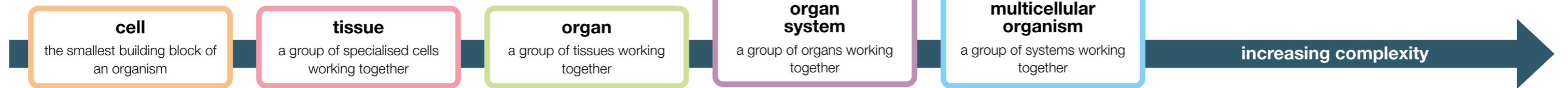


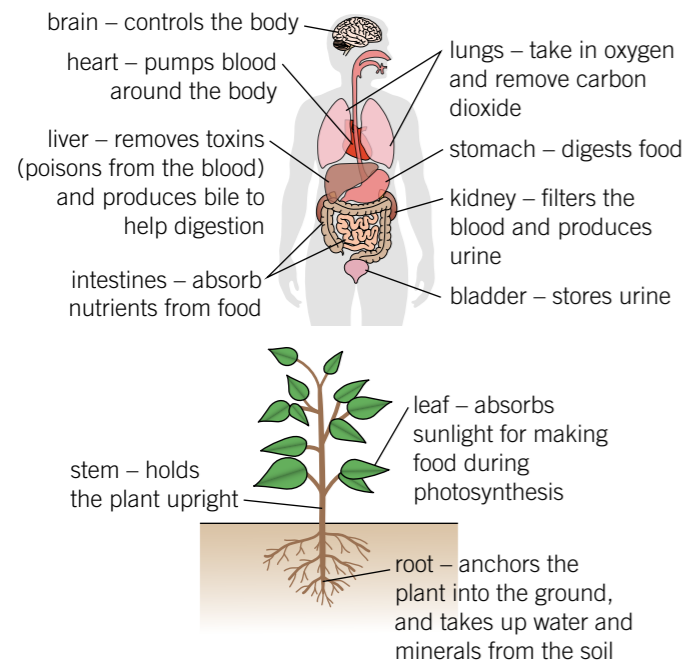
# B1 Chapter 2: Structure and function of body systems

## Knowledge organiser

**Multicellular** organisms are made up of many cells and have five levels of organisation:



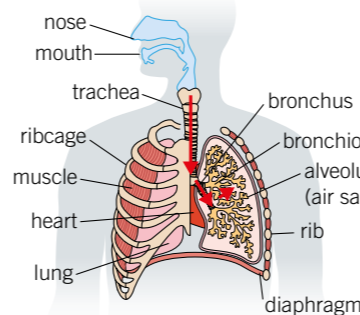
### Plant and animal organs



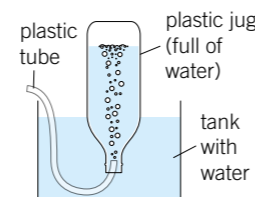
### Respiratory system

The respiratory system is involved in:

- breathing in oxygen (for **respiration**)
- breathing out waste carbon dioxide.



### Measuring lung volume



When you breathe out fully into the plastic tube, air from your lungs pushes water out of the bottle.

**volume of air in the plastic bottle**

=  
**lung volume**

### Skeleton

All the bones in your body make up your skeleton.

The four main functions of the **skeleton** are to:

- support the body
- protect vital organs
- help the body move
- make blood cells (in the **bone marrow**).

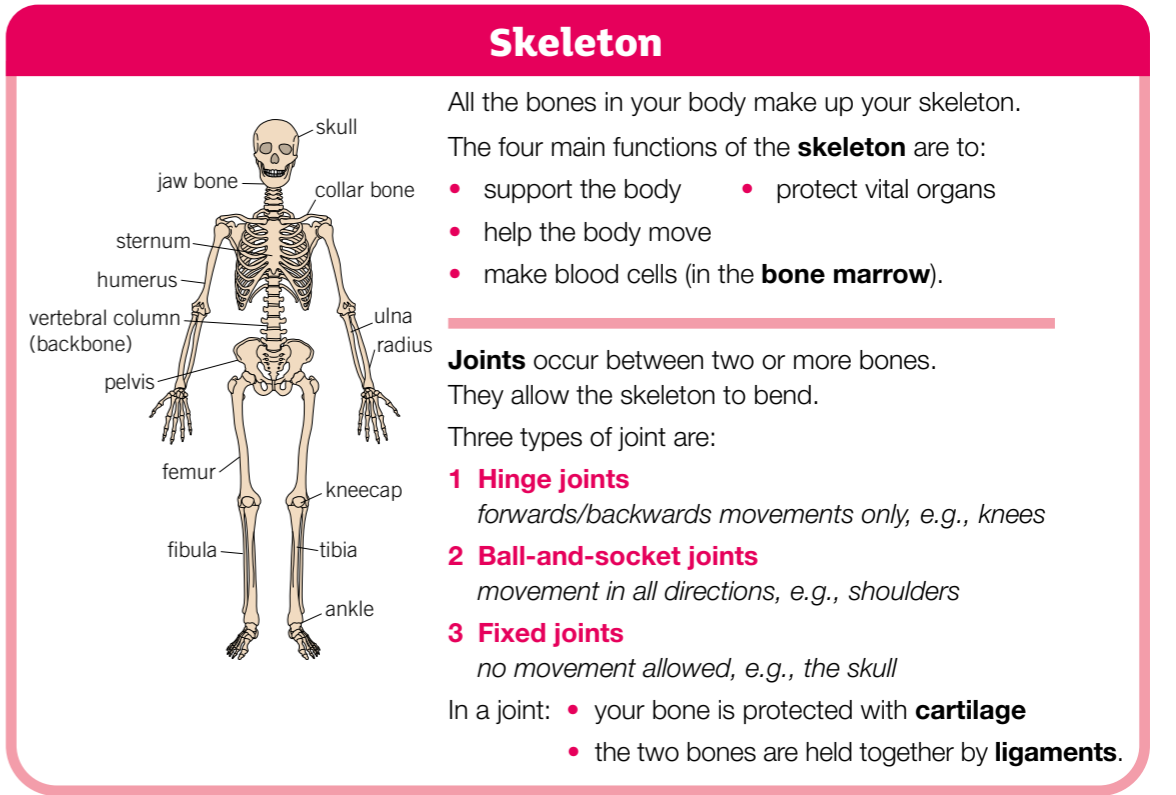
**Joints** occur between two or more bones. They allow the skeleton to bend.

Three types of joint are:

- Hinge joints**  
forwards/backwards movements only, e.g., knees
- Ball-and-socket joints**  
movement in all directions, e.g., shoulders
- Fixed joints**  
no movement allowed, e.g., the skull

In a joint:
 

- your bone is protected with **cartilage**
- the two bones are held together by **ligaments**.



### What happens when we breathe?

When you breathe in (inhale)	composition of inhaled air:
<ul style="list-style-type: none"> <li>muscles between ribs contract</li> <li>ribs are pulled up and out</li> <li>diaphragm contracts and flattens</li> <li>volume of the chest increases</li> <li>pressure inside the chest decreases</li> <li>air rushes into the lungs</li> </ul>	<p>oxygen, O<sub>2</sub> 20.96%</p> <p>carbon dioxide, CO<sub>2</sub> 0.04%</p> <p>nitrogen, N<sub>2</sub> 79.00%</p>
When you breathe out (exhale)	composition of exhaled air:
<ul style="list-style-type: none"> <li>muscles between ribs relax</li> <li>ribs are pulled in and down</li> <li>diaphragm relaxes and moves up</li> <li>volume in the chest decreases</li> <li>pressure inside the chest increases</li> <li>air is forced out of the lungs</li> </ul>	<p>oxygen, O<sub>2</sub> 16.00%</p> <p>carbon dioxide, CO<sub>2</sub> 4.00%</p> <p>nitrogen, N<sub>2</sub> 79.00%</p>

### Muscles

Muscles are a type of tissue – lots of muscle cells work together to cause movement.

Types of muscle include:

- cardiac (heart) muscle**
- smooth muscle**
- skeletal muscle**

Muscles are attached to bones by **tendons**.

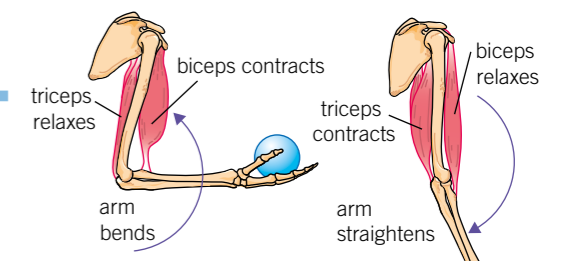
Muscles produce movement by **contracting** (getting shorter).

If a muscle contracts it pulls the bone, causing it to move.

#### Antagonistic muscles

Pairs of muscles that work together are called **antagonistic** muscles. When one contracts the other relaxes.

For example, *biceps* and *triceps* work together to bend and straighten the forearm.



### Key words

Make sure you can write a definition for these key terms.

alveolus antagonistic bone bone marrow cell contract cartilage diaphragm exhale inhale joint ligament lung multicellular organ organ system respiration respiratory system ribcage skeleton tendon tissue trachea volume



### Human reproduction

#### Adolescence

The time during which you change from being a child to being an adult is called **adolescence**. The physical changes that happen between the ages of 9–14 are called **puberty**.

These changes include:

#### Females

breasts develop, ovaries start to release egg cells, periods start, hips widen,

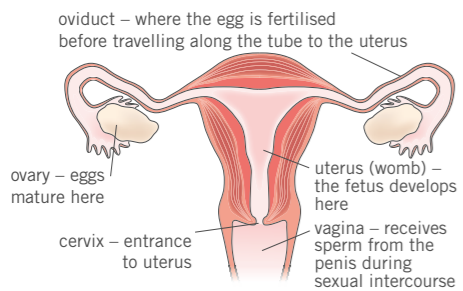
pubic and underarm hair grows, body odour develops, emotional changes, growth spurt

#### Males

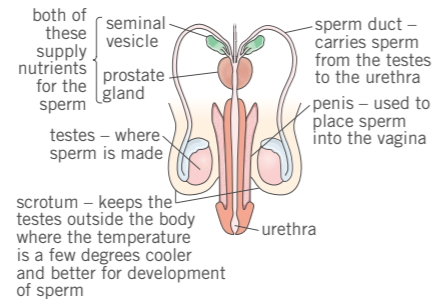
voice breaks, sexual organs develop, testes start to produce sperm, shoulders widen, hair grows on face and chest

#### Reproductive systems

##### female



##### male



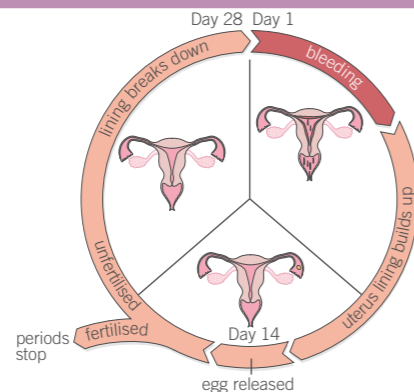
#### The menstrual cycle

**Day 1** – blood from uterus lining leaves the body through the vagina.

**Day 5** – bleeding stops. Uterus lining begins to re-grow.

**Day 14** – an egg cell is released from one of the ovaries (**ovulation**).

The egg cell travels through the oviduct towards the uterus.



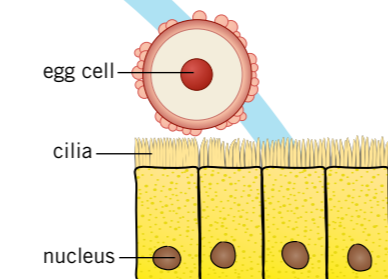
#### Methods of contraception

**Condoms** – A thin layer of latex rubber that prevents semen being released into the vagina.

**Contraceptive pill** – a daily tablet that contains hormones. It prevents pregnancy by stopping ovulation.

#### Fertilisation

An egg is released every month.



The egg cell is moved along the oviduct towards the uterus by **cilia**.

Sperm cells are produced in the **testicles/testes**.

Sperm are mixed with nutrients and fluid from the glands to form **semen**.

During sexual intercourse a male will release semen into the vagina (**ejaculation**).

If a sperm meets the egg **fertilisation** may happen.

The fertilised egg may then **implant** in the uterus lining and form an **embryo** (ball of cells)

the main steps in a baby's development (**gestation**) during pregnancy

just a dot	1 week – cells beginning to specialise
3 mm long	4 weeks – spine and brain forming, heart beating
3 cm long	9 weeks – tiny movements, lips and cheeks sense touch, eyes and ears forming
7 cm long	12 weeks – fetus uses its muscles to kick, suck, swallow, and practise breathing

There are three important structures in the uterus during gestation:

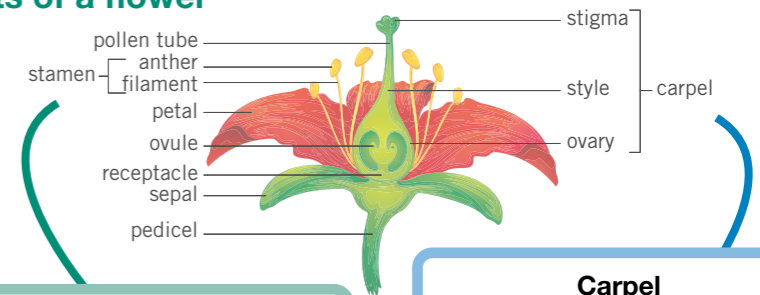
**placenta** – where substances pass from female to **foetus**

**umbilical cord** – connects the fetus to the placenta

**fluid sac** – shock absorber that protects the baby.

### Plant reproduction

#### Parts of a flower



#### Stamen

**male** part of the flower

- the **anther** produces pollen
- the **filament** holds up the anther

#### Carpel

**female** part of the flower

- the **stigma** is sticky to catch grains of pollen
- the **style** holds up the stigma
- the ovary contains **ovules**

#### Pollination

Pollination is the fertilisation of the ovule, which occurs when pollen is transferred from an anther to the stigma. Pollination can occur due to insects or the wind.

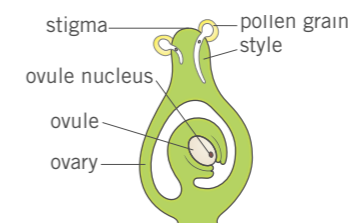
#### cross-pollination

between two **different** plants

#### self-pollination

between the male and female parts of the **same** plant

#### Fertilisation



The tube grows out of the pollen grain and down through the style.



The pollen nucleus moves down the tube.



The pollen nucleus joins with the ovule nucleus. Fertilisation takes place and a seed will form.

The ovules become seeds and are dispersed away from each other and from the parent plant. This is so they have space to grow and do not compete for resources such as nutrients. Dispersal can be by wind, animal, water or by explosion.

#### Germination

When a seed starts to grow it is called **germination**.

To germinate, seeds need:

- water – for the seed to swell and the embryo to start growing
- oxygen – for respiration and transferring energy for germination
- warmth – to help speed up the reactions in the plant.

#### Key Words

Make sure you can write a definition for these key terms.

adolescence anther carpel cervix cilia condom contraception contraceptive pill ejaculation embryo fertilisation foetus filament fluid sac fruit gametes germination gestation implantation menstrual cycle ovary penis period petal oviduct ovulation ovule placenta pollen pollination puberty scrotum seed seed dispersal semen sepal sex hormones sexual intercourse sperm duct stamen stigma style testes umbilical cord urethra uterus vagina



## Atoms

An **atom** is the smallest part of an element that can exist.

There are 100 types of atom – one for each of the 100 elements that exist naturally.

Each type of atom has different properties (e.g., size or mass).

## Elements

An **element**:

- cannot be broken down into other substances
- is made of one type of atom only.

Examples of elements include gold, potassium, carbon, and hydrogen.

The names and symbols of all the elements can be found on the **periodic table** of elements.

Elements in the periodic table are grouped together by their properties, which are different for each element.

		group number										0					
1	2											He					
Li	Be											He					
Na	Mg	B	C	N	O	F	Ne						Ne				
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac															

The **chemical symbol** for an element is universal – it is the same in every language, even if the name of the element is different.

Some examples of chemical symbols for common elements are:

hydrogen	H	sulfur	S
carbon	C	sodium	Na
oxygen	O	chlorine	Cl
nitrogen	N	magnesium	Mg

## Molecules

A **molecule** is more than one atom chemically joined together.

Molecules can be made up from:

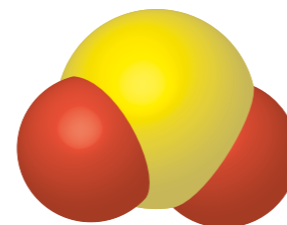
several of the same type of atom (elements)

e.g., oxygen gas  
O<sub>2</sub>



two or more types of atoms (compounds)

e.g., sulfur dioxide  
SO<sub>2</sub>



Different elements have different masses. So, in a molecule, the different atoms that make it up have different masses.

For example, a molecule of water has two hydrogen atoms and one oxygen atom.

## Chemical formulae

A **chemical formula** tells you the relative number of atoms of each element that is in the compound.



two hydrogen atoms for every oxygen atom.



two chlorine atoms for every one magnesium atom.



one sodium atom for every one oxygen atom, and every one hydrogen atom

When you are writing chemical formulae, write the numbers:

- to the right of their chemical symbol, just below the line.
- smaller than the chemical symbols.

## Compounds

**Compounds:**

- are made of two or more *different* atoms strongly joined together.
- can be broken down into other substances.

### Naming compounds

In a compound made of a metal and a non-metal, the name of the metal comes first.

*for example, iron bromide, magnesium fluoride*

If the non-metal atom is oxygen, it is called oxide. If the non-metal atom is chlorine, it is called chloride.

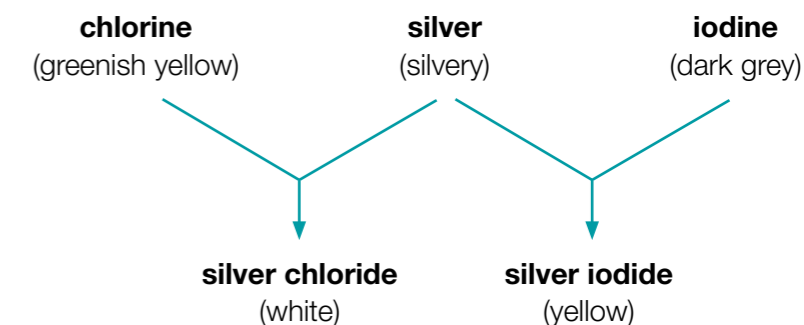
*for example, copper oxide, sodium chloride*

In a compound made of a non-metal and oxygen, oxygen comes second and is called monoxide if there is one oxygen atom or dioxide for two oxygen atoms.

*for example, carbon monoxide, sulfur dioxide*

When atoms join together to make a compound, the compound has properties that are different to the properties of the atoms that make them up.

For example, the colours of the silver compounds are very different from the colours of the elements that make them up:



## Key words

Make sure you can write a definition for these key terms.

atom

chemical formula

chemical symbol

compound

element

molecule

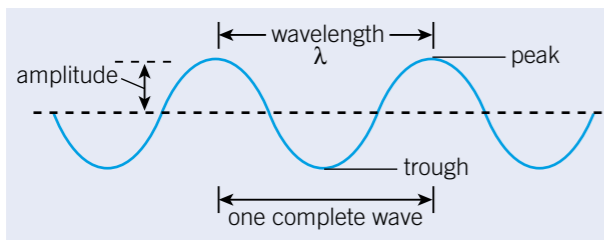
periodic table



# P1 Chapter 2: Sound Knowledge organiser

## Properties of waves

A wave is an **oscillation** or **vibration** that transfers energy. Matter is not transferred. Waves can be longitudinal or transverse.



**Amplitude** – distance from the middle to the top or bottom of the wave

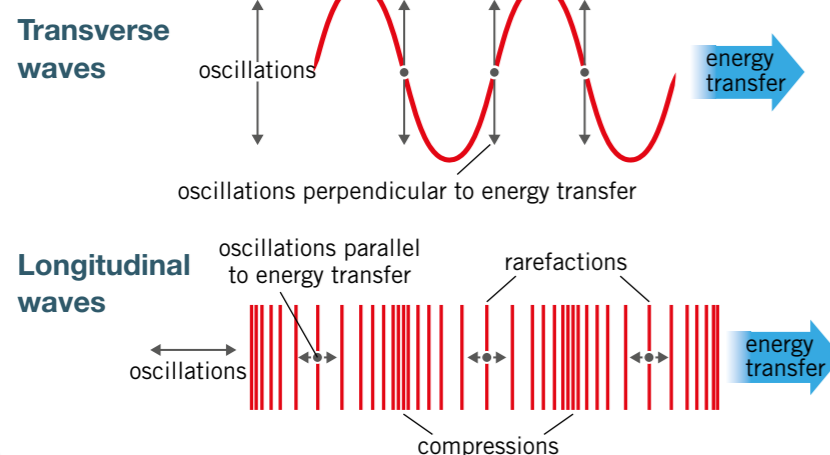
**Wavelength** – distance between a point on the wave to the same point on the next wave

**Trough** – bottom of the wave **Peak** – top of the wave

**Frequency** – how many waves go past a particular point in a second, measured in **hertz** (Hz) or kHz

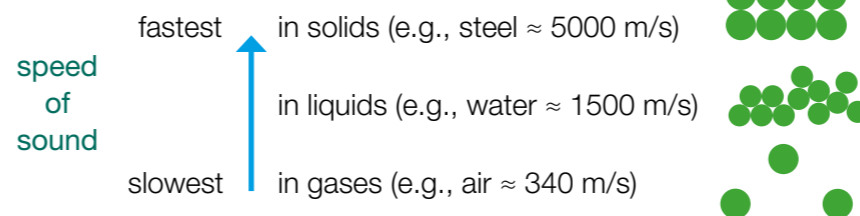
If waves meet they **superpose**. This means they add up or cancel out, depending on if they are in time with each other or not.

## Transverse and longitudinal waves



## Sound waves

Sound is produced by vibrations, which make air molecules oscillate. Sound is a longitudinal wave.

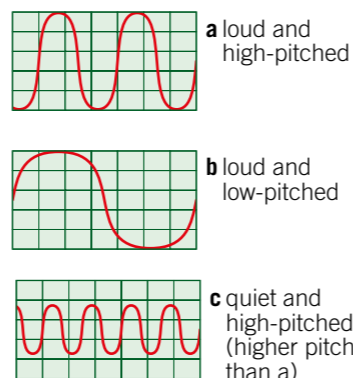


Waves can be **reflected** from a surface. The wave hitting the surface is the **incident wave**, and the wave bouncing off is the **reflected wave**.

A reflected sound wave is heard as an echo. The time delay of an echo can be used to work out the distance to an object.

**Ultrasound** (waves >20kHz) is used to make images of unborn babies, in medical scans, and for underwater (sonar) searches.

## Measuring sound



**Oscilloscopes** are instruments that give a visual representation of a sound wave. The taller the waves, the more energy that is in the wave and higher the volume. The more waves there are in the screen, the higher the frequency and the pitch is higher.

Humans can hear frequencies 20 Hz to 20 kHz. Above this is ultrasound. Below this is **infrasound**.

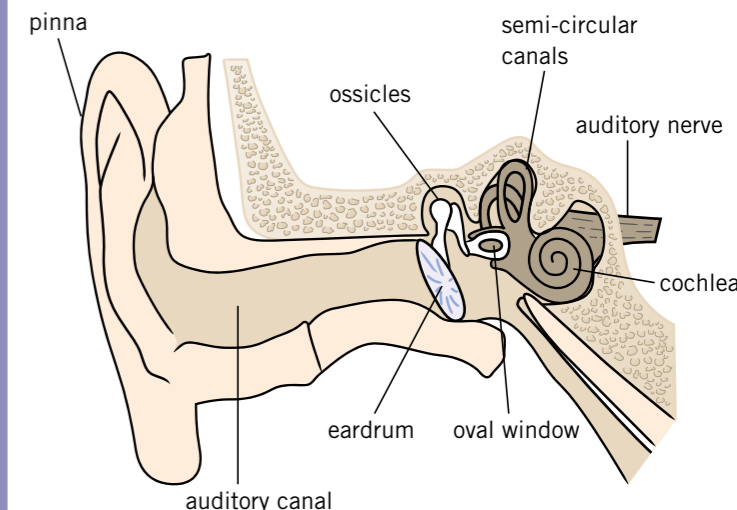
Sound volume is measured in **decibels** (dB). The decibel scale is not linear – a 10dB increase is 10 times the volume.

## Recording and playing sounds

In a microphone sound waves hit a **diaphragm** making it vibrate. This produces an electrical signal by moving a coil of wire over a magnet. Speakers are the opposite to microphones – an electrical signal is turned into sound by moving a cone backwards and forwards.

## Hearing

Your ear is made of many specially adapted structures that detect and transmit sound waves, allowing you to hear noises.



Part of ear	Structure	Function
outer ear	<b>pinna</b>	directs sound into auditory canal
	<b>auditory canal</b>	sound travels through it to reach the eardrum
	<b>eardrum</b>	vibrates and passes vibrations to the ossicles
middle ear	<b>ossicles</b>	tiny bones that <b>amplify</b> sound
inner ear	<b>cochlea</b>	contains fluid and hair that produce an electrical signal
	<b>semi-circular canals</b>	helps you keep your balance

**Hearing damage** be caused by a number of factors, for example:

- a hole in the ear drum (grows back naturally)
- canal blocked with wax (curable)
- loud sounds or injury, causing damage to the hairs in the cochlea (permanent).

## Key words

Make sure you can write a definition for these key terms.

amplify amplitude auditory canal auditory nerve cochlea compression decibel diaphragm eardrum frequency hertz incident wave infrasound longitudinal oscillation oscilloscope ossicle oval window peak pinna pitch rarefaction reflected semi-circular canal superpose transverse trough ultrasound vibration wavelength