Upper key stage 2 – years 5-6

The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

'Working and thinking scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read, spell and pronounce scientific vocabulary correctly.

Upper Key Stage 2

Working scientifically

Upper Key Stage 2 programme of study (statutory requirements)	Notes and guidance (non-statutory
During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: • 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 • recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs	Pupils in years 5 and 6 should use their science experiences to: explore ideas and raise different kinds of questions; select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why. They should use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment. They should make their own decisions about what observations to make, what measurements to use and how long to make them for, and

• using test results to make predictions to set up further comparative and fair tests • using simple models to describe scientific ideas • reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations • identifying scientific evidence that has been used to support	whether to repeat them; choose the most appropriate equipment to make measurements and explain how to use it accurately. They should decide how to record data from a choice of familiar approaches; look for different causal relationships in their data and identify evidence that refutes or supports their ideas. They should use their results to identify when further tests and observations might be needed; recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact. They should use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas and should talk about how scientific ideas have developed over time. These opportunities for working scientifically should be provided across years 5 and 6 so that the expectations in the programme of study can be met by the end of year 6. Pupils are not expected to cover each aspect for every area of study.

Year 6: All living things

Year 6 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
Pupils should be taught to: • describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals • give reasons for classifying plants and animals based on specific characteristics.	Pupils should build on their learning about grouping living things in year 4 by looking at the classification system in more detail. They should be introduced to the idea of broad groupings and how these subdivide. Through direct observations where possible, they should classify animals into vertebrates (reptiles, fish, amphibians, birds and mammals) and commonly found invertebrates (e.g. insects, spiders, snails, worms). They should discuss reasons why living things are placed in one group and not another. Pupils might find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.	• Which groups would you put organisms from the local environment? Pupils might work scientifically by: devising classification systems and keys to identify some animals and plants in the immediate environment. They could research animals and plants in other habitats and decide where they belong in the classification system.

Other teaching ideas

- Discuss why the original method of classification in plants and animals would be a problem with all the organisms which we now know about.
- Watch videos to explore classification like http://youtu.be/ZrrZAp9N46c
- Sort a selection of animals into groups based on similar characteristics.
- Discuss some of the problems with how scientisits before Linnaeus used to classify animals e.g. by if they were wild or domestic or terrestrial or aquatic or large or small.
- Give examples that would be difficult to classify into each group.
- Find out about Linnaeus inclusion of animals such as Homo ferus (wild man) and Homo caudatus (man with tail) might have been included in the classification system
- Discuss why you think that some species have been names upto 20 times in the classification system.
- Create a new animal which would fit into a specific part of the classification system.

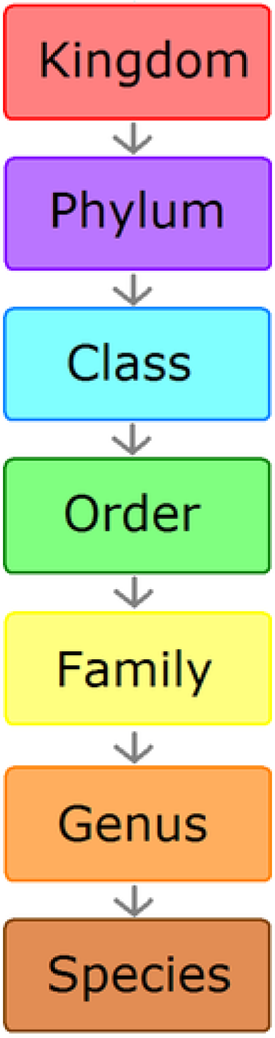
Key information

Scientific Classification

Biological Classification is the way scientists use to categorize and organize all of life. It can help to distinguish how similar or different living organisms are to each other.

An example of Classification

Biological classification works a bit like the library does. Inside the library books are divided up into certain areas. The kids books in one section, the adult books in another, and the teen books in another section. Within each of those sections, there will be more divisions like fiction, non-fiction. Within those sections there will be even more divisions such as mystery, science fiction, and romance novels in the fiction section. Finally you will get down to a single book.



Biological classification works the same way. At the top there are the kingdoms. This is sort of like the adult section vs. the kids' section. The kingdoms divide up life into big groups like plants and animals. Under the kingdoms are more divisions which would be like fiction, non-fiction, mystery, etc. Finally, you get to the species, which is sort of like getting to the book in the library.

7 Major Levels of Classification

There are seven major levels of classification: Kingdom, Phylum, Class, Order, Family, Genus, and Species. The two main kingdoms we think about are plants and animals. Scientists also list four other kingdoms including bacteria, archaebacteria, fungi, and protozoa. Sometimes an eighth level above the Kingdom called the Domain is used.

Classification for Humans

Here is an example of how humans are classified. You will see that our species is homo sapiens.

Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Primates
Family: Hominidae

Genus: Homo

Species: Homo sapiens

Fun ways to Remember Biological Classification

A good way to remember lists is to make up a sentence using the first letters in a list. In this case we want to remember Kingdom, Phylum, Class, Order, Family, Genus, and Species: K, P, C, O, F, G, S

Here are some sentences:

- Kids Prefer Cheese Over Fried Green Spinach.
- Koalas Prefer Chocolate Or Fruit, Generally Speaking
- King Philip Came Over For Good Spaghetti
- Keeping Precious Creatures Organized For Grumpy Scientists

Interesting Facts about Biological Classification

- Although the system of classification continues to be modified, Carolus Linnaeus, a Swedish plant scientist, is generally credited with inventing the current system.
- Animals with exoskeletons like insects and crabs are part of the Phylum Arthropoda and are often called arthropods.
- Under the Phylum Chordata we get the classes of animals many are familiar with such as mammals, amphibians, reptiles, fish and birds.
- A species is usually defined as individuals that can reproduce (have kids).

Year 6: Animals including humans

Year 6 programme of study (statutory requirements)	Notes and guidance (non-statutory	Working Scientifically ideas
Pupils should be taught to: • identify and name the main parts of the human circulatory system, and explain the functions of the heart, blood vessels and blood • recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function • describe the ways in which nutrients and water are transported within animals, including humans.	Pupils should build on their learning from years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function. Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body.	• How does your heart rate change for different activities? • How would different types of stomach juices affect break down of food? • Is lung capacity linked to height, age, fitness? Pupils might work scientifically by: exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.

Other teaching ideas

- Link to PSHE and drug awareness.
- Explore the job of each part of the circulatory and digestive systems.
- Dramatization depicting the different stages of each system.
- Make a movie on how to keep you bodies healthy.
- Create a quiz about the body.
- Explore different body systems using websites such as http://kidshealth.org/kid/htbw/
- Make links between the different systems see http://tinyurl.com/kzsoobb for an example of how this might look.
- Recreate parts of the different systems using experiments at http://tinyurl.com/me4blww
-

Key information

Your Cardiovascular System

What is it?

It's a big name for one of the most important systems in the body. Made up of the heart, blood and blood vessels, the circulatory system is your body's delivery system. Blood moving from the heart, delivers oxygen and nutrients to every part of the body. On the return trip, the blood picks up waste products so that your body can get rid of them.

Your Heart

About the size of your clenched fist, your heart is a muscle. It contracts and relaxes some 70 or so times a minute at rest -- more if you are exercising -- and squeezes and pumps blood through its chambers to all parts of the body. And it does this through an extraordinary collection of blood vessels.

Your Blood Stream

Your blood travels through a rubbery pipeline with many branches, both big and small. Strung together end to end, your blood vessels could circle the globe 2 1/2 times! The tubes that carry blood away from your heart are called arteries. They're hoses that carry blood pumped under high pressure to smaller and smaller branched tubes called capillaries. The tubes that more gently drain back to the heart are veins.

How does your blood get oxygen?

When you inhale, you breathe in air and send it down to your lungs. Blood is pumped from the heart to your lungs, where oxygen from the air you've breathed in gets mixed with it. That oxygen-rich blood then travels back to the heart where it is pumped through arteries and capillaries to the whole body, delivering oxygen to all the cells in the body -- including bones, skin and other organs. Veins then carry the oxygen-depleted blood back to the heart for another ride.

What's blood, anyway?

Most of your blood is a colorless liquid called plasma. Red blood cells make the blood look red and deliver oxygen to the cells in the body and carry back waste gases in exchange. White blood cells are part of your body's defense against disease. Some attack and kill germs by gobbling them up; others by manufacturing chemical warfare agents that attack. Platelets are other cells that help your body repair itself after injury.

Did You Know?

- The body of an adult contains over 60,000 miles of blood vessels!
- An adult's heart pumps nearly 4000 gallons of blood each day!
- Your heart beats some 30 million times a year!
- The average three-year-old has two pints of blood in their body; the average adult at least five times more!
- A "heartbeat" is really the sound of the valves in the heart closing as they push blood through its chambers.

Your Muscular System

So what do muscles do?
Muscles move cows, snakes, worms and humans. Muscles move you! Without muscles you couldn't open your mouth, speak, shake hands, walk, talk, or move your food through your digestive system. There would be no smiling, blinking, breathing. You couldn't move anything inside or outside you. The fact is, without muscles, you wouldn't be alive for very long!

Do I have lots of muscles?
Indeed. On average, probably 40% of your body weight is in muscles. You have over 630 muscles that move you. Muscles can't push. They pull. You may ask yourself, if muscles can't push how can you wiggle your fingers in both directions, back and forth, back and forth? The answer? Muscles often work in pairs so that they can pull in different or opposite directions.

How do muscles move?
The cells that make up muscles contract and then relax back to original size. Tiny microscopic fibers in these cells compress by sliding in past each other like a sliding glass door being opened and then shut again. The cells of your muscles use chemical energy from the food you eat to do this. Without food, and particular kinds of nutrients, your muscles wouldn't be able to make the energy to contract!

Some muscles are known as "voluntary" -- that is, they only work when you specifically tell them to. Do you want to say something? Or swing a bat? Or clap your hands? These are voluntary movements. Others, like the muscular contracting of your heart, the movement of your diaphragm so that you can breathe, or blinking your eyes are automatic. They're called involuntary movements. And how do any of these muscles move? Through signals from your nerves, and, in some cases, your brain, as well.

Can you hurt muscles?
Yup. If you hear someone say that they "pulled" a muscle, they have, in fact, torn a muscle in the same way that you can tear a ligament or break a bone. And, like these other living body parts, with a little help, they generally mend themselves.

Factoids:

- You have over 30 facial muscles which create looks like surprise, happiness, sadness, and frowning.
- Eye muscles are the busiest muscles in the body. Scientists estimate they may move more than 100,000 times a day!
- The largest muscle in the body is the gluteus maximus muscle in the buttocks.

Your Digestive System

The story we're about to tell is of stormy seas, acid rains, and dry, desert-like conditions. It's an arduous journey that traverses long distances and can take several days. It's one in which nothing comes through unchanged. It's the story of your digestive system whose purpose is turn the food you eat into something useful -- for your body!

Down the Hatch

It all starts with that first bite of pizza. Your teeth tear off that big piece of crust. Your saliva glands start spewing out spit like fountains. Your molars grind your pizza crust, pepperoni, and cheese into a big wet ball. Chemicals in your saliva start chemical reactions. Seemingly like magic, starch in your pizza crust begins to turn to sugar! A couple of more chews and, then, your tongue pushes the ball of chewed food to the back of your throat. A trap door opens, and there it goes, down your gullet!

Next, your muscles squeeze the wet mass of food down, down, down a tube, or esophagus, the way you would squeeze a tube of toothpaste. It's not something you tell your muscles to do -- they just do it -- in a muscle action called peristalsis. Then, the valve to the stomach opens and pizza mush lands in your stomach!

Inside your stomach

Imagine being inside a big pink muscular bag -- sloshing back and forth in a sea of half-digested mush and being mixed with digestive chemicals. Acid rains down from the pink walls which drip with mucus to keep them from being eroded.

Sound a little like an amusement ride gone crazy? Every time you think you've got your equilibrium back, the walls of muscle contract and fold in on themselves again. Over and over again, you get crushed under another wave of slop. Every wave mixes and churns the food and chemicals together more--breaking the food into even smaller and smaller bits. Then another valve opens. Is the end in sight you ask, as the slop gets pushed into the small intestine.

Inside the small intestine, chemicals and liquids from places like your kidneys and pancreas break down and mix up the leftovers. The small intestine looks like a strange underwater world filled with things that resemble small finger-like cactus. But they're not cactus, they're villi. Like sponges, they're able to absorb tremendous amounts of nutrients from the food you eat. From the villi, the nutrients will flow into your bloodstream.

But hold on! The story's still not over yet -- the leftovers that your body can't use still have more traveling to do! Next, they're pushed into the large intestine. It's much wider and much drier. You find that the leftovers getting smaller, harder and drier as they're pushed through the tube. After all, this is the place where water is extracted and recycled back into your body. In fact, the leftovers that leave your body are about 1/3 the size of what first arrived in your intestines!

Where Food Turns Into Poop

Finally, the end of the large intestine is in sight! Now the drier leftovers are various handsome shades of brown. They sit, at the end of their journey, waiting for you to expel them -- out your anus. Of course, you know the rest! A glorious,if slightly stinky, journey, don't you think?

Factoids:

- An adult's intestines are at least 25 feet. Be glad you're not a full-grown horse ... their coiled-up intestines are 89 feet long!
- Chewing food takes from 5-30 seconds
- Swallowing takes about 10 seconds
- Food sloshing in the stomach can last 3-4 hours
- It takes 3 hours for food to move through the intestine
- Food drying up and hanging out in the large intestine can last 18 hours to 2 days!
- Americans eat about 700 million pounds of peanut butter.
- Americans eat over 2 billion pounds of chocolate a year.
- In your lifetime, your digestive system may handle about 50 tons!!

Year 6: Evolution and inheritance

<table>
<tr><th>Year 6 programme of study (statutory requirements)</th><th>Notes and guidance (non-statutory</th><th>Working Scientifically ideas</th></tr>
<tr><td>Pupils should be taught to:
• recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
• recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
• Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</td><td>Building on what they learned about fossils in the topic on rocks in year 3, pupils should find out more about how living things on earth have changed over time. They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, labradors are crossed with poodles. They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Pupils might find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.

Note: At this stage, pupils are not expected to understand how genes and chromosomes work.</td><td>• How are local aniamls/insects different from those in other locations/countries
• Explore advantages and disadvantages of adaptations e.g. long fur

Pupils might work scientifically by: observing and raising questions about local animals and how they are adapted to their environment; comparing how some living things are adapted to survive in extreme conditions, for example cactuses, penguins and camels. They might analyse the advantages and disadvantages of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.</td></tr>
<tr><td colspan="3">Other teaching ideas

1. Odd one out. A child chooses 3 pictures of a minibeast/bird/plant. Others say which is odd one out and why
2. Classifying pictures of animals. Which live in hot or cold climates?</td></tr>
</table>

3. Pupils could use online resources to find out about a specific animal and a specific plant and then find out how it is suited to the environment in which it lives.
4. Create a tree of life to show the link between species.
5. Identify examples of how animals have adapted to their environment.
6. Explore Darwin's idea of evolution by using websites such as http://tinyurl.com/pxle7sh
7.

Key information

Effects of heredity

Offspring inherit characteristics from their parents. For sexual reproduction to occur a male and a female parent are needed. The offspring show some of the characteristics of each parent and so cannot be exactly like either of them. In addition, the way in which the various characteristics come together during reproduction involves a high degree of chance. Thus each individual offspring will have the characteristics of their parents combined in different ways, so they will also vary from each other. In some organisms reproduction can also take place asexually. In this process one individual produces an offspring by dividing in two or producing another structure which eventually becomes independent. Plants are produced asexually when a gardener takes cuttings. Offspring resulting from asexual reproduction are almost exactly like their parents. Similarities are retained but there is little or no opportunity for any variation. Thus variation within a species occurs as a result of sexual reproduction.

Sudden changes in characteristics

From time to time offspring will be produced with a characteristic that is very distinct and unexpected. These sudden changes, called mutations, occur with varying frequency in different species and are the result of changes that have taken place during the formation of the male sex cells (sperm or pollen) and/or the female sex cells (egg or ovum). When the egg and sperm come together at fertilization these new characteristics become part of the offspring. Often these changes are lethal so the offspring do not live, but occasionally the mutation results in a characteristic that is of benefit to the individual. The peppered moth used to be white, but in the nineteenth century a black form appeared which was better able to survive on tree-trunks blackened by smoke in Britain's cities.

What is evolution?

Evolution is the slow process that changes animals and plants and it's a great piece of science! It describes loads of things in nature like fossils, peacocks' tails, lions' teeth, birds' wings and human brains, just to name a few. It is also supported by lots and lots of evidence that has been collected by scientists for more than 150 years! Some people think it's not true. They prefer religious explanations of why nature is like it is, but the evidence says that evolution is the real explanation.

what is a species?

A species is a group of animals or plants that are very similar. Members of a species share the same characteristics. For example the species pet cats belong to all have sharp teeth, retractable claws, fur, a tail and the same number of toes and nipples. Members of our own species, *Homo sapiens*, to give it its proper name all walk upright, have some sharp teeth and

some flat ones, our eyes point forwards, we have some hair but not all over and we have pretty big brains!
Scientists often decide whether two groups of animals or plants are different species by working out whether or not they can mate with each other. If you try and get a rose to make seeds with a cabbage it won't work: they are separate species. If you try and get a rose to make seeds with another rose that will work: they are the same species even if they look quite a lot different!
Of course you can't go around trying to force lots of animals and plants to mate with each other! Scientists can use other more subtle measures, for example if two groups of birds look really similar but sing different songs and don't seem to find each other attractive, it's a good bet they are different species.

How do species evolve?

All species are related to each other. If you trace your family tree back through your parents, grandparents etc. it will quite quickly join up with your cousin's family tree. If you keep going back far enough, eventually your tree will join up with that of a chimpanzee! Keep going and it will join up with your pet hamsters, further still with your pet cats. Keep going and eventually it will join up with your pet goldfish and if you really keep going for a long time you can trace it back so it joins up with an apple tree's family tree, and eventually bacteria will join up too!
So what makes all the species different? Charles Darwin had the answer! Animals and plants produce too many offspring. Think about how many tadpoles you see at the start of spring, and how few frogs you see at the end of spring. A lot of them die, because there is not enough food to go around. Of course they all try their best to get all the food they need, so they have to compete with each other.
Darwin realised all the members of a species are unique, they are all slightly different. Sometimes this can be the difference between life and death! Think about a bird which eats seeds which have a tough case like a nut. When nuts are in short supply only the really strong birds with big beaks will be able to crack them open and eat them. Since they get more food, they will be less likely to starve or get sick.
Now, since offspring inherit a lot of their characteristics from their parents birds with big beaks will have chicks that grow up to have big beaks too. So over many generations the average beak size in that group of birds which struggle to crack tough nuts will increase. Each generation changes by a really little bit, but all these changes can be added up over time to make a big difference: that's evolution! Darwin called this process natural selection.

What about us?

When Darwin told the world about his discovery in his book *On the Origin of Species* he didn't really say anything about humans other than to hint his ideas would reveal the secrets of human history. But the message was clear; natural selection is the process which has shaped all species, including us!
Other scientists wrote books about human evolution, often comparing our bones to those of apes and monkeys. Eventually Darwin decided to write a book about it too to set the record straight about what the thought about humans. He wrote a book called *The Descent of Man*. He presented lots of evidence to support the theory that humans evolved from apes. He also argued that all the different human races were one species, which was a keenly debated subject in Victorian times.

Year 6: Light

Year 6 programme of study (statutory requirements)	Notes and guidance (non-statutory	Working Scientifically ideas
Pupils should be taught to: • recognise that light appears to travel in straight lines • use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye • explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions.	• What happens to the size of a shadow when you move the object nearer the light? • How can we see round corners? – link to periscopes • Which materials are the best for reflecting light? • What colour of writing can be seen best in the dark? • How many reflections can you create using mirrors? • Which light makes the best shadows? Pupils might work scientifically by: deciding where to place rear-view mirrors on cars; designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works. They might investigate the relationship between light sources, objects and shadows by using shadow puppets. They could extend their experience of light by looking a range of phenomena including rainbows, colours on

		soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).

Other teaching ideas

1. Read Periscope by Michael Rosen
2. Then create a periscope and explain how it works.
3. Find your blind spot
4. Create a pin hole camera
5. Look at and through lenses and prisms and try to explain what happens to light shone through them.

Key information

It was only a few hundred years ago that it was finally discovered how we see things. Before that, it was believed that we saw things because rays shot from our eyes, maybe bouncing back to our eyes or joining with rays of light landing on the object.

We see things because our eyes are receivers of light. Light travels to our eyes. The light enters our eyes. We see the light reflected from an object.

Light reflected from a shiny surface can reflect an image - a picture. This is how mirrors work.

If light is blocked by an object, a shadow is formed. Opaque objects make strong shadows, because they let no light through them. Transparent objects let almost all the light through them. But even they cast a slight shadow.

Year 6: Electricity

Year 6 programme of study (statutory requirements)	Notes and guidance (non-statutory)	Working Scientifically ideas
Pupils should be taught to: • associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit • compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches • use recognised symbols when representing a simple circuit in a diagram.	Building on their work in year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. They should learn how to represent a simple circuit in a diagram using recognised symbols. **Note:** Pupils are expected to learn only about series circuits, not parallel circuits. Pupils should be taught to take the necessary precautions for working safely with electricity. .	• Does adding another battery make any difference? • Does the thickness of the wire affect the brightness of the bulb? • Does the length of wire affect the brightness of the bulb? Pupils might work scientifically by: systematically identifying the effect of changing one component at a time in a circuit; designing and making a set of traffic lights, a burglar alarm or some other useful circuit.
Other teaching ideas 1. Create a light to wear if caving. 2. Create a burglar alarm. 3. Spot the mistake in a circuit diagram and correct. 4. Draw on circuits using correct symbols.		
Key information **Electrical circuits** Electricity can flow through the components in a complete electric circuit. We can use symbols to draw circuits. You can make bulbs brighter by adding more batteries to the circuit. But if you add more bulbs instead they will get dimmer.		

Circuits

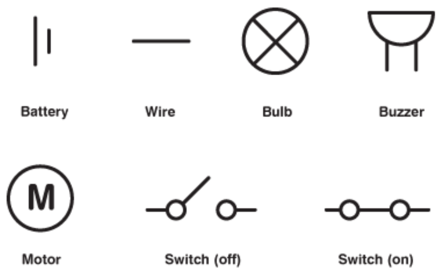
A circuit always needs a power source, such as a **battery**, with wires connected to both the **positive** (+) and **negative** (-) ends. A battery is also known as a **cell**.

A circuit can also contain other electrical **components**, such as bulbs, buzzers or motors, which allow electricity to pass through.

Electricity will only travel around a circuit that is **complete**. That means it has no gaps.

Symbols

We use these symbols to draw diagrams of circuits:

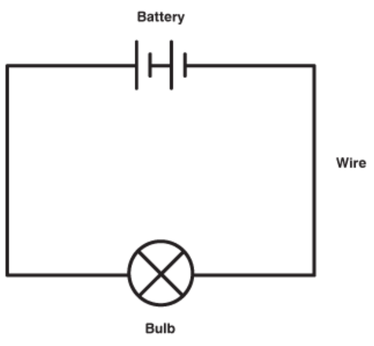


Switches

- When a switch is open (off), there is a gap in the circuit. Electricity **cannot** travel around the circuit.
- When a switch is closed (on), it makes the circuit complete. Electricity **can** travel around the circuit.

Changing circuits

Adding **more batteries** to a simple circuit will increase the electrical energy, which will make a bulb **brighter**.



More bulbs

Adding **more bulbs** to a simple circuit will reduce the electrical energy and make the bulbs **dimmer**.

Longer wires

Lengthening the wires in a simple circuit will reduce the electrical energy, as it has further to travel. The extra distance will make the bulb **dimmer**.

Adding a motor

If electrical energy is flowing around the circuit, the motor will rotate.