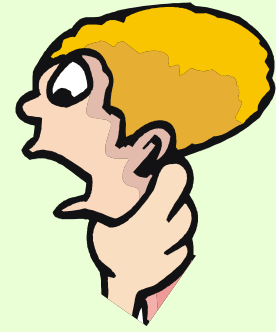
vibrating tuning fork



vibrating air particles - a **sound wave**

- From what you learned earlier, do you think a **sound wave** is a **longitudinal wave** or a **transverse wave**?

Activity 2 - Human Voice



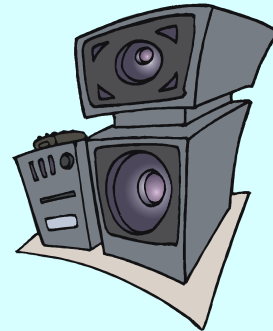
experiment discuss write



Gently put your fingers on your throat. Speak or sing quietly.

- What do your fingers feel?
- What do you think is happening inside your throat?
- Explain how the **sound** of your **voice** travels through the **air**.

Activity 3 - Loudspeakers



experiment discuss write



A **loudspeaker** gives out **sound energy**.

Loudspeakers are used in devices such as mobile phones and radios.

- Think of some other devices which contain **loudspeakers**.

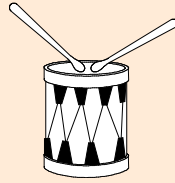
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- 1) Your teacher will show you a large **loudspeaker**. Gently touch the **loudspeaker** when it is giving out **sound energy** and some **small pieces of paper** have been placed on it.
 - What do you see and feel?
 - 2) Your teacher will give you some apparatus and show you how to make a model **loudspeaker**.
 - (i) Connect the **iron core** and **wire coil** to the **d.c.** terminals of a **power pack** and try to pick up some **steel paper clips**.
 - What happens when the **power pack** is switched **on** and **off**?
 - Why does this happen?
 - (ii) Connect the **iron core** and **wire coil** to the **a.c.** terminals of a **power pack** and place a **steel can lid** on the **iron core**.
 - What happens to the **steel can lid**?
 - Why does this happen?

Activity 4 - Musical Instruments

discuss write



- How do you think each of these **musical instruments** produce **sound energy**?



Activity 5 - What Does Sound Travel Through?

experiment discuss write



1) **Wood** is a **solid**. The tables in the lab are made of **wood**.

Put one ear on the table and **tap** gently on the table.

- Does **sound energy** travel through **solids** like **wood**?

2) **Water** is a **liquid**.

Think about the last time you had a bath or went swimming.

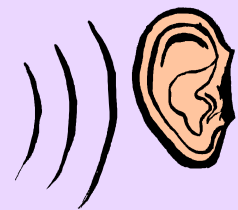
- Does **sound energy** travel through **liquids** like **water**?



3) **Air** is a **gas**.

Listen to what is going on around you.

- Does **sound energy** travel through **gases** like **air**?



4) Your teacher will show you an **electric bell** in a glass **bell jar** which is full of **air**.

- Can you hear the bell ring?

- Explain why.

Your teacher will now pump the **air** out of the jar.

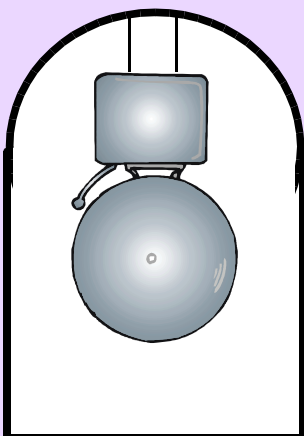
This creates a **vacuum** in the jar.

- What is a **vacuum**?

- Can you hear the bell ring now?

- Explain why?

- Why do you think that "**outer space**" is **very quiet**?

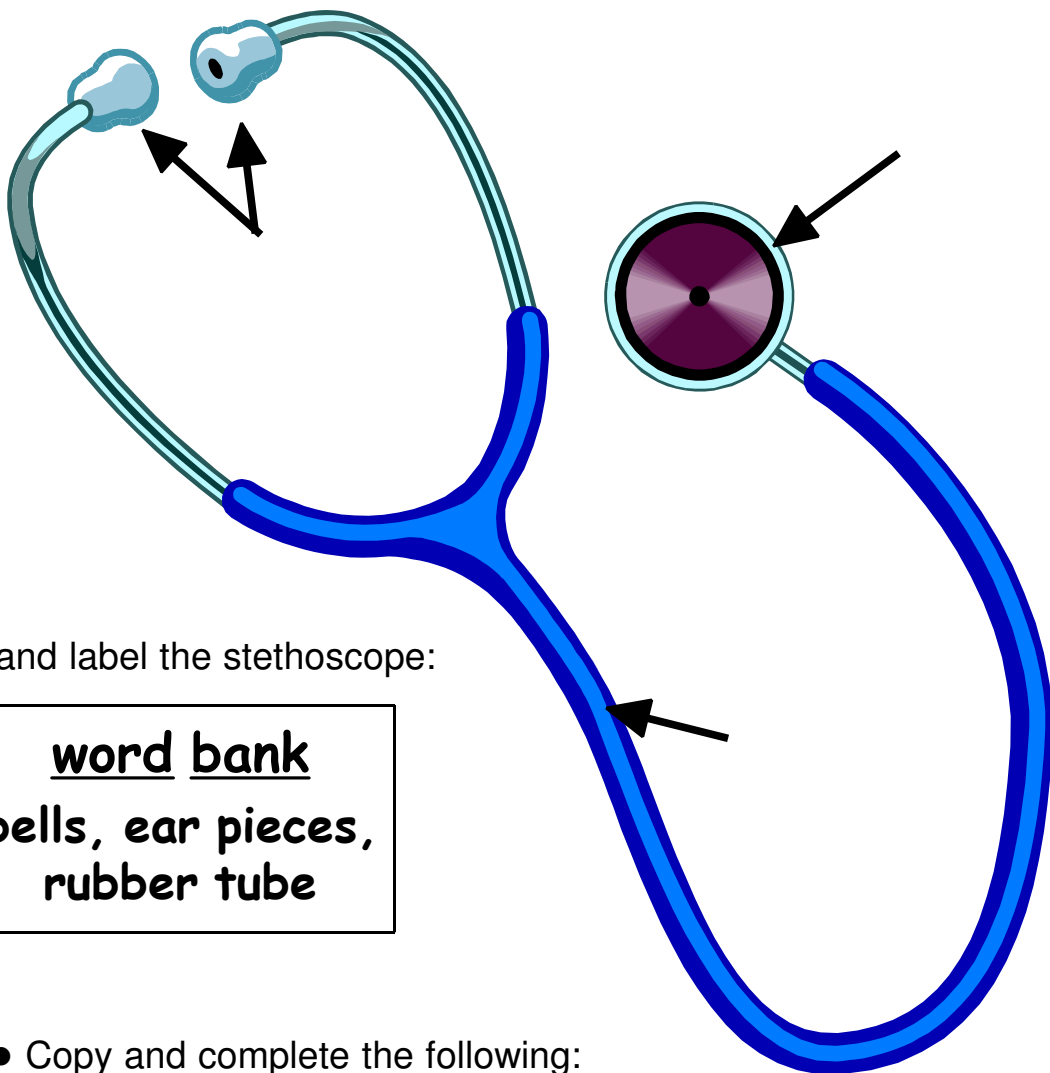


The Ear and Hearing

The STETHOSCOPE

- Your teacher will let you look at and use a **stethoscope**.

YOU MUST BE EXTREMELY CAREFUL WHEN YOU HAVE A STETHOSCOPE IN YOUR EARS. NEVER LET ANYONE SHOUT INTO YOUR STETHOSCOPE OR HIT THE END - THIS COULD BADLY DAMAGE YOUR HEARING.



- Draw and label the stethoscope:

word bank
bells, ear pieces,
rubber tube

- Copy and complete the following:

word bank
air, back, bell, bell, chest, ears, sound, vibrations

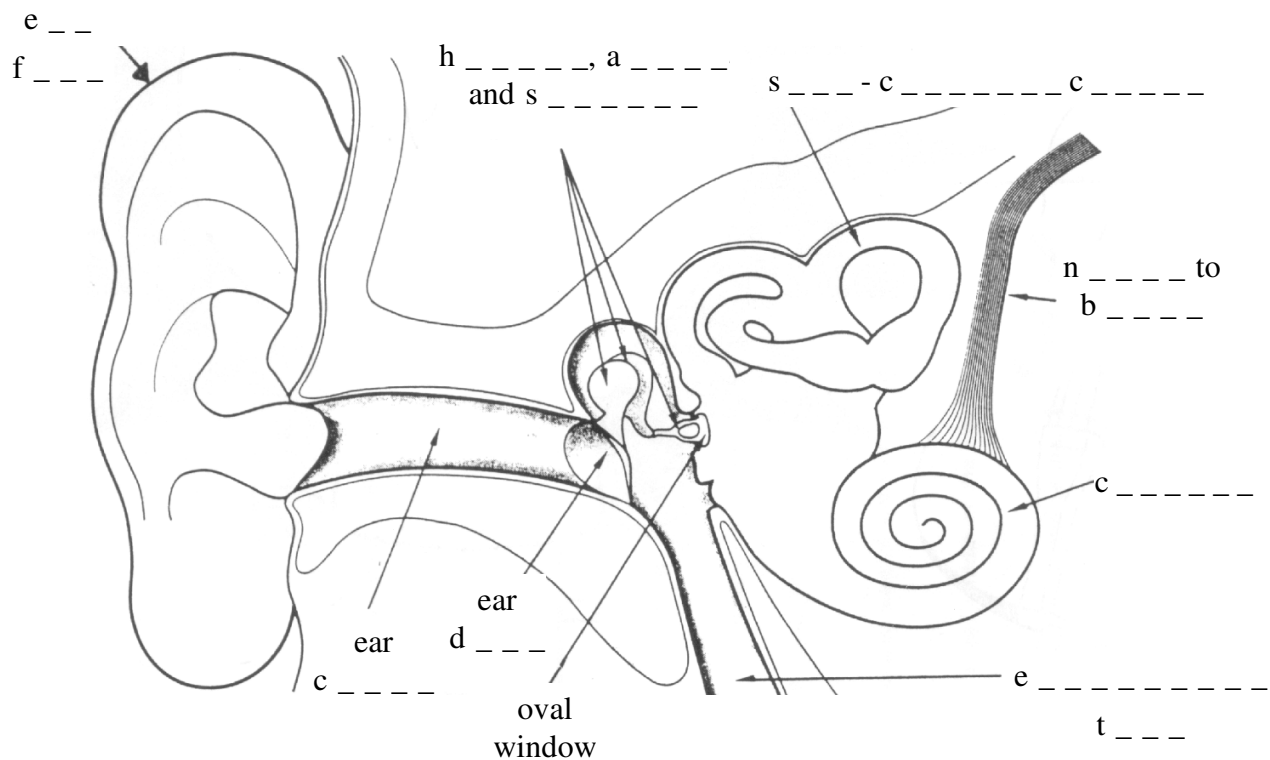
The _____ of the stethoscope is placed on the patient's _____ or _____. The _____ picks up _____ which pass through _____ in the rubber tubes to the doctor's _____.

The Ear and Hearing

- Look carefully at this labelled diagram of a **human ear**:

- Collect the diagram below and stick it into your notebook.

Label the diagram and complete the explanation of how we **hear sound**:



V _____ in the air (s _____ waves) are funnelled into the ear c _____. This makes the ear d _____ start to v _____. Movements of the ear drum make three small b _____ (the h _____, a _____ and s _____) v _____. The vibrations make l _____ inside the snail-shaped c _____ vibrate against sensitive h _____ cells that line the cochlea tube. Their movement sends e _____ signals along n _____ to the b _____.