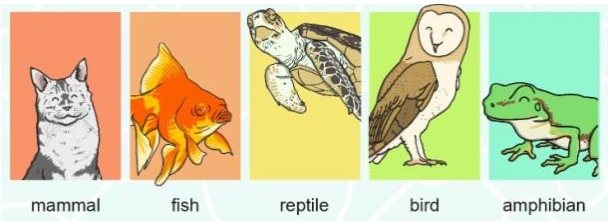
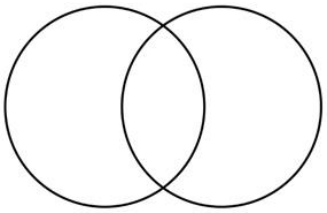
Priory Primary School

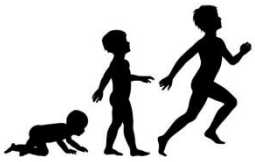
Year 1 Science Spring: Animals, including Humans

Knowledge	
How can we organise the animals in a zoo?	**Identifying and Classifying** There are five main types of animal that have a backbone, called vertebrates, that you would find in a zoo: mammals, fish, reptiles, birds and amphibians. You can use the different features of each animal to help organise them, like the number of legs they have or if they have wings or scales. 
How are the animals in Australia different to the ones that we find in Britain? Why might we see these differences?	**Research** Because Australia and Britain are in different parts of the world, the weather and the habitats of the animals that live there are also different. Not only that, but Australia is about 32 times bigger than Britain, so there's also a lot of differences around the country! What might the differences in weather and habitat be? Which animals live in the wild in Britain but not in Australia? Why?
How are pets different?	**Research** All of the different animal types can be kept by people as pets. This makes them different to wild animals that might be found in a pond, or a forest, or underground. Apart from their habitat, what else makes pets different to wild animals? Would you treat them the same? Would they eat the same things? How would you know they were healthy? Could the same animal live in the wild and as a pet? Why?
Which animals fit into the groups: carnivore, herbivore and omnivore? *What types of food do you eat the most? Does this make you a carnivore, herbivore or omnivore?*	**Pattern Seeking** **Observing Over Time** The difference between carnivores, herbivores and omnivores is the kinds of food that these animals eat. Animals that eat only meat are carnivores, whilst animals that eat only plants are herbivores. Any animal that eats a mixture of plants and meat is an omnivore.  Think about your own diet and the meals you eat over one week. Do you eat mostly meat or mostly plants? Do you eat just plants, or just meat? How could you show this information and group different animals and humans based on what they eat?
What features do predators have? How do these features help them to hunt for their food?	**Research** Because predators hunt their food, they are nearly always carnivores, although some are omnivores. What would a predator need that a herbivore would not? For example, a carnivore's teeth are long and sharp to help them catch and cut their food. Can you think of any other features that would help them to hunt?
Do nocturnal animals eat different types of food to animals that eat during the day?	**Comparative Testing** Nocturnal animals are awake and active at night, whilst diurnal animals are awake and active during the day. Because of this, their habitats would have to be different so that they are safe and able to sleep while there is daylight. Also, most nocturnal animals are predators. Is there an experiment that you could do to test this? What would you need to change and what would you be able to keep the same? What would you expect your results to be? Why?
How are reptiles different from each other?	**Comparative Testing** Even though animals can be the same type, such as reptiles, they can still look, move or act differently. For example, snakes and crocodiles are both reptiles, but snakes have no legs, whilst crocodiles have four. Can you think of any other differences? How could you present this information to other people who might be interested?

What are the names for all of the parts of our bodies?	 **Identifying and Classifying** On a large roll of paper, draw the outline of a friend's body. Using the vocabulary list, could you label all of their body parts on the drawing you've made? Head Neck Arms Elbows Legs Knees Face Ears Eyes Hair Mouth Teeth
Which parts of the human body are responsible for our senses?	**Identifying and Classifying** We have five senses: 1. We smell using our nose. 2. We taste using our tongue. 3. We touch using different parts of our body, like our hands. 4. We see using our eyes. 5. We hear using our ears. 
Do all animals have the same senses as humans?	**Research** Because humans are mammals, we have the same senses as other mammals. In fact, most animals share the same five senses. However, do all animals have the same quality of senses? For example, bats have better hearing than most animals, which helps them to see in the dark! Are there other examples like this?
Is our sense of smell better when we can't see?	**Comparative Testing** The human brain is so clever that if you are not able to use one of your senses, like people who are blind or deaf, then your other senses become better to make up for this. Using this information, what sort of experiment could you do to test this? What equipment would you need? What would you need to keep the same and what would you need to change? What would you measure to get your results? What do you predict will happen? Why?

Vocabulary	
Amphibians	Animals which breathe through gills and have cold blood. **Amphibians** can live on land or in water.
Arms	The upper **limbs** of the **body**, between the **shoulders** and the **hands**.
Birds	Animals that have feathers, wings and a beak. Most **birds** can fly.
Body	The physical structure of an animal or human.
Brain	One of the main organs of an animal or human **body** that is found in the **skull**.
Carnivores	Animals that only eat meat.
Ears	The part of the **body** that is able to hear. Hearing is one of our five **senses**.
Elbows	The parts of the **body** that help our **arms** to bend.
Eyebrows	A part of the **body** that protects our **eyes**.
Eyes	The part of the **body** that is able to see. Seeing is one of our five **senses**.
Feet	The parts of the **body** that help us to stay balanced and upright.
Fish	Animals that have gills and fins. All **fish** live in water.
Hair	A part of the **body** that grows on the **head** and helps to protect the **skull**.
Hands	The parts of the **body** that allow us to touch and grip things, such as a pencil to write with.
Head	The part of the **body** above the **neck**.
Herbivores	Animals that only eat plants.
Knees	The parts of the **body** that help our **legs** to bend.
Legs	The lower **limbs** of the **body** that allow us to stand and walk.
Limbs	The **arms** and **legs** of an animal or human.
Mammals	Animals which have **hair** or fur and feed their babies themselves.
Mouth	The part of the **body** used to eat and talk.
Neck	The part of the **body** that connects the **head** to everything else.
Nose	The part of the **body** that is able to smell. Smell is one of our five **senses**.

Omnivores	Animals that eat a mixture of meat and plants.
Reptiles	Animals that have dry, scaly skin. Most **reptiles** are cold-blooded and lay eggs.
Senses	Something that animals and humans use to help them understand objects and feelings.
Shoulders	The parts of the **body** that help our **arms** to lift up.
Skin	The outer covering of the **body** of an animal or human that helps them to touch things. Touch is one of our five **senses**.
Skull	The large bone in the **body** that protects the **brain**.
Teeth	The hard, bony parts of the **mouth** that are used for biting and chewing.
Tongue	The part of the **body** that is able to taste. Taste is one of our five **senses**.

What should I already know? (KS1)	Potential Cross-curricular Links (KS1)
• **Key Stage 1: Working scientifically [NC 2014, p113]**.	 **Healthy Me:** Diet

Statutory requirements

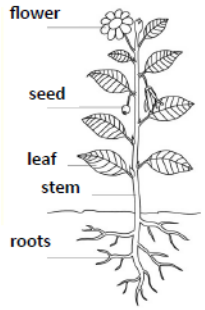
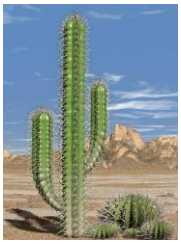
Pupils should be taught to:

- identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals
- identify and name a variety of common animals that are carnivores, herbivores and omnivores

Statutory requirements

- describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)
- identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.

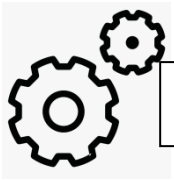
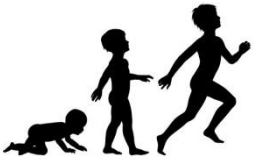
Year 2 Science Spring 1: Plants

Knowledge	
What is the life cycle of a plant?	**Research** https://www.bbc.co.uk/bitesize/clips/z3wsbk7 A life cycle is the series of changes that a plant (or animal) passes through from the beginning of its life until its death. Beginning as either a bulb or a seed, the plant begins to germinate, grow and develop new parts, such as roots, a stem and leaves, before eventually becoming a living thing that can reproduce to create new plants. 
Which plants are commonly found in the UK?	**Research** Both deciduous and evergreen trees grow in the UK, such as oak and cedar trees. There are lots of different flowering plants too, such as dandelions, daisies, nettles and buttercups. The emblems of each separate country in the UK are also flowering plants – can you remember what they are?
How do seeds and bulbs change over time?	 **Observing Over Time** The main difference between seeds and bulbs is that a seed is the way a plant reproduces and creates new plants, whilst a bulb is a plant that lives underground and can only be seen when its leaves grow through the surface of the soil. Based on this information, what differences would you expect to see if you planted a seed and a bulb and watched them both grow over the same amount of time? Why do you think this happens?
How do seeds disperse?	**Identifying and Classifying**  When a plant with seeds is ready to reproduce, it disperses those seeds in lots of different ways. Some seeds travel on the wind or through the air, whilst others can travel by water if the plant they come from grows near a river. Some seeds explode and throw new seeds out away from the plant, and sometimes even animals transport seeds when they eat them or brush against them and catch them in their fur. All these different ways of dispersal depend on the shape of the seed and how well they are suited to each possibility.
Which factors are needed for a plant to grow?	**Pattern Seeking** As a living thing, plants require things such as water, warmth, nutrients from the soil and light to grow. If they do not have one or more of these things, then they may stop growing properly, or even stop growing altogether.
How does a cactus survive in a desert with no water?	**Research**  The main habitat of a cactus (or cacti) is somewhere where there is very little rainfall, in particular deserts or arid (dry) countries. Because of this, they don't have access to water for long periods of time, so they have adapted to allow them to keep growing. How might this be possible? Similarly, the main habitat of a camel is an arid environment and they also survive with very little water. Is there a link between the two?
Do plants grow better in the dark or light?	**Comparative Testing** Light is one of the main factors needed for a plant to grow properly, although some plants need more light than others. Using this information, what sort of experiment could you do to measure this? What equipment would you need? What would you need to keep the same and what would you need to change? What would you measure to get your results? What do you predict will happen? Why?

Does the direction that the light hits a plant affect the way in which it grows?	**Pattern Seeking** Because light and warmth are two of the main factors needed for a plant to grow properly, a plant will usually grow towards a place where both of these factors comes from. For example, if a plant is on a windowsill then it should grow towards the window rather than towards the inside of the room. Using this information, could you create an experiment to see how this happens? What equipment would you need? What would you need to keep the same and what would you need to change? How will you know if the information is true or false?
Are all food types plants? Which plants can be eaten safely?	**Research**  https://www.nhs.uk/live-well/eat-well/ Many plants provide us with food. For example, fruit provides seeds which can be planted to grow new fruit, such as tomatoes, whilst farmers grow crops such as wheat and oats that provide us with cereals and grains. We also eat different parts of vegetable plants: root vegetables such as carrots and potatoes; stem vegetables like celery; leafy vegetables such as cabbage and lettuce; and flowering vegetables like broccoli. Even nuts and seeds can be eaten, like peanuts and sesame seeds, and herbs are grown to help add flavour to other foods. Using this information, do you think plants fit into all of the 5 main food groups (fruit and vegetables, carbohydrates, proteins, dairy and healthy fats)? Why?
How did George Washington Carver use science to improve farming in America?	**Ideas Over Time**  George Washington Carver (1864-1943) https://www.youtube.com/watch?v=i9XyhcjjkyI American agricultural scientist and inventor.

Vocabulary	
Branches	Parts that grow out from the **tree trunk** and have **leaves**, **flowers** or **fruit** growing on them.
Bulb	A **root** shaped like an onion that grows into a **flower** or **plant**.
Common	Something that either happens often or is found in large numbers.
Crop	**Plants** such as wheat and potatoes that are grown for food in large amounts.
Deciduous	A **tree** that loses its **leaves** in the autumn every year.
Evergreen	A **tree** or bush which has green **leaves** all year round.
Flower	The part of a **plant** that is often brightly coloured and grows at the end of a **stem**.
Flowering	**Trees** or **plants** which produce **flowers**.
Fruit	Something that grows on a **tree** or bush. **Fruit** contains **seeds** or a stone and is covered by a substance that can be eaten.
Garden	A piece of land next to a house that can contain **flowers**, **vegetables**, other **plants**, and grass.
Herb	A **plant** whose **leaves** are used in medicine or in cooking to add flavour to food.
Leaves	The parts of a **tree** or **plant** that are flat, thin and usually green.
Nutrients	Substances that help **plants** and animals to grow.
Petal	The thin, coloured or white parts of a **flower**.
Plant	A living thing that grows in the earth and has a **stem**, **leaves** and **roots**.
Reproduce	When an animal or **plant** produces one or more living things similar to itself.
Roots	The parts of a **plant** that grow under the ground.
Seed	The small, hard part of a **plant** from which a new plant grows.
Stem	The thin, upright part of a **plant** on which the **flowers** and **leaves** grow.
Tree	A tall **plant** that has a hard **trunk**, **branches** and **leaves**.
Trunk	The large, main **stem** of a **tree** from which **branches** grow.

Vegetable	**Plants** such as cabbages, potatoes and onions which can be cooked and eaten.
Vegetation	**Plants**, **trees** and **flowers**.
Weed	A **wild plant** that grows in **gardens** and prevents other plants from growing properly.
Wild	Animals or **plants** that live or grow in natural surroundings and are not looked after by people.

What should I already know? (KS1)	Potential Cross-curricular Links (KS1)
• **Key Stage 1: Working scientifically [NC 2014, p113]**; • **Y1 Plants:** *identify and describe the basic structure of a variety of common flowering plants, including trees.*	 **The United Kingdom:** Country Emblems  **Fruit and Vegetables**  **Healthy Me:** Balanced Diet

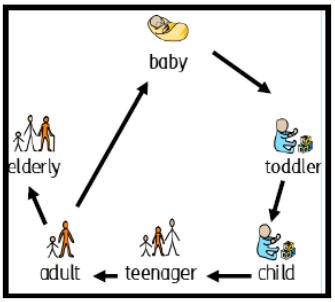
Statutory requirements

Pupils should be taught to:

- observe and describe how seeds and bulbs grow into mature plants
- find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.

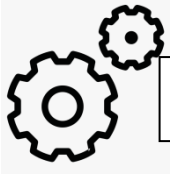
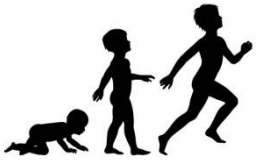
Priory Primary School

Year 2 Science Spring 2: Animals, including Humans

Knowledge	
How do animals and humans change over time?	**Observing Over Time** A life cycle is the series of changes that an animal (including humans) or plant passes through from the beginning of its life until its death. All animals, including humans, have offspring which grow into adults.
What stages of development do humans go through? *What happens to your size as you grow?*	**Research** **Comparative Testing** A human being goes through many stages of development from before they are born to the time that they die. At each stage, there are changes to the body that can be seen, and changes that take place in the brain that can't be seen.  Is it always true that the size of a human being changes at each stage? Does a human being get bigger or smaller with age? How could this be investigated fairly? What do you predict will happen? Why?
Which offspring belongs to whom?	**Pattern Seeking**  The offspring of some animals look different to when they are fully grown. Can you identify what a chick or a sheep will grow into? What about when there is more than one main stage to the life cycle, such as frogspawn or a caterpillar? How many stages does it take to reach a fully grown adult then?
What do all animals and humans need to survive? **What happens when one of the survival needs are removed?**	**Identifying and Classifying** **Observing Over Time** All animals and humans share three basic needs in order to survive: food and water are needed to provide nutrition and help the body to function, whilst air allows them to breathe. If one of those three basic needs is taken away, then a part of the body would not be able to function properly and the animal or human would die. Are there any other things that animals and humans may need to stay both alive and healthy? Why are these things important?
Do animals need the same as humans to survive?	**Comparative Testing** Different species of animals will need slightly different things in order to survive and be healthy. For example, some animals are carnivores, whilst others are herbivores or omnivores. Can you think of any other differences that there might be between different species of animals?
Why is Dr. Ernest Madu significant?	**Research** Dr. Ernest Madu (1960-). https://www.youtube.com/watch?v=IN88mI8zpSg  Cardiologist and entrepreneur. His work focuses on providing affordable healthcare in low-resource nations and helping to prevent heart disease through preventative measures such as diet and exercise.
Are people who exercise regularly taller?	**Pattern Seeking** Exercise helps to keep a person's muscles and bones healthy. Based on this information, do you think there is a link between a person's height and how much they exercise? How could you find out by doing an experiment? What do you think the answer might be? Why?
What is a balanced diet?	**Identifying and Classifying** https://www.nhs.uk/live-well/eat-well/ A balanced diet is an important part of keeping healthy, and to do this a person needs to eat and drink the right amount of the 5 main food groups (fruit and

	 vegetables, carbohydrates, proteins, dairy and healthy fats). For example, an adult should be eating five different portions of fruit and vegetables every day, as well as drinking at least 6 to 8 glasses of water or other fluids. What other foods do people eat that might be part of a balanced diet? Which of the main food groups do you think they belong to? Why?
What impact does healthy and unhealthy food have on our bodies?	**Comparative Testing** Eating a balanced diet means that the body gets everything it needs in the right amounts to stay healthy. However, if our diet is not balanced and we eat a lot of some things and not enough of others, then it can make our bodies unhealthy. For example, some foods contain lots of fat and sugar that can make us ill. We may put on too much weight and parts of our body like the heart will become diseased. Which foods do you think might be classed as unhealthy? What is it about those foods that make them unhealthy?
Where have different dishes originated from and what nutrients do they offer?	**Ideas Over Time** Over several years, the food available to people has changed because of how easy it has become to transport goods and travel around the world, which has meant that their diets have also changed. Could you construct a timeline that shows where different dishes have originated from, such as pizzas or curries? What are the different nutrients that these dishes offer?
Which age group of children wash their hands the most in a day?	**Pattern Seeking**  In order to keep healthy, humans need to keep good hygiene by washing regularly, having clean clothes and brushing their teeth and hair. When are people most likely to wash their hands? Why? Is there a way of investigating this question within school? What would you need to think about to make it fair?

Vocabulary	
Adult	A person who is fully grown and no longer a child.
Balanced	When something is equal.
Bones	The hard parts inside the body which form the **skeleton**.
Breathing	The process of taking in and expelling air from the lungs.
Diet	The food and water that animals and humans need to **survive**.
Disease	An illness that affects people, animals or plants.
Exercise	A physical activity that keeps your body fit.
Farm	An area of land used to produce crops or to breed animals and livestock.
Habitat	Where an animal or human lives.
Healthy	To be well and not suffering from any illness or **disease**.
Heartbeat	The pulsing of the heart.
Hygiene	Keeping yourself and your surroundings clean, especially to stop illnesses or **diseases** from spreading.
Muscles	Something inside the body that connects two **bones** and is used to make the body move.
Nutrition	Providing the food that the body needs to grow and be **healthy**.
Offspring	The child of an animal.
Significant	Another way of saying something is very important.
Skeleton	The framework of **bones** inside the body.
Species	A group of similar living things.
Survive	When an animal or human continues to live or exist.

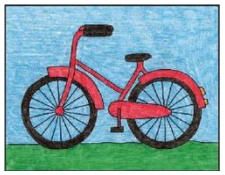
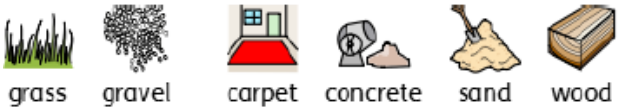
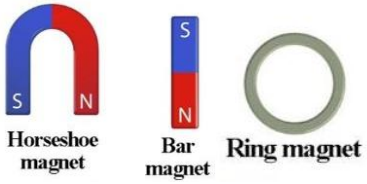
What should I already know? (KS1)	Potential Cross-curricular Links (KS1)
• **Key Stage 1: Working scientifically [NC 2014, p113]**; • **Y1 Animals, including humans:** *identify and name a variety of common animals, including fish, amphibians, reptiles, birds and mammals;* • **Y1 Animals, including humans:** *identify and name a variety of common animals that are carnivores, herbivores and omnivores.*	 **Continents:** Food origins  **Fruit and Vegetables**  **Healthy Me:** Balanced Diet

Statutory requirements

Pupils should be taught to:

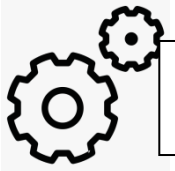
- notice that animals, including humans, have offspring which grow into adults
- find out about and describe the basic needs of animals, including humans, for survival (water, food and air)
- describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.

Year 3 Science Spring: Forces and Magnets

Knowledge	
Can we identify pushing and pulling forces in action?	**Identifying and Classifying**  Forces change the motion of an object by pushing or pulling. They can make it start to move, speed up, slow down or even make it stop altogether. For example, when a cyclist pushes down on the pedals of a bike, it begins to move. The harder the cyclist pedals, the faster the bike moves. However, when the cyclist pulls on the brakes, the bike slows down and eventually stops. Can you think of any other examples of forces pushing and pulling?
How does the type of surface affect movement?	**Comparative Testing**  Forces act in opposite directions to each other, and when an object moves across a surface, friction acts as an opposite force. Some surfaces create more friction than others, which means that objects move across them much more slowly. Now that we know this, how could we investigate the effect of friction on different surfaces? What equipment and materials will we need? Is there anything else we need to consider? If you had to predict what you think will happen based on the appearance of each surface, which one do you think will create the most (or least) friction? Why?
Is contact needed for a force?	**Pattern Seeking**  For some forces, like with the example of a bicycle, there has to be contact to create the pushing or pulling force which causes motion. However, does there need to be contact with an apple to make it fall out of a tree? Is the apple being pushed downwards from the sky, or pulled downwards from the ground? What force is operating here? Are there any other examples you can think of where a force works with no contact?
Why do we call magnetism a non-contact force?	**Pattern Seeking** Magnets produce an area of force around them called a magnetic field. When objects enter this magnetic field, they will be attracted to the magnet if they are magnetic, or repelled from the magnet if they are non-magnetic.
Which materials are magnetic and non-magnetic?	**Identifying and Classifying**  All magnetic materials are made of metal, but that doesn't mean that every metal is magnetic! Any magnetic object, such as iron or steel, will be attracted to a magnet, whilst any non-magnetic object, such as aluminium or copper, will not.
Does the size and shape of a magnet affect how strong it is?	**Pattern Seeking**  There are different sizes and shapes of magnet, such as a bar, ring, button or horseshoe. The strength of a magnet is in its ends, which are called poles, so based on the images, which magnet would you expect to be the strongest? Why? If the poles are made bigger, what would you usually expect to happen? Why?
What will happen if two North poles are facing each other?	**Comparative Testing** When magnets attract, they pull together, but when they repel they push each other away. A magnet has two poles, north (N) and south (S), and whilst opposite poles attract, similar poles repel. Using this information, what would you expect to happen when you place the north poles of two bar magnets

	together? How could you justify your prediction? What would you have to do to the bar magnets to get the opposite reaction? Why?
If a magnetic metal goes rusty, or if it's painted, can it still be attracted to a magnet?	**Observing Over Time** Over time, when something goes rusty it creates a non-magnetic layer around the magnetic metal that has rusted. Similarly, when a magnetic object is painted, there is at least one layer of paint covering the object's surface. This means that the distance between the magnetic part of the object and the magnet will be bigger, even though it is sometimes only by a small amount. Is there a way you could investigate this in the classroom, or at home, and make a prediction using this information? How will you know if you are correct?
How have magnets changed everyday life?	**Comparative Testing** Magnets are very important in the 21st century, although you wouldn't believe some of the different ways they are used! For example, they are used to seal fridge and freezer doors, they are inside the speakers in your television, and are even used to help scan people in hospital to check for disease. Based on what you know about how magnets work, can you think of any other ways in which they might be used in your everyday life?
Who was William Sturgeon? How did he adapt his ideas of the magnet to revolutionise their use?	**Ideas Over Time** William Sturgeon (1783-1850) https://www.youtube.com/watch?v=DbGrHMTlyjM English physicist and inventor. 

Vocabulary	
Attract	To give out a **force** that **pulls** two objects together.
Force	The **pulling** or **pushing** effect that something has on something else.
Friction	The **resistance** of **motion** when there is contact between two **surfaces**.
Gravity	The **force** which causes things to drop to the ground.
Magnet	A piece of iron or other material which **attracts** magnetic materials towards it.
Magnetic field	An area around a **magnet**, or something functioning as a **magnet**, in which the **magnet's** power to **attract** things is felt.
Metal	A hard substance such as iron, steel, gold or lead.
Motion	The activity of changing position or moving from one place to another.
Newton	The unit of measurement used for **forces**. It is written as a capital N.
Non-magnetic	An object that is not magnetic.
Opposite	Things of the same kind which are also different in a particular way. For example, north and south are **opposite** directions.
Position	The place where someone or something is in relation to someone or something else.
Pull	To use **force** to move an object towards something or away from its previous **position**.
Push	To use **force** to move an object away from something or away from its previous **position**.
Repel	To give out a **force** that **pushes** two objects apart, such as two magnetic poles.
Resistance	A **force** which slows down a moving object or vehicle.
Surface	Either the flat, top part of something or the outside of it.

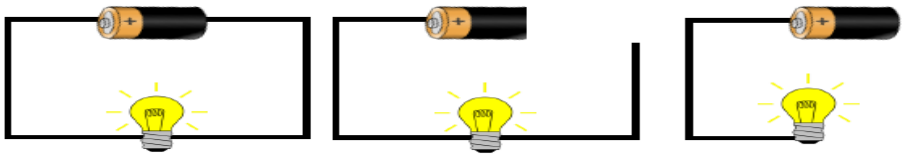
What should I already know? (KS1/KS2)	Potential Cross-curricular Links (KS1/KS2)
• **Lower Key Stage 2: Working scientifically [NC 2014, p120]**; • **Y1 Everyday materials:** *compare and group together a variety of everyday materials on the basis of their simple physical properties.*	 **Sliders/Levers** **Wheels/Axles** **Puppets**

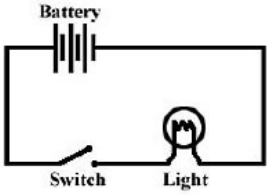
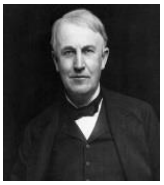
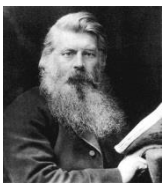
Statutory requirements

Pupils should be taught to:

- compare how things move on different surfaces
- notice that some forces need contact between two objects, but magnetic forces can act at a distance
- observe how magnets attract or repel each other and attract some materials and not others
- compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials
- describe magnets as having two poles
- predict whether two magnets will attract or repel each other, depending on which poles are facing.

Year 4 Science Spring: Electricity

Knowledge	
What is electricity and how is it made?	**Research** Electricity is a form of energy that can be used in a variety of ways to provide power. It is generated using energy from natural sources, known as fuel sources, such as the Sun, oil, water and wind.
What impact has electricity had on everyday appliances?	**Ideas Over Time**  In the 20th century and earlier, appliances that were used for everyday jobs, such as washing clothes and cleaning floors, were slower and done manually as opposed to being helped by electricity. However, many different everyday appliances use electricity as their source of power in the 21st century. Some appliances use batteries and some use mains electricity. Batteries come in different sizes depending on how much, and for how long, the appliance is used. Which appliances in your house are powered by mains electricity and which ones are powered by batteries? Using this information, why do you think this is?
How dangerous is electricity?	**Identifying and Classifying** https://www.bbc.co.uk/bitesize/clips/z8x2tfr  Electricity is extremely useful in our everyday lives, but it can also be incredibly dangerous if it is not respected or used properly. For example, if electricity and water combine, it can create a fire and burn anybody close to it. What could you do to make other children in school aware of the dangers of not using electricity correctly?
Can you identify the main components in a circuit?	**Identifying and Classifying** A complete circuit is a loop that allows electrical current to flow through wires. It contains a battery (or cell), wires and a component that requires the electricity in order to work, such as a bulb, motor or buzzer. The electrical current flows through the wires from the cell to the component.
What do you notice about these circuits?	**Identifying and Classifying**  For a circuit to work and be classed as complete, it needs a cell, wires placed in the right places on the cell and a component, in this case a bulb (or lamp). However, if the wires are not placed correctly or the battery is not connected properly, then the circuit will be incomplete. Based on this information, which circuit is the complete one? What makes the other two circuits incomplete? How else could you draw either a complete or incomplete circuit?
What happens when the circuit is incomplete? What happens if I bridge the gap in the circuit with different materials?	**Comparative Testing** If a circuit is incomplete, then electrical current cannot flow all the way around the circuit: as soon as it reaches a point where the wire is not connected to either a cell or a component, the current has nowhere to go. However, the circuit can be completed in a number of ways, such as by attaching extra wire or by using another material to bridge the gap. Some materials are better at allowing the electrical current to pass through than others, so how can this be investigated safely? What types of material do you think would be best? Why? What variables do you have to consider for this to be a fair test? How will you record your results?

What is the difference between an insulator and a conductor?	**Identifying and Classifying** When objects are placed in a circuit, they may or may not allow electricity to pass through. Objects that are made from materials that allow electricity to pass through and create a complete circuit are called electrical conductors, whilst objects that are made from materials that do not allow electricity to pass through and do not create a complete circuit are known as electrical insulators.
Which materials tend to be conductors? **Which metal is the best conductor of electricity?**	**Pattern Seeking** **Comparative Testing**  Because they allow electrical current to flow through them easily, all metals can conduct electricity. Some metals, however, are better at conducting electricity than others because of how pure they are: for example, brass is a metal made from copper and zinc, which makes it less pure than other metals. Additionally, although it is not a metal, graphite can also conduct electricity. Seeing as a school pencil is made of graphite, does this mean that you could use it to create an electrical circuit? Why/why not? Using this information, how can the conductivity of metals be investigated safely? Which metal do you think would be the best conductor? Why? What other variables do you have to consider for this to be a fair test? How will you record your results?
Why is plastic used as an insulator on devices?	**Pattern Seeking** Any electrical conductor will react with another electrical conductor if the two items are placed too close to each other, which can cause electric shock. Therefore, wires and other conductors must be insulated to make them safe to use. Plastic is a very poor conductor of electricity and heat, meaning that when an electrical appliance gets hot through being used for a long time, such as a hairdryer or a food mixer, it is still safe.
What impact do switches have on a circuit? **If I make a series circuit and open a switch, what happens?**	**Pattern Seeking** **Observing Over Time**  A switch can break or reconnect a circuit by controlling the flow of the electrical current. When the switch is off, the current cannot flow. However, this is not the same as an incomplete circuit. Why do you think this is?
Who actually invented the light bulb: Thomas Edison or Joseph Swan?	**Ideas Over Time** https://www.youtube.com/watch?v=YmAxDH0eNLQ  Thomas Alva Edison (1847-1931) American inventor and businessman. Sir Joseph Wilson Swan (1828-1914) English physicist, chemist and inventor. 
What happens to the brightness of a bulb if I add more batteries? What happens to the brightness if I add more bulbs?	**Observing Over Time** Generally speaking, the more components there are in a circuit, the more power is needed for them to function fully. Similarly, the more power there is, the more likely a component is to function fully. Based on this information, what would you expect to happen if you experimented with the number of bulbs and the number of cells in a complete circuit? Why do you think this?

Vocabulary	
Appliances	**Devices** or machines, often electrical, that are used to do a job, such as cleaning or cooking.
Battery	A small **device** that provide the **power** for electrical items, such as torches.
Bulb	The glass part of an electric lamp, which gives out light when **electricity** passes through it.
Buzzer	An electrical **device** that is used to make a buzzing sound.

Cell	A synonym for **battery**.
Circuit	A complete route which an electric **current** can flow around.
Component	The parts that something is made from.
Conductor	A substance that heat or **electricity** can pass through or along.
Current	A flow of **electricity** through a **wire** or **circuit**.
Device	An object that has been invented for a particular purpose.
Electricity	A form of **energy** that can be carried by **wires** and can provide **power** for **devices**. It is used for heating, lighting and many other important purposes.
Energy	The **power** from **sources**, such as **electricity**, that makes machines work or provides heat.
Fuel	A substance such as coal, oil or petrol that is burned to provide heat or **power**.
Generate	To cause something to begin and develop.
Insulator	A non-**conductor** of **electricity** or heat.
Mains	Where the supply of water, **electricity** or gas enters a building.
Motor	A **device** that uses **electricity** or **fuel** to produce movement.
Power	**Energy**, especially **electricity**, that is obtained in large amounts from a **fuel source** and used to operate lighting, heating and machinery.
Socket	A place where electrical **devices** can be plugged into and powered from.
Source	Where something comes from.
Switch	A small control for an electrical **device** which is used to turn the **device** on or off.
Wire	A long, thin piece of metal that is used to fasten things or carry electric **current**.

What should I already know? (KS2)	Potential Cross-curricular Links (KS2)
• **Lower Key Stage 2: Working scientifically [NC 2014, p120]**.	**Victorian Dudley:** Fuel sources Machinery

Statutory requirements

Pupils should be taught to:

- identify common appliances that run on electricity
- construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
- 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
- recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- recognise some common conductors and insulators, and associate metals with being good conductors.

Year 5 Science Spring: Forces

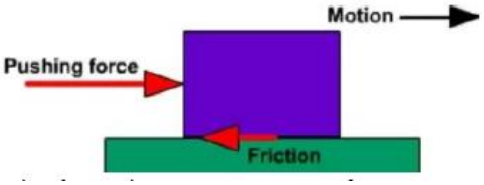
Knowledge

Forces are pushes and pulls. These forces change the motion of an object: they will make it start to move, speed up, slow down or even stop. For example, when a cyclist pushes down on the pedals of a bike, it begins to move. The harder the cyclist pedals, the faster the bike moves. When the cyclist pulls on the brakes, the bike slows down and eventually stops.

Friction is a force – it is the resistance of motion when one object rubs against another. Other forces that create resistance include air resistance and water resistance.

What are the effects of friction acting between moving surfaces?

Comparative Testing



Friction occurs because no surface is completely smooth: the rougher a surface is, the more friction takes place. There is also greater friction between heavy objects, as they press together with greater force. Because the surfaces of moving objects create friction, this in turn creates heat, and the faster the surfaces move, the greater the heat.

Can you think of a way that you could investigate these general rules concerning friction to see if they are accurate? What variables would you have to consider to ensure you were carrying out a fair test? How would you record your results?

Why is friction so important to cars and other moving vehicles?

Observing Over Time

The combination of friction and the tread of a vehicle's tyres allow it to move safely along the rough surface of a road. Every vehicle uses its engine to generate the pushing force on its wheels that move it forwards. However, the tread of the tyres is worn away by the pulling force of the road surface, creating friction and stopping the tyres from sliding across the road and causing an accident.

Which forces are used when using levers and pulleys?

Does the use of pulleys and levers make objects easier to move?


lever


pulley


gear


spring

Pattern Seeking

There are a number of mechanisms which use forces to help with the movement of objects, some of them heavy:

- Levers allow us to do heavy work with less effort. For example, trying to pick up a large, heavy box is difficult, but by using the pushing force of a lever, it becomes much easier to move it;
- Pulleys also allow us to do heavy work – objects are attached to ropes and pulley wheels, so instead of lifting a heavy object upwards, we can pull on the pulley rope downwards;
- Gears are toothed wheels. Their 'teeth' can fit into each other so that when the first wheel turns, so does the next one. This allows forces to move across a surface;
- Springs can be stretched by pulling them or squashed by pushing them. The greater the force pulling or pushing the spring, the greater the force the spring uses to move back to its normal shape.

Do gears allow a smaller force to have a greater effect?

Research

Consecutive gears turn in the opposite direction to each other, which creates friction. Additionally, the speed of a gear depends on its size: small gears turn faster than big gears.

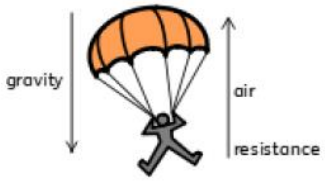
Using this information, think about the sort of everyday objects or machinery that use gears, such as a bicycle. Can you build a model that will help to research the question in detail and see how the forces created are affected by the movement of the gears?

Which everyday objects use levers, pulleys or friction to work? Do some use more than one?

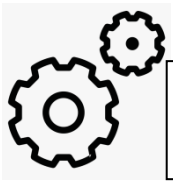
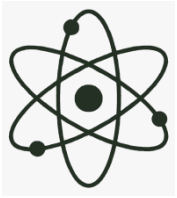
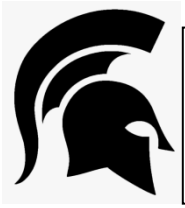
Identifying and Classifying

https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs

There are many different machines and objects we use in everyday life that make use of levers and pulleys. How many can you think of?

	We already know that friction creates heat, and the faster surfaces move, the greater the heat. Why might this be a disadvantage in some machines? Think about a forest fire, which is caused by friction between tree branches: how could something similar happen with machinery? Is there any way that this can be avoided?
Why do objects fall towards the centre of the Earth?	 **Identifying and Classifying** Gravity is the force that pulls objects to the centre of the Earth. The Earth has a very strong gravitational force because of its size, which attracts all objects towards it and is why we feel a downward pull on the surface rather than a downward push from above.
How have our ideas about gravity changed over time? *Who was Galileo Galilei and how have his ideas helped to develop the theory of gravitation?*	**Ideas Over Time** https://www.youtube.com/watch?v=oeR8Iz7Qnhg Galileo Galilei (1564-1642) Italian astronomer, physicist and engineer.  The idea of gravity and how it pulls objects towards a particular point was first discovered in the 4th century BC by the Ancient Greek philosopher Aristotle. Since then, many famous scientists and philosophers have built upon Aristotle's beliefs to give us the understanding of gravity we have today. Can you create a timeline of the key events and how what we know about gravity has changed between the 4th century BC and the 21st century AD?
How does air resistance work on moving objects?	**Pattern Seeking** Air resistance works in a similar way to friction by pushing up on an object and opposing the force of gravity, therefore making the object fall more slowly through the air. In general terms, the faster an object is falling towards the ground, the greater the air resistance acting upon it. Can you think of any ways in which you can see air resistance working in everyday life?
Which shape parachute takes the longest to fall?	**Comparative Testing**  Air collects inside the fabric of a parachute as it falls, pushing up against the gravitational pull from below and creating friction. However, the size and shape of a parachute will also have a bearing on how long it takes to reach the ground: the larger or heavier an object is, the faster it will fall. Therefore, you would expect that the more air a parachute can collect as it travels, the greater the air resistance. Can you think of a way that you could investigate with parachutes to see if these general rules about air resistance are accurate? What variables other than size and shape would you have to consider for the purposes of fair testing? What do you predict will happen and how can you justify your prediction?
What is water resistance?	**Pattern Seeking**  Water resistance is the friction that is created between water and an object that is moving through it. Some objects can move through water with less resistance if they are streamlined. This is why, for example, professional swimmers all wear swim hats: their hair causes water resistance, so by covering it and creating one smooth surface, the swimmer becomes more streamlined, which helps them to move more quickly through the water.
Which shape would help water resistance on a boat?	**Identifying and Classifying** Below the water's surface, water resistance is greater, but above the surface it can be reduced through a streamlined shape: this is why ships are shaped to have a point at the bow, or front. If you look at different types of boat or ship, such as cruise ships, oil tankers or sailing boats, what do you notice about the shape of their bows? What are the similarities and differences between them? Which type of vessel do you think will have the least water resistance? Why?

Vocabulary	
Attract	To give out a **force** that pulls two objects together.
Friction	The **resistance** of **motion** when one object rubs against another.
Force	The pulling or pushing effect that something has on something else.
Gear	A part of a machine that causes another part to move because of teeth that connect the two.
Gravity	The **force** which causes things to drop to the ground.
Lever	A basic tool used to lift or prise things open.
Motion	The activity of changing position or moving from one place to another.
Opposite	Things of the same kind which are also different in a particular way. For example, north and south are **opposite** directions.
Pulley	A simple machine that makes lifting something easier.
Repel	To give out a **force** that **pushes** two objects apart, such as two magnetic poles.
Resistance	A **force** which slows down a moving object or vehicle.
Spring	A spiral of wire which returns to its original shape after it is pressed or pulled.
Streamlined	Having a shape that allows something or someone to move quickly or efficiently through air or water.
Surface	The flat, top part of something, or the outside of it.

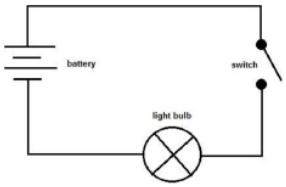
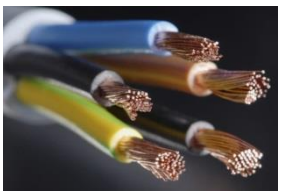
What should I already know? (KS2)	Potential Cross-curricular Links (KS2)
• **Upper Key Stage 2: Working scientifically [NC 2014, p128]**; • **Y3 Forces and Magnets:** *compare how things move on different surfaces;* • **Y3 Forces and Magnets:** *notice that some forces need contact between two objects […].*	 **Pulleys and Gears:** Viking Sails  **Light:** Sir Isaac Newton  **Battle of Britain:** Parachute Regiment/ Paratroopers

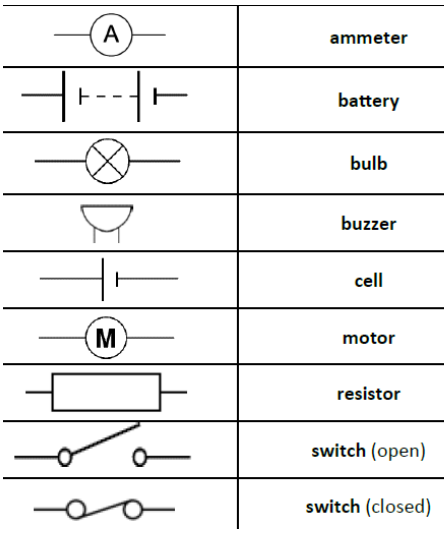
Statutory requirements

Pupils should be taught to:

- explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Year 6 Science Spring 1: Electricity

Knowledge	
What do we already know about electricity and circuits?	**Identifying and Classifying** We have already learnt that:  • Electricity is created by natural fuel sources and is used to provide power for different appliances and devices; • Electrical current is carried in wires or can be stored in batteries (or cells); • The use of electricity has increased over time, and many manual jobs of the past now use electricity to make them more efficient; • A complete circuit is a loop that allows electrical current to flow all the way around it. It includes a cell, wires and often a component, such as a buzzer, motor or bulb. If a circuit is incomplete, the current cannot flow all the way around; • For electrical current to flow, it needs a conductor of electricity to flow through. All metals are conductors and used to make wires, although some metals conduct electricity more effectively than others; • Plastic is a non-conductor of both electricity and heat, and is therefore used as an insulator on the surfaces of devices and appliances to prevent people from getting an electric shock; • Electricity can be very dangerous if it is not used safely.
In what ways does the brightness of a bulb or the speed of a motor change?	**Pattern Seeking**  To improve or reduce the effectiveness of a component in a circuit, a number of different things could be done. For example, the amount of power provided by a cell could be increased by using a battery with a higher voltage: the higher the voltage, the more energy the cell supplies to the circuit and, in turn, to the components within that circuit. Alternatively, resistance could be created by using a resistor: in a similar way that friction provides resistance to motion, a resistor will limit the power of the electrical current and reduce the flow around the circuit.
Does changing the wire affect the bulb? How?	**Comparative Testing**  We already know that different metals conduct electricity better than others, but the thickness and length of a wire could also affect how well a circuit component works, such as the brightness of a bulb. What would you expect to happen if the flow of electricity was made longer by increasing the length of the wire – would the flow become greater or smaller? Why? Similarly, what would you expect to happen to the resistance in a circuit if the wires were all made thinner – would the current be stronger or weaker? Why? Is there a way you could investigate this fairly in a classroom environment to prove or disprove your hypotheses?
Does the temperature of a light bulb go up the longer it is on?	**Observing Over Time** From our previous learning, we know that heat is a by-product of electricity: in a bulb, the filament that provides the light becomes hot because of the amount of energy needed to make the bulb light up. Therefore, if the bulb is continuously switched on, over time the temperature is likely to increase gradually. Is there any way that this temperature change could be minimised by redesigning the outer surface of the light bulb? What properties of materials would you need to consider in your design?

Why do we need to use conventional symbols for circuits?	**Identifying and Classifying** The symbols that are used for electrical circuits are universal: everywhere in the world uses the same ones. By doing this, these symbols become a common language that everyone can understand when they handle electrical circuits. If every country in the world used different symbols for their circuits, what do you think might happen? Why? 
Who was Nikola Tesla and how did he revolutionise the everyday use of electricity?	**Research**  https://www.youtube.com/watch?v=g1DqaqBiVRY Nikola Tesla (1856-1943) Serbian-American inventor, electrical engineer, mechanical engineer and futurist.
How would you group electrical components and appliances based on what electricity makes them do?	**Identifying and Classifying** The most common components in a complete circuit are: bulbs, motors, buzzers and switches. They can be found in many everyday electrical devices and appliances, and each component is designed to produce a different effect: • Bulbs are used to provide a source of light. One of the main places you will see them is in overhead lighting for buildings, but they can be used on much smaller levels too; • Motors are used to provide movement, for example in different forms of transport, whether they are toys or the full-size, functioning versions; • Buzzers are used to provide a source of sound, such as in a doorbell. As with bulbs, their uses are many and can be on a large or small scale; • Switches are incredibly common in electrical devices and appliances and allow the user to disconnect and reconnect the circuit at will. In doing so, the user can save energy and also use the device safely. Think about the different electrical devices and appliances that are in your home. Which components are you most likely to find in them? Do some of them have more than one component in them? Why do you think this is?
How have batteries changed over time?	**Ideas Over Time**  Several inventors worked on different versions of a 'battery' from as early as the late 18th century, such as Benjamin Franklin and Luigi Galvani, but the first true battery was invented by Alessandro Volta in 1800, who made it from layered discs of copper and zinc with pieces of cloth soaked in brine to separate each disc. Over time, improvements in technology have led to batteries being made of different, more efficient metals, and even becoming rechargeable! Would you be able to piece together an accurate history of the battery from the 18th century to the present day? How might you present this information?

Vocabulary	
Ammeter	Measures the **current** in a **circuit**.
Appliances	**Devices** or machines in the home that are used for jobs such as cleaning or cooking. **Appliances** are often electrical.

Battery	A small **device** that provides the **power** for electrical items such as torches.
Bulb	The glass part of an electric lamp, which gives out light when **electricity** passes through it.
Buzzer	An electrical **device** that is used to make a buzzing sound.
Cell	A synonym for **battery**.
Circuit	A complete route which an electrical **current** can flow around.
Components	The parts that something is made of.
Conductor	A substance that heat or **electricity** can pass through or along.
Current	A flow of **electricity** through a **wire** or **circuit**.
Device	An object that has been invented for a particular purpose.
Electricity	A form of **energy** that can be carried by **wires** and is used for heating, lighting and to provide **power** for **devices**.
Energy	The **power** from **sources** such as **electricity** that makes heat or allows machinery to work.
Fuel	A substance such as coal, oil or petrol that is burned to provide heat or **power**.
Generate	To cause something to begin and develop.
Insulator	A non-**conductor** of **electricity** or heat.
Mains	Where the supply of water, **electricity** or gas enters a building.
Motor	A **device** that uses **electricity** or **fuel** to produce movement.
Power	**Energy**, especially **electricity**, that is obtained in large quantities from a **fuel source** and used to operate lighting, heating and machinery.
Resistance	A force which slows down a moving object or vehicle.
Resistor	A part of an electrical **circuit** that provides **resistance** to some of the **current**.
Source	Where something comes from.
Switch	A small control for an electrical **device** which can be used to turn the **device** on or off.
Voltage	The force of an electrical **current** as measured in volts.
Wires	Long, thin pieces of metal that are used to fasten things or carry electrical **current**.

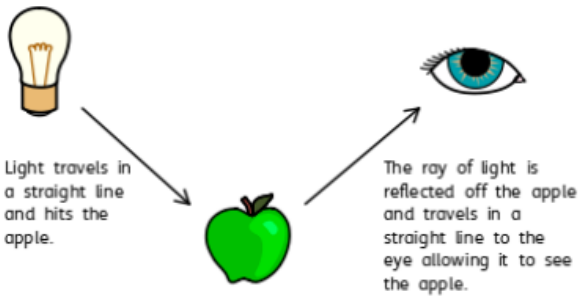
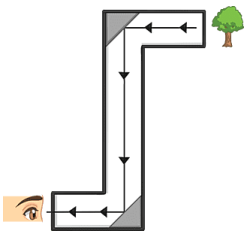
What should I already know? (KS2)	Potential Cross-curricular Links (KS2)
• **Upper Key Stage 2: Working scientifically [NC 2014, p128]**; • **Y4 Electricity:** *identify common appliances that run on electricity;* • **Y4 Electricity:** *construct a simple series electrical circuit, identifying and naming 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;* • **Y5 Properties and changes of materials:** *compare and group together everyday materials on the basis of their properties, including their […] conductivity (electrical and thermal) […];* • **Y5 Forces:** *identify the effects of air resistance, water resistance and friction, that act between moving surfaces*.	 **Victorian Dudley:** Fuel Sources Machinery

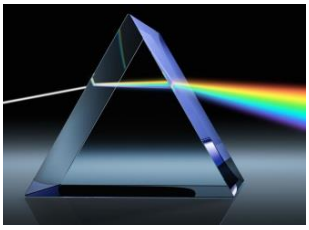
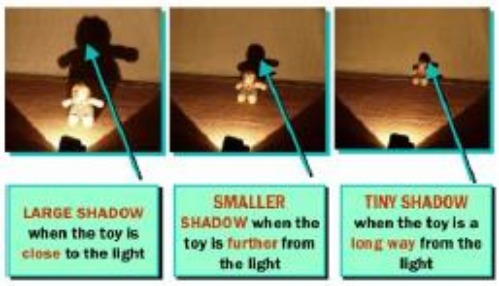
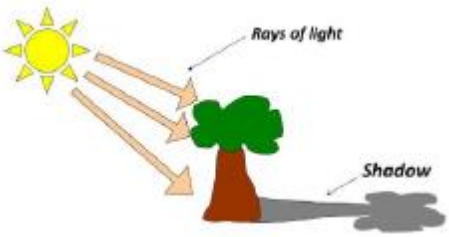
Statutory requirements

Pupils should be taught to:

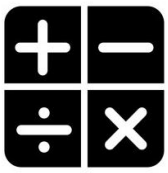
- associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
- use recognised symbols when representing a simple circuit in a diagram.

Year 6 Science Spring 2: Light

Knowledge	
How do our eyes allow us to see and why can we see objects?	**Identifying and Classifying** https://www.bbc.co.uk/bitesize/clips/zf9c87h Light travels in a straight line: when you place a torch on a table in a dark room, the beam of light travels in a straight line. When we see an object, it is because there is a light source present, which reflects the light into our eyes: the pupil of our eye allows light in, which hits the eyes' lens and is focused onto the retina, which in turn messages the brain and allows us to see. The brighter a light source is, the smaller our pupils become to limit the amount of light they let in, but because darkness is the absence of light, our pupils will expand to let in as much light as possible when it is dark or any available light source is quite dim. 
What is reflection?	**Pattern Seeking** Reflection occurs when light bounces off a surface – this changes the direction in which the light travels. If the surface is smooth and shiny, like glass, water or polished metal, the light will reflect at the same angle as it hits the surface: for a smooth surface, reflected rays of light travel in the same direction. 
How does a periscope work?	 **Research** A periscope lets you look around walls, corners or other obstacles. In a periscope, light from an object strikes the top mirror at 45 ° and bounces off at the same angle. This sends light directly down the tube and onto the lower mirror. This mirror, also at a 45 ° angle, reflects light directly into a person's eye. The most well-known example of periscopes being used is in submarines, but where else might they be used? Why?
Where is the best place to put rear view mirrors in cars?	**Identifying and Classifying** We already know that light reflects at the same angle as it hits a smooth surface, such as a mirror. Because of this, a driver needs to be able to look in the rear view mirror and see the traffic behind their own car. By positioning the rear view mirror exactly in the middle of the front windshield, the driver can then adjust the mirror depending on how tall they are and how they are sitting to drive in order to see behind them. Is there a way of presenting this information using a diagram to show how the light travels through the car and allows the driver to see?
Which material is the most reflective?	**Comparative Testing** https://www.bbc.co.uk/bitesize/clips/zs3ygk7 For a material to be reflective, it needs to be able to reflect light from a light source, such as a candle, torch or car headlights. Opaque materials tend to work best as they do not allow light to pass through them, and different colours reflect different amounts of light. Based on everything you now know about reflection, what would be the best material to use for reflective strips on your coat if you were walking to and from school in the winter? What factors do you have to consider about the material? What other variables do you need to think about to ensure fair testing? How will you collect and record your results to reach a definitive conclusion?

How is the invention of Percy Shaw being developed to improve road safety in the 21st century?	**Ideas Over Time** https://www.youtube.com/watch?v=OmffQ0G8azA Percy Shaw (1890-1976) English inventor and businessman. 
What is refraction and how is it useful?	**Comparative Testing** https://www.bbc.co.uk/bitesize/clips/zqg3cdm  Refraction is when light travels from the air through a medium that is translucent or transparent, such as glass or water, and the rays of light become bent and change direction. This can create optical illusions and make us believe our eyes are playing tricks on us, but it is also very useful in some situations, such as in magnifying glasses, cameras and peepholes in doors. Is it possible to work out whether a medium or material reflects or refracts light, or even does both? How could you do this in the classroom? What would your prediction be depending on whether your medium/material was transparent, translucent or opaque? Why? How could you collect and record your results to reach accurate conclusions?
Do rainbows occur when using different types of soap?	**Comparative Testing** The wall of a bubble is a thin film of water, which is protected from collapsing by a layer of detergent (or soap) molecules on each side, and light is reflected from opposite sides of the bubble wall to create different colours. The thickness of the film is what determines the colours that can be seen in the bubble, so it is possible that different types of soap may influence the thickness. Bearing all of this in mind, how could you investigate this fairly in a classroom environment to prove or disprove the question? Other than the type of soap, are there any other variables that you would need to consider? What do you predict will happen? Why?
What is the relationship between light sources, objects and shadows?	 **Pattern Seeking** Because light travels in straight lines, when there is an opaque object blocking the light, a shadow forms. These shadows have the same shape as the objects that cast them. The size of a shadow changes as the light source moves closer or further away from the object: the closer the light source, the larger the shadow being cast. 
How does my shadow change over the day?	**Observing Over Time** https://www.schoolsobservatory.org/learn/astro/esm/daynight/shadows When we are outside in the sun, it is easy to see how our shadows change throughout the day. The length of our shadows changes depending on the Sun's position in the sky: when the Sun is low and near to the horizon, our shadow is long, whilst our shadows become shorter the higher the Sun is in the sky.

Vocabulary	
Angle	The direction from which you look at something.
Darkness	The absence of **light**.
Dimness	**Light** that is not bright.
Electricity	A form of energy that can be carried by wires and is used for heating, lighting and powering machines.
Emit	To give out a sound or produce and discharge something, such as **light**.
Light	A brightness that allows you to see things.
Mirror	A flat piece of glass that **reflects light**, so that when you look at it you can see yourself **reflected** in it.
Opaque	A substance or object that **light** cannot pass through, preventing you from seeing through it.
Reflect	To send something back from a **surface** and not allow it to pass through.
Shadows	Dark shapes on a **surface** that are made when something is placed between a **light** and its **surface**.
Source	Where something comes from.
Surface	The flat, top part of something or the outside of it.
Torches	Small electric lights that are powered by batteries and can be carried.
Translucent	A substance or object that allows some **light** to pass through it.
Transparent	A substance or object that **light** can pass through, allowing you to see through it.

What should I already know? (KS2)	Potential Cross-curricular Links (KS2)
• **Upper Key Stage 2: Working scientifically [NC 2014, p128]**; • **Y3 Light:** *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 a solid object;* • **Y3 Light:** *find patterns in the way that the size of shadows change;* • **Y5 Earth and space:** *use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky;* • **Y5 Properties and changes of materials:** *compare and group together everyday materials on the basis of their properties, including their […] transparency […].*	 **Geometry:** Angles

Statutory requirements

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.