

Subject Science	Topic name: Animals including humans	Year group 6	Term Summer
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**Prior Knowledge** Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans) Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)

**Skills to be taught** Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Identifying scientific evidence that has been used to support or refute ideas or arguments. Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. Using test results to make predictions to set up further comparative and fair tests

**Key Knowledge**  
The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system.

Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well our heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins. This content is also included in PSHE. The new statutory requirements for relationships and health education can be found below: [statutory guidance on Physical health and mental wellbeing \(primary and secondary\)](#).

<b>Key Vocabulary</b>	
<b>circulatory system</b>	A system which includes the heart, veins, arteries and blood transporting substances around the body.
<b>heart</b>	An organ which constantly pumps blood around the <b>circulatory system</b> .
<b>blood vessels</b>	The tube-like structures that carry blood through the tissues and organs. Veins, arteries and capillaries are the three types of blood vessels.
<b>oxygenated blood</b>	Oxygenated blood has more oxygen. It is pumped from the <b>heart</b> to the rest of the body.
<b>deoxygenated blood</b>	Deoxygenated blood is blood where most of the oxygen has already been transferred to the rest of the body.
<b>Key Vocabulary</b>	
<b>drug</b>	A substance containing natural or man-made chemicals that has an effect on your body when it enters your system.
<b>alcohol</b>	A <b>drug</b> produced from grains, fruits or vegetables when they are put through a process called fermentation.
<b>nutrients</b>	Substances that animals need to stay alive and healthy.

<p>Plasma is liquid. The other parts of your blood are solid.</p> <p>Red blood cells carry oxygen through your body.</p> <p>Platelets help you stop bleeding when you get hurt.</p> <p>White blood cells fight infection when you're sick.</p>	<p>Drugs, alcohol and smoking have negative effects on the body.</p> <p>A healthy diet involves eating the right types of nutrients in the right amounts.</p>
<p>The <b>heart</b> pumps blood to the lungs to get oxygen.</p>	<p>It then pumps this <b>oxygenated blood</b> around the body.</p>

Mammals have **hearts** with four chambers. Notice how the blood that has come from the body is **deoxygenated**, and the blood that has come from the lungs is **oxygenated** again. The blood isn't actually red and blue: we just show it like that on a diagram.

from body → to body  
from body → to lungs  
from lungs → to body

deoxygenated blood → ← oxygenated blood

Capillaries are the smallest **blood vessels** in the body and it is here that the exchange of water, nutrients, oxygen and carbon dioxide takes place.

<p>Arteries carry <b>oxygenated blood</b> away from the <b>heart</b>.</p>	<p>capillaries</p>	<p>veins</p> <p>Veins carry <b>deoxygenated blood</b> toward the <b>heart</b>.</p>
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If you linked up all of the body's blood vessels, including arteries, capillaries, and veins, they would measure over 60,000 miles.

Blood transports:

- gases (mostly oxygen and carbon dioxide);
- nutrients (including water);
- waste products.

The liquid part of blood contains water and protein. This is called plasma.

Regular exercise:

- strengthens muscles including the heart muscle;
- improves circulation;
- increases the amount of oxygen around the body;
- releases brain chemicals which help you feel calm and relaxed;
- helps you sleep more easily;
- strengthens bones.

It can even help to stop us from getting ill.



**Possible experiences**  
Create a role play model for the circulatory system.  
Carry out a range of pulse rate investigations:  
- fair test – effect of different activities on my pulse rate  
- pattern seeking – exploring which groups of people may have higher or lower resting pulse rates  
- observation over time - how long does it take my pulse rate to return to my resting pulse rate (recovery rate)  
- pattern seeking – exploring recovery rate for different groups of people.  
Research the negative effects of drugs (e.g. tobacco) and the benefits of a healthy diet and regular exercise by asking an expert or using carefully selected secondary sources.

Subject Science

Topic name Electricity

Year group 6

Term Autumn 2

## Prior Knowledge

Identify common appliances that run on electricity. (Y4 - Electricity)  
 Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. (Y4 - Electricity)  
 Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. (Y4 - Electricity)  
 Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. (Y4 - Electricity)  
 Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)

## Skills to be taught

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate  
 Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs  
 Identifying scientific evidence that has been used to support or refute ideas or arguments  
 Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations  
 Using test results to make predictions to set up further comparative and fair tests

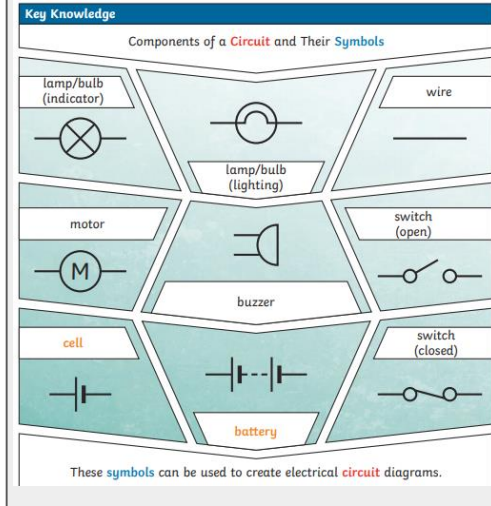
## Key Knowledge

Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter.  
 Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well.

You can use recognised circuit symbols to draw simple circuit diagrams.

Key Vocabulary	
<b>circuit</b>	A path that an electrical <b>current</b> can flow around.
<b>symbol</b>	A visual picture that stands for something else.
<b>cell/battery</b>	A device that stores energy as a chemical until it is needed. A <b>cell</b> is a single unit. A <b>battery</b> is a collection of <b>cells</b> .
<b>current</b>	The flow of <b>electrons</b> , measured in <b>amps</b> .
<b>amps</b>	How electric <b>current</b> is measured.
<b>voltage</b>	The force that makes the electric <b>current</b> move through the wires. The greater the <b>voltage</b> , the more <b>current</b> will flow.
<b>resistance</b>	The difficulty that the electric <b>current</b> has when flowing around a <b>circuit</b> .
<b>electrons</b>	Very small particles that travel around an electrical <b>circuit</b> .

## Pictures/maps/images



## Possible experiences

Explain how a circuit operates to achieve particular operations, such as to control the light from a torch with different brightnesses or make a motor go faster or slower.  
 Make circuits to solve particular problems, such as a quiet and a loud burglar alarm.  
 Carry out fair tests exploring changes in circuits.  
 Make circuits that can be controlled as part of a DT project.

**What will make a bulb brighter or a buzzer louder?**

- More **batteries** or a higher **voltage** create more power to flow through the **circuit**.
- Shortening the wires means the electrons have less **resistance** to flow through.

**Series Circuit**  
 A **circuit** that has only one route for the **current** to take. If more bulbs or buzzers are added, the power has to be shared and so they will be dimmer or quieter. If just one part of this series **circuit** breaks, the **circuit** is broken and the flow of **current** stops.

**What will make a bulb dimmer or a buzzer quieter?**

- Fewer **batteries** or a lower **voltage** give less power to the **circuit**.
- More buzzers or bulbs mean the power is shared by more components.
- Lengthening the wires means the electrons have to travel through more **resistance**.

More components sharing less power.

A broken **circuit** with no electrical **current**.



# Knowledge Organiser

Subject Science	Topic name Evolution and Inheritance	Year group 6	Term Spring 1
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**Prior Knowledge** Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. (Y2 - Living things and their habitats) Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants) Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 - Rocks) Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats)

Describe the life process of reproduction in some plants and animals. (Living things and their habitats - VS)

Key Vocabulary	
<b>offspring</b>	The young animal or plant that is produced by the reproduction of that species.
<b>inheritance</b>	This is when <b>characteristics</b> are passed on to <b>offspring</b> from their parents.
<b>variations</b>	The differences between individuals within a species.
<b>characteristics</b>	The distinguishing features or qualities that are specific to a species.
<b>adaptation</b>	An <b>adaptation</b> is a trait (or <b>characteristic</b> ) changing to increase a living thing's chances of surviving and reproducing.
<b>habitat</b>	Refers to a specific area or place in which particular animals and plants can live.
<b>environment</b>	An <b>environment</b> contains many <b>habitats</b> and includes areas where there are both living and non-living things.

Key Vocabulary	
<b>evolution</b>	<b>Adaptation</b> over a very long time.
<b>natural selection</b>	The process where organisms that are better adapted to their <b>environment</b> tend to survive and produce more <b>offspring</b> .
<b>fossil</b>	The remains or imprint of a prehistoric plant or animal, embedded in rock and preserved.
<b>adaptive traits</b>	Genetic features that help a living thing to survive.
<b>inherited traits</b>	These are traits you get from your parents. Within a family, you will often see similar traits, e.g. curly hair.

**Skills to be taught** Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Identifying scientific evidence that has been used to support or refute ideas or arguments. Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. Using test results to make predictions to set up further comparative and fair tests

**Offspring**  
Animals and plants produce **offspring** that are similar but not identical to them. **Offspring** often look like their parents because features are passed on.

**Variation**  
In the same way that there is **variation** between parents and their **offspring**, you can see **variation** within any species, even plants.

**Adaptive Traits**  
**Characteristics** that are influenced by the environment the living things live in. These **adaptations** can develop as a result of many things, such as food and climate.

**Inherited Traits**  
Eye colour is an example of an inherited trait, but so are things like hair colour, the shape of your earlobes and whether or not you can smell certain flowers.

**Habitats**  
A good **habitat** should provide **shelter**, **water**, enough space and plenty of food.

**Environments**  
There are many types of **environments** around the world. Polar regions, deserts, rainforests, oceans, rivers, and grasslands are all **environments**.

**Possible experiences** Design a new plant or animal to live in a particular habitat. Use models to demonstrate evolution e.g. 'Darwin's finches' bird beak activity. Use secondary sources to find out about how the population of peppered moths changed during the industrial revolution. Make observations of fossils to identify living things that lived on Earth millions of years ago. Identify features in animals and plants that are passed on to offspring and explore this process by considering the artificial breeding of animals or plants e.g. dogs. Compare the ideas of Charles Darwin and Alfred Wallace on evolution. Research the work of Mary Anning and how this provided evidence of evolution.

**Natural Selection**  
Fossils of giraffes from millions of years ago show that they used to have shorter necks. They have gradually evolved through **natural selection** to have longer necks so that they can reach the top leaves on taller trees.

**Key Knowledge**  
All living things have offspring of the same kind, as features in the offspring are inherited from the parents. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other. Plants and animals have characteristics that make them suited (adapted) to their environment. If the environment changes rapidly, some variations of a species may not suit the new environment and will die. If the environment changes slowly, animals and plants with variations that are best suited survive in greater numbers to reproduce and pass their characteristics on to their young. Over time, these inherited characteristics become more dominant within the population. Over a very long period of time, these characteristics may be so different to how they were originally that a new species is created. This is evolution. Fossils give us evidence of what lived on the Earth millions of year ago and provide evidence to support the theory of evolution. More recently, scientists such as Darwin and Wallace observed how living things adapt to different environments to become distinct varieties with their own characteristics.

Fossils are the preserved remains, or partial remains, of ancient animals and plants. Fossils let scientists know how plants and animals used to look millions of years ago. This is proof that living things have evolved over time.

Evolution is the gradual process by which different kinds of living organism have developed from earlier forms over millions of years. Scientists have proof that living things are continuously evolving - even today!

Living Things	Habitat	Adaptive Traits
polar bear	arctic	Its white fur enables it to camouflage in the snow.
camel	desert	It has wide feet to make it easier to walk in the sand.
cactus	desert	It stores water in its stem.
toucan	rainforest	Its narrow tongue allows it to eat small fruit and insects.

Subject Science	Topic name Light	Year group 6	Term Autumn 1
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**Prior Knowledge** Recognise that they need light in order to see things and that dark is the absence of light. (Y3 - Light) Notice that light is reflected from surfaces. (Y3 - Light) Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light) Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 - Light) Find patterns in the way that the size of shadows change. (Y3 - Light) Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. (Y5 - Properties and changes of materials)

**Skills to be taught** Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Identifying scientific evidence that has been used to support or refute ideas or arguments. Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. Using test results to make predictions to set up further comparative and fair tests.


## Key Knowledge

Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen.

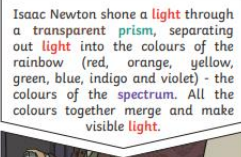
Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.

Key Vocabulary	
<b>refraction</b>	This is when <b>light</b> bends as it passes from one medium to another. E.g. <b>Light</b> bends when it moves from air into water.
<b>visible spectrum</b>	<b>Light</b> that is visible to the human eye. It is made up of a colour spectrum.
<b>prism</b>	A <b>prism</b> is a solid 3D shape with flat sides. The two ends are of an equal shape and size. A transparent <b>prism</b> separates out visible <b>light</b> into all the colours of the <b>spectrum</b> .
<b>shadow</b>	An area of darkness where <b>light</b> has been blocked.
<b>transparent</b>	Describes objects that let <b>light</b> travel through them easily, meaning you can see through the object.
<b>translucent</b>	Describes objects that things let some <b>light</b> through, but scatters the <b>light</b> so we can't see through them properly.
<b>opaque</b>	Describes objects that do not let any <b>light</b> pass through them.

**Key Knowledge**

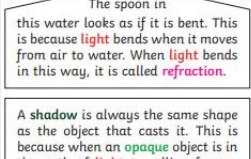


Isaac Newton shone a **light** through a transparent **prism**, separating out **light** into the colours of the rainbow (red, orange, yellow, green, blue, indigo and violet) - the colours of the spectrum. All the colours together merge and make visible **light**.




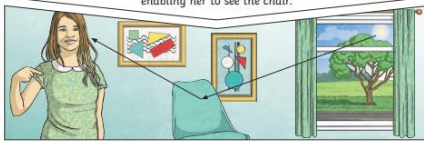
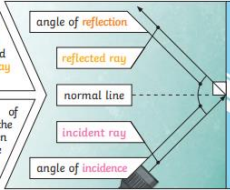
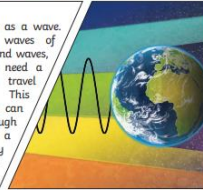
The spoon in this water looks as if it is bent. This is because **light** bends when it moves from air to water. When **light** bends in this way, it is called **refraction**.

A **shadow** is always the same shape as the object that casts it. This is because when an **opaque** object is in the path of **light** travelling from a **light source**, it will block the **light** rays that hit it, while the rest of the **light** can continue travelling.



**Shadows** can also be elongated or shortened depending on the angle of the **light source**. A **shadow** is also larger when the object is closer to the **light source**. This is because it blocks more of the **light**.



Key Vocabulary		Key Knowledge	
<b>light</b>	A form of energy that travels in a wave from a source.	We need <b>light</b> to be able to see things. <b>Light</b> waves travel out from sources of <b>light</b> in straight lines. These lines are often called rays or beams of <b>light</b> .	
<b>light source</b>	An object that makes its own <b>light</b> .	<b>Light</b> from the sun travels in a straight line and hits the chair. The <b>light</b> ray is then <b>reflected</b> off the chair and travels in a straight line to the girl's eye, enabling her to see the chair.	
<b>reflection</b>	<b>Reflection</b> is when <b>light</b> bounces off a surface, changing the direction of a ray of <b>light</b> .		
<b>incident ray</b>	A ray of <b>light</b> that hits a surface.		
<b>reflected ray</b>	A ray of <b>light</b> that has bounced back after hitting a surface.		
<b>the law of reflection</b>	The law states that the angle of the <b>incident ray</b> is equal to the angle of the <b>reflected ray</b> .	 <p><b>Light</b> travels as a wave. But unlike waves of water or sound waves, it does not need a medium to travel through. This means <b>light</b> can travel through a vacuum - a completely airless space.</p> 	

## Possible experiences

Explore different ways to demonstrate that light travels in straight lines e.g. shining a torch down a bent and straight hose pipe, shining a torch through different shaped holes in card. Explore the uses of the behaviour of light, reflection and shadows, such as in periscope design, rear view mirrors and shadow puppets.

Subject Science	Topic name Living Things and Their Habitats	Year group 6	Term Spring 2
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**Prior Knowledge** Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Y4 - Living things and their habitats) Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)

**Skills to be taught** Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Identifying scientific evidence that has been used to support or refute ideas or arguments. Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. Using test results to make predictions to set up further comparative and fair tests.

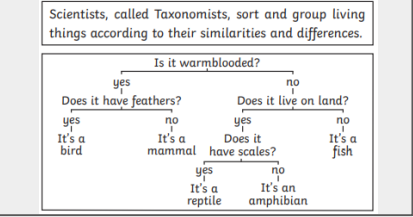
**Key Knowledge**  
 Living things can be formally grouped according to characteristics. Plants and animals are two main groups but there are other living things that do not fit into these groups e.g. microorganisms such as bacteria and yeast, and toadstools and mushrooms. Plants can make their own food whereas animals cannot.  
 Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has common characteristics. Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms.

Key Vocabulary		Key Vocabulary	
<b>bacteria</b>	A single-celled <b>microorganism</b> .	<b>characteristics</b>	Special qualities or appearances that make an individual or group of things different to others.
<b>microorganism</b>	An organism that can only be seen using a <b>microscope</b> , e.g. <b>bacteria</b> , mould and yeast.	<b>classify</b>	To sort things into different groups.
<b>microscope</b>	A piece of equipment that is used to view very tiny ( <b>microscopic</b> ) things by magnifying their appearance.	<b>taxonomist</b>	A scientist who classifies different living things into categories.
<b>species</b>	A group of animals that can reproduce to produce fertile offspring.	<b>key</b>	A <b>key</b> is a series of questions about the <b>characteristics</b> of living things. A <b>key</b> is used to identify a living thing or decide which group it belongs to by answering 'yes' or 'no' questions.

**Microorganisms**  
 Microorganisms are viruses, **bacteria**, moulds and yeast. Some animals (dust mites) and plants (phytoplankton) are also **microorganisms**.

Microorganisms are very tiny living things that can only be seen using a **microscope**. They can be found in and on our bodies, in the air, in water and on objects around us.

**Possible experiences**  
 Use secondary sources to learn about the formal classification system devised by Carl Linnaeus and why it is important. Use first-hand observation to identify characteristics shared by the animals in a group. Use secondary sources to research the characteristics of animals that belong to a group. Use information about the characteristics of an unknown animal or plant to assign it to a group. Classify plants and animals, presenting this in a range of ways e.g. Venn diagrams, Carroll diagrams and keys. Create an imaginary animal which has features from one or more groups.



Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants

**Classification**  
 In 1735, Swedish Scientist Carl Linnaeus first published a system for **classifying** all living things. An adapted version of this system is still used today: The Linnaeus System.

Living things can be **classified** by these eight levels. The number of living things in each level gets smaller until the one animal is left in its species level. This is how a dog would be classified.

<b>Domain: Eukarya</b>	jackal, clownfish, cat, dog, ladybird, daisy, rabbit, fox
<b>Kingdom: Animals</b>	jackal, clownfish, cat, dog, ladybird, rabbit, fox
<b>Phylum: Chordata</b>	jackal, clownfish, cat, dog, rabbit, fox
<b>Class: Mammals</b>	jackal, cat, dog, rabbit, fox
<b>Order: Carnivore</b>	jackal, cat, dog, fox
<b>Family: Canidae</b>	jackal, dog, fox
<b>Genus: Canis</b>	jackal, dog
<b>Species: Lupus</b>	dog

Each group allows scientists to observe and understand the **characteristics** of living things more clearly. They group similar things together then split the groups again and again based on their differences.