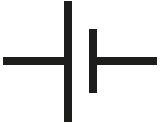







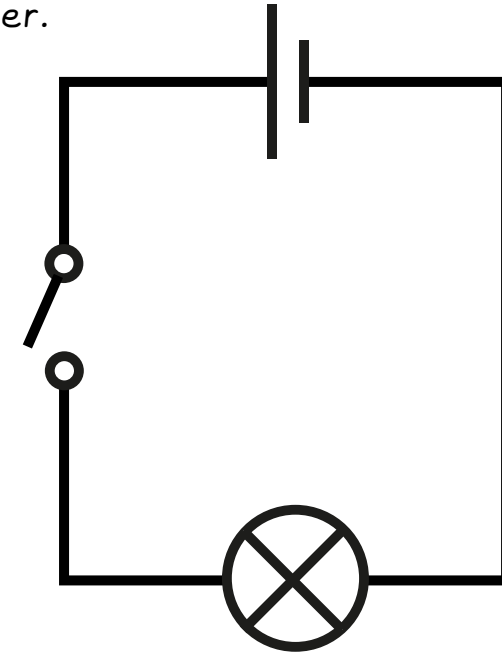


A **component** is a device in an electrical circuit. Symbols are often used to represent the components so they are easier to draw and easily recognised.

 <p>Cell - a single unit of power.</p>	 <p>Battery - more than one cell.</p>	 <p>Wire - connects components in a circuit.</p>	 <p>Open switch - breaks a circuit.</p>
 <p>Closed switch - completes a circuit.</p>	 <p>Bulb - gives out light.</p>	 <p>Buzzer - makes sound.</p>	 <p>Motor - moves.</p>

A **circuit diagram** is a simple line drawing that represents how the components in an appliance join together.



A complete circuit must have a **power supply**, a **complete loop** and at least one **component**.



Electrical safety

Do not use wet hands when using electrical appliances or switches.

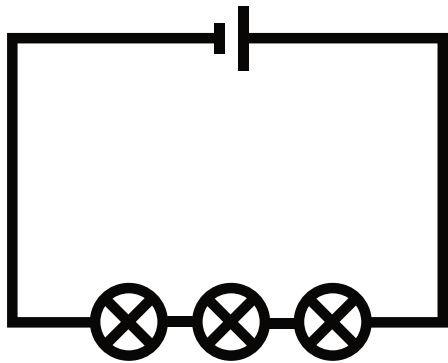
Do not put anything other than a plug in an electrical socket.

Let an adult know if electrical appliances or wires appear damaged.

Do not leave electrical wires across the floor or hot surfaces.

Investigating bulb brightness and resistance

The more bulbs, the dimmer their brightness.

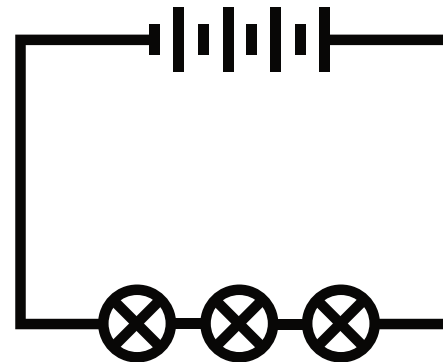


Or the more buzzers, the quieter the sound.

- The more components added to a circuit, the greater the resistance.
- This makes it harder for the current (charge) to flow.
- Less energy is transferred so the bulbs are dimmer.

Investigating bulb brightness and voltage

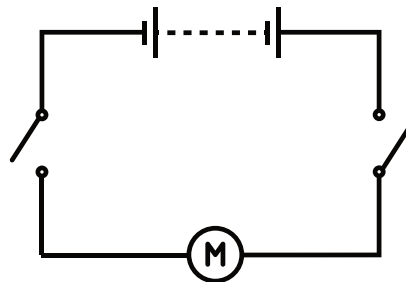
The more cells, the higher the voltage and the brighter the bulbs.



Or the more cells, the louder the buzzer.

- The more cells added, the higher the voltage.
- The higher the voltage, the more 'push' there is of the current.
- More energy is transferred so the bulbs are brighter.

If more than one switch is used in a circuit, both need to be closed for it to work. These are often used to keep people safe with dangerous appliances.



Switches need materials that are **electrical conductors** to complete the circuit.

current

A measure of how much electrical charge flows through a circuit.

resistance

Something that slows the flow of current/electrical charge in a circuit.

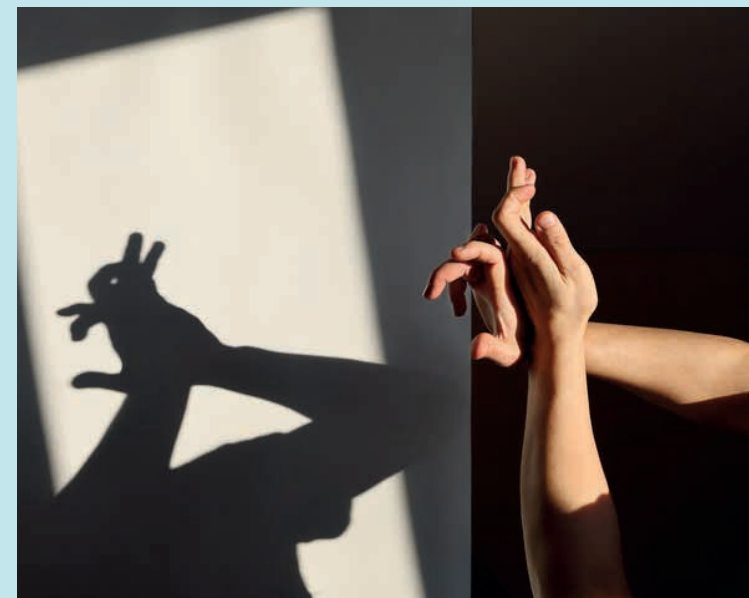
voltage

The measure of how much energy is carried by electrical charge; the 'push' from the power source.



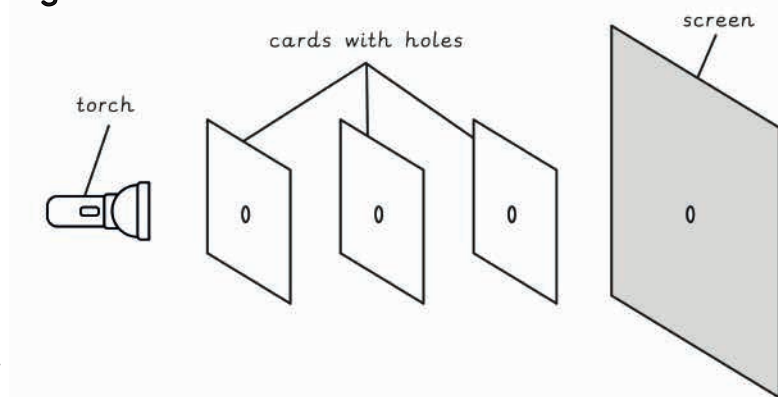
light	A store of energy that can be seen with our eyes.
light source	Where light comes from.
light ray	A narrow beam of light.
luminous	Something that gives off light.
non-luminous	Something that does not give off light.
transparent	A material that allows light to pass through with minimal scattering or reflection so an object is clearly visible.
translucent	A material that allows some light to pass through. Light may be scattered, causing objects behind to appear fuzzy or distorted.
opaque	A material that blocks or absorbs all light, preventing objects on the other side from being seen.

Shadow: a dark area caused by something blocking the light.



Light travels in a **straight** line.

The holes must line up exactly for the light to pass through and show on the screen. This is because light cannot move around objects - it travels in a straight line.

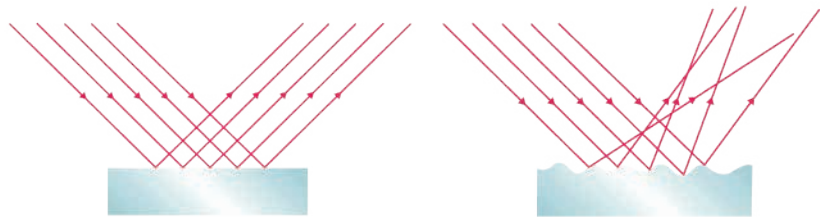


A **shadow** is formed when an **opaque** object is in the pathway of light because light travels in straight lines.

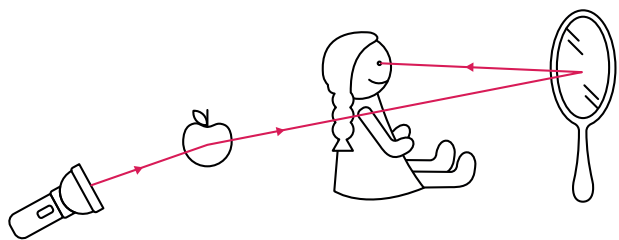
Shadows have the same shape as the objects that cast them. The size of a shadow changes as the light source moves.



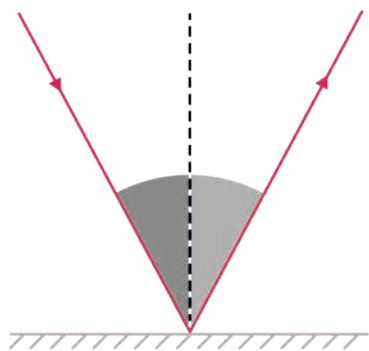
Light can change direction when it reaches a different material. **Reflection** is when light does not pass through a material and changes direction.



Shiny surfaces **reflect** light **uniformly**, whereas rough surfaces **scatter** the light rays.

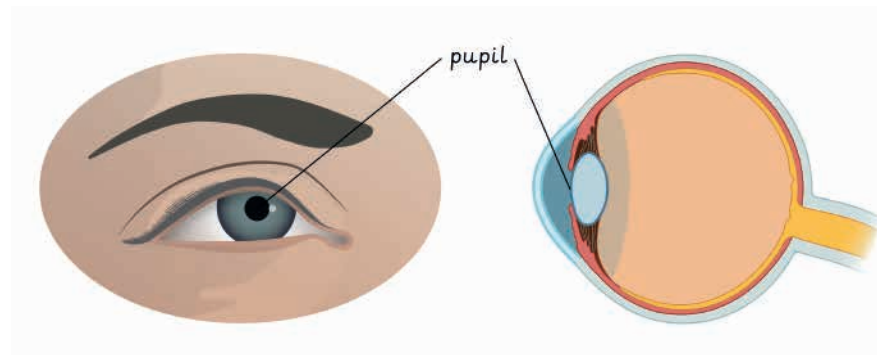


A **ray diagram** is a scientific drawing to show the pathway of light. It can be helpful to explain observations.



On a smooth surface, the angle of the **incoming ray** is the same as the angle of the **reflected ray**.

Light needs to enter the eye for us to see. It enters through the **pupil**.

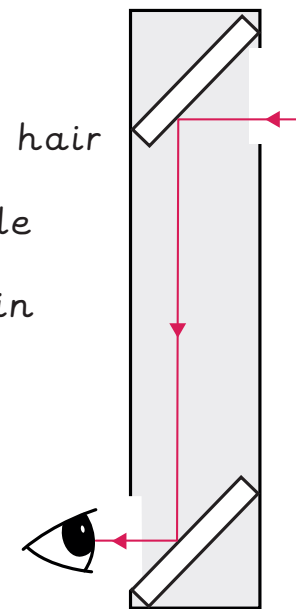


Light may come directly from a **luminous** object or reflect off a **non-luminous** object.

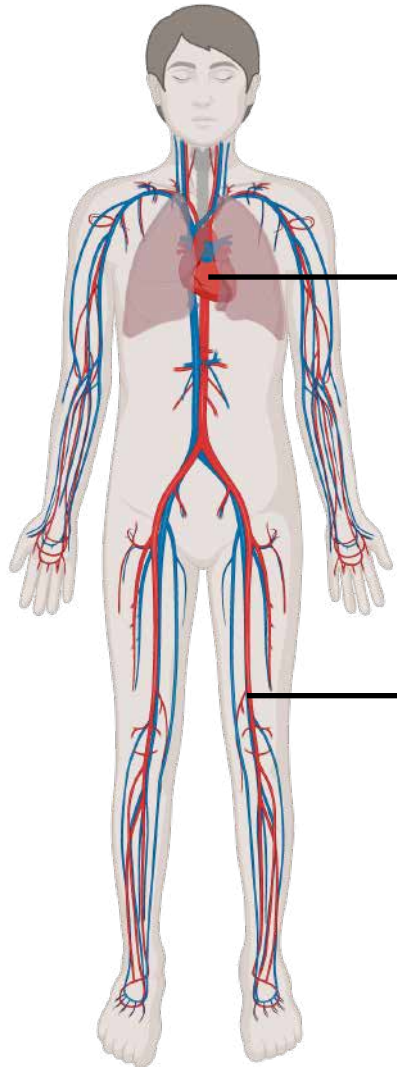
Mirrors are useful in lots of situations:

- Looking at the back of your hair when you get it cut.
- Dentists looking at the inside of the mouth.
- Rear view and side mirrors in a car to look at your surroundings in a vehicle.

Periscopes are long, vertical tubes that contain a set of mirrors to give a view above the position of the eye.



The **circulatory system** is a group of organs that work together to transport substances around the body.



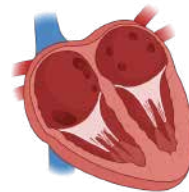
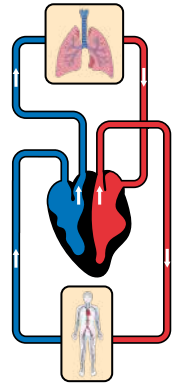
The **heart** is a muscular pump that pushes blood around the body.

Blood flows in **blood vessels** to every part of the body.

Humans have a **double circulatory system**:

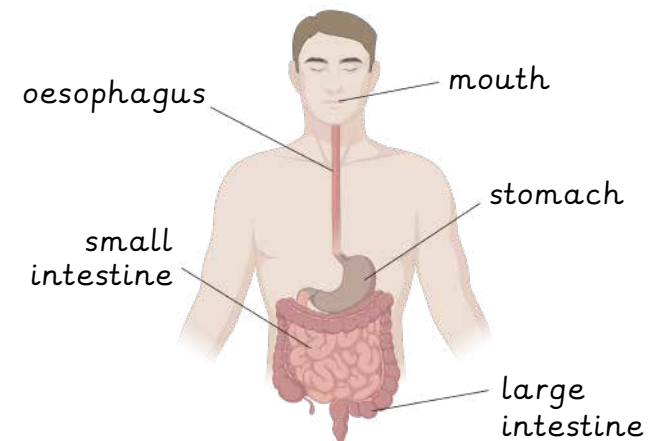
One loop of blood vessels transports blood from the heart to the lungs to pick up oxygen and drop off carbon dioxide.

Another loop of blood vessels transports blood around the body to deliver useful substances and pick up waste products.

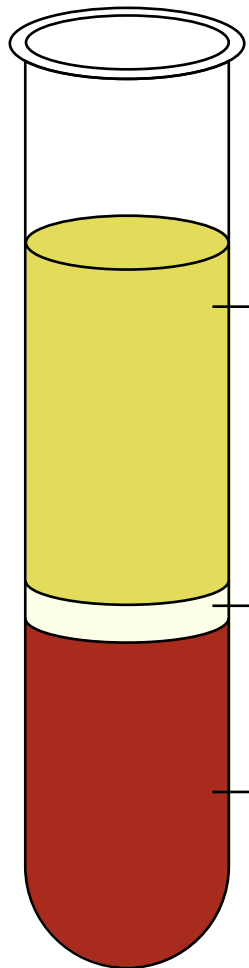


The **heart** is split into two sides: one side pumps blood to the lungs and the other side pumps blood to the body. The heart muscle is under involuntary control to contract and relax; we cannot choose to move it.

Nutrients are absorbed from the small intestine into the bloodstream to be transported around the body, whereas **water** is absorbed from the large intestine into the blood.



Blood is a mixture of many different things. It **transports** useful substances to where they are needed and carries waste products away to be removed from the body.

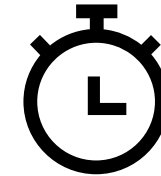
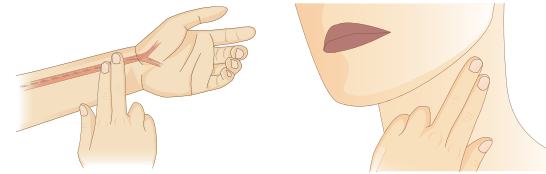


The liquid part of blood contains water and transports nutrients, carbon dioxide and other substances.

Some parts of blood help fight disease and others help stop us bleeding.

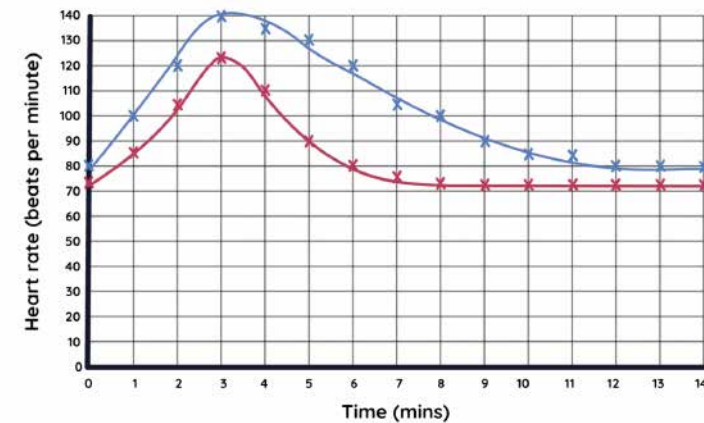
The red-coloured part of blood transports oxygen.

The **resting heart rate** is the number of times the heart beats in one minute when relaxed, sitting or lying down.



Count for 60 seconds or 30 seconds x2.

When we exercise, our **heart rate** increases (goes up). This happens to speed up the transport of substances like oxygen and sugar to the working muscles so they have more **energy**.



Someone who is fitter will have a lower resting heart rate and their heart rate after exercise will return to the resting rate more quickly.



drugs

A drug is a substance that changes the way your body works; some are helpful but others are damaging.



exercise

Do a variety of types and intensities of physical activity across the week. Try to spread activity throughout the day to avoid long periods of sitting or lying down.



diet

A balanced diet includes all seven nutrients but in different amounts. Eat plenty of fruit and vegetables every day but less high-sugar and fatty foods. Drink regularly throughout the day.



exercise

Improve your mood by connecting with other people, learning new skills and being active.

Factors affecting health



alcohol

Alcohol can affect judgement, behaviour and reaction times. Regularly drinking large amounts of alcohol damages the organs.



hygiene

Make sure you wash your hands thoroughly before preparing food, after going to the toilet, coughing or sneezing and playing outside.



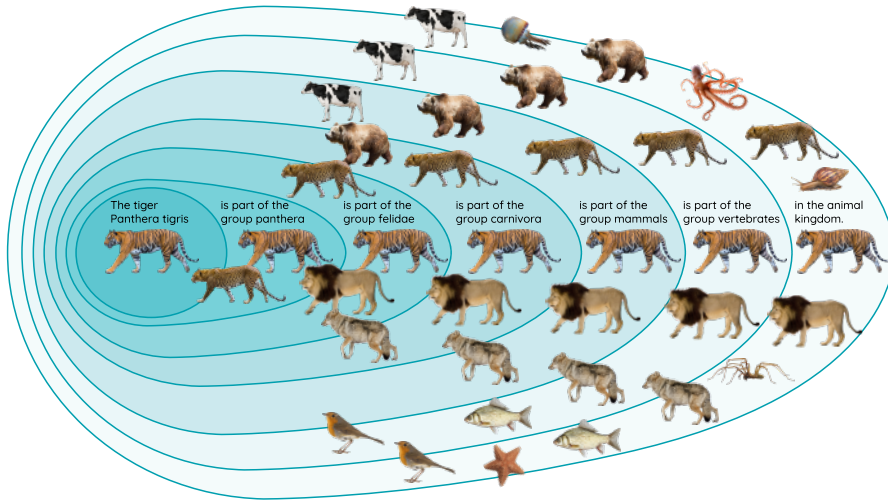
smoking

The chemicals in cigarette smoke cause damage all around the body, especially the lungs, heart and blood circulation. These are also breathed in by people around the smoker. While vaping is less harmful, the long-term effects are still unknown. It is better not to smoke at all.

Classifying big and small

Carl Linnaeus

Carl Linnaeus developed the Linnaean system for sorting and classifying living things according to shared characteristics.



Number keys

The key is made from pairs of questions or statements.

The answers lead through the key until a group or name is reached.



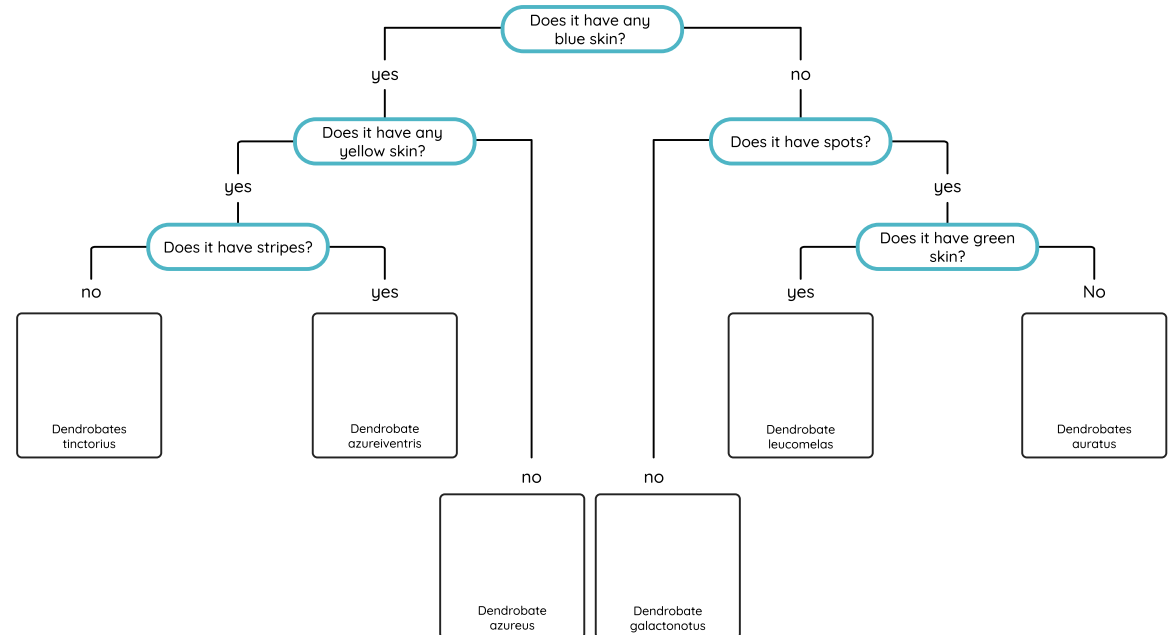
1a	Wings are covered by an exoskeleton.	Go to 2.
1b	Wings are not covered by an exoskeleton.	Go to 3.
2a	Exoskeleton is red.	Ladybird.
2b	Exoskeleton is green.	Green beetle.
3a	Wings are broad and wide.	Butterfly.
3b	Wings are long and narrow.	Dragonfly.

Classification keys

Classification keys can be used to sort and classify living things. They can use questions or statements.

Branching keys

Each branch of the key has a question. The answers will eventually lead to a final group or name.



Vertebrates: animals with a backbone.

Fish	Amphibians	Reptiles	Birds	Mammals
<ul style="list-style-type: none"> Wet scales. Soft eggs. Cold-blooded. Gills. 	<ul style="list-style-type: none"> Moist skin. Jelly-coated eggs. Cold-blooded. Gills/lungs/breathe through skin. 	<ul style="list-style-type: none"> Dry scales. Leathery eggs. Cold-blooded. Lungs. 	<ul style="list-style-type: none"> Feathers. Hard-shelled eggs. Warm-blooded. Lungs. 	<ul style="list-style-type: none"> Fur. Produce milk. Warm-blooded. Lungs.

Invertebrates: animals without a backbone.

Worms	Snails	Spiders (arachnids)	Insects
<ul style="list-style-type: none"> Soft bodied. Segmented. 	<ul style="list-style-type: none"> Soft bodied. External shell. 	<ul style="list-style-type: none"> Exoskeleton. Two body segments. Eight legs. 	<ul style="list-style-type: none"> Exoskeleton. Three body segments. Six legs. Two pairs of wings (mostly.) 

Plants

Mosses	Ferns	Conifers	Flowering plants
<ul style="list-style-type: none"> Simple leaves. No roots. Spores. 	<ul style="list-style-type: none"> Feathery leaves (fronds.) Roots. Spores. 	<ul style="list-style-type: none"> Needle-like leaves. Roots. Seeds in cones. 	<ul style="list-style-type: none"> Broad or long leaves. Roots. Seeds (often in fruits.) Flowers.

Micro-organisms: organisms that are too small to see with the naked eye, including bacteria, protists and some fungi.

Bacteria are classified according to their shape:

Spherical 	Rod bacteria 	Comma 	Spiral 	Corkscrew 
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Variation: differences between individuals of a species.

There is variation in all living things.



Variation happens because of the environment, inheritance or both.

Environmental variation is caused by our lifestyles and surroundings, such as scars.



Inherited variation is caused by the genes inherited from parents, such as eye colour.



Some characteristics are affected by both the environment and inheritance, such as height and hair colour.

Living things produce offspring of the same kind but often appear different to the parents due to **variation**.



Adaptation: a characteristic that helps an organism to survive in its habitat.

Sometimes the inherited variation may help an individual to survive in its habitat.



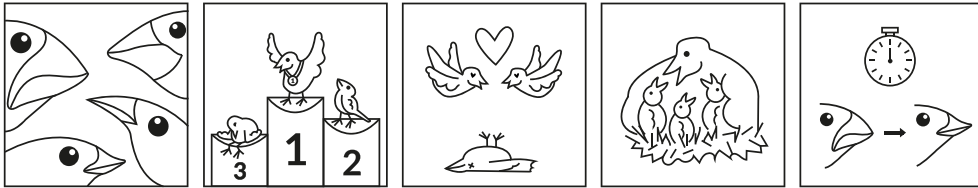
Penguins have a thick fat layer and waterproof feathers to survive the snow and icy ocean.



Some flowers produce sweet nectar to attract insects that help pollinate for plant reproduction.

If it survives and reproduces, the useful characteristic can be passed onto the offspring.

Natural selection (survival of the fittest): the process where living things that are better adapted to their habitat survive and produce more offspring with those characteristics.



1. Variation.
2. Struggle to survive: competition for resources and adaptations to the environment.
3. Survival of the fittest: the best adapted survive and reproduce.
4. Advantages inherited by offspring.
5. Gradual change.

If these characteristics continue to be useful for survival, the species may change over time. If a new species is significantly different from its **ancestors**, it is said to have **evolved**.

Evidence for evolution



Fossils: the remains or traces of an animal or plant that lived long ago.

Fossils provide information about living things that inhabited the Earth millions of years ago. They can show how a species has changed over time.

ancestor	A relative of a living thing that lived a long time ago.
extinct	A living thing that no longer exists.
offspring	The young born to a living organism.
scientific theory	An explanation for something in the natural world backed by evidence.