



Topic: Electricity

Science Enquiries:

- Fair testing

Prior Learning

Year 4:

- 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.

Key Learning for Y6

1. . Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.
2. 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.
3. Use recognised symbols when representing a simple circuit in a diagram.
4. 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.
5. Learn how to represent a simple circuit in a diagram using recognised symbols.

Children **do not** need to understand what voltage is, but will use **volts and voltage** to describe different batteries. The words "cells" and "batteries" are now used interchangeably.

Common Misconceptions

Some children may think that:

- larger-sized batteries make bulbs brighter
- a complete circuit uses up electricity
- components in a circuit that are closer to the battery get more electricity.

Evidence/Activities for key learning:

- Make electric circuits and demonstrate how variation in the working of particular components, such as the brightness of bulbs, can be changed by increasing or decreasing the number of cells or using cells of different voltages.
- Draw circuit diagrams of a range of simple series circuits using recognised symbols.
- Incorporate a switch into a circuit to turn it on and off
- Draw circuits using recognised symbols

Evidence/Activities for science skills + science enquiries

- Devise ways to measure brightness of bulbs, speed of motors, volume of a buzzer during a fair test.
- Explain how a circuit operates to achieve particular operations, *such as to control the light from a torch with different brightnesses or make a motor go faster or slower.*
- Make circuits to solve particular problems, *such as a quiet and a loud burglar alarm.*
- Carry out fair tests exploring changes in circuits and use evidence to predict results and answer questions.
- *Make circuits that can be controlled as part of a DT project (cross-curricular link: DT).*

Progression/Future learning

This topic is taught again at KS3, so there is no further learning in KS2.

Topic: Light

Science Enquiries:

- Fair Testing

Prior Learning

Year 3: Light

- Recognise that they need light in order to see things and that dark is the absence of light.
- Notice that light is reflected from surfaces.
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
- Recognise that shadows are formed when the light from a light source is blocked by an opaque object.
- Find patterns in the way that the size of shadows change.

Key Learning for Y6:

Recognise that light appears to travel in straight lines.

2. 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.

3. 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.

4. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

5. 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.

6. Look at 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).

Common Misconceptions

Some children might think that:

- We see objects because light travels from our eyes to the object.

Evidence/Activities for key learning

- Describe, with diagrams or models,
 - how light travels in straight lines either from sources or reflected from other objects into our eyes
 - how light travels in straight lines past translucent or opaque objects to form a shadow of the same shape .
- Predict and explain, with diagrams or models:
 - how the path of light rays can be directed by reflection to be seen e.g. the

reflection in car rear view mirrors or in a periscope
- how the shape of shadows can be varied

Evidence/Activities for science enquiries and science skills

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

Progression/Future learning

This topic is taught again at KS3, so there is no further learning in KS2.

Topic: Evolution & Inheritance

Science Enquiries:

- Classifying
- Pattern Seeking
- Research

Prior Learning

Year 2 - Living things & their habitats

- Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other.

Year 3 – Rocks

- Describe in simple terms how fossils are formed when things that have lived are trapped within rock.

Year 4 - Living things and their habitats

- Recognise that environments can change and that this can sometimes pose dangers to living things.

Key Learning for Y6

1. . Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.
2. Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.
3. Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Common Misconceptions

Some children might think that:

- adaptation occurs during an animal's lifetime: giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life
- offspring most resemble their parents of the same sex, so that sons look like fathers
- all characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited
- cavemen and dinosaurs were alive at the same time.

Evidence/Activities for Key Learning

- Explain the process of evolution
- Give examples of how plants and animals are suited to an environment
- Give examples of how an animal or plant has evolved over time e.g. penguin, peppered moth
- Give examples of living things that lived millions of years ago and the fossil evidence we have to support this
- Give examples of fossil evidence that can be used to support the theory of evolution
- Identify characteristics that will make a plant or animal suited or not suited to a particular habitat.
- Explain why the dominant colour of the peppered moth changed over a very short period of time

Evidence/Activities for science enquiries and science skills:

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

Progression/Future learning

This topic is taught again at KS3, so there is no further learning in KS2.

Topic: Living things & their habitats

Science Enquiries

- Classifying
- Research

Prior Knowledge

Year 4:

- Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats)
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.

Year 5:

- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats)
- Describe the life process of reproduction in some plants and animals.

Key Learning for Y6:

1. . 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.
2. Give reasons for classifying plants and animals based on specific characteristics.
3. Know that broad groupings, such as micro-organisms, plants and animals can be subdivided.
4. Should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals).
5. Find out about significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.

Common Misconceptions

Some children may think that:

- all micro-organisms are harmful
- mushrooms are plants.

Evidence/Activities for key learning:

- Give examples of animals in the five vertebrate groups and some of the invertebrate groups
- Give the key characteristics of the five vertebrate groups and some invertebrate groups
- Compare the characteristics of animals in different groups
- Give examples of flowering and non-flowering plants
- Use classification materials to identify unknown plants and animals
- Create classification keys for plants and animals
- Give a number of characteristics that explain why an animal belongs to a particular group.

Evidence/Activities for science skills and science enquiries

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

Progression/Future learning

This topic is taught again at KS3, so there is no further learning in KS2.

Topic: Animals including humans

Science enquiries:

- Observing
- Pattern Seeking
- Fair Testing

Prior Learning

Year 2

- Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.

Year 3

- Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat.

Year 4

- Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans)
- Identify the different types of teeth in humans and their simple functions.

Key Learning for Y6:

1. identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.
2. Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.
3. Describe the ways in which nutrients and water are transported within animals, including humans.
4. Explore questions to understand how the circulatory system enables the body to function.
5. 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.
6. Explore the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.

Common Misconceptions

Some children may think that:

- your heart is on the left side of your chest
- the heart makes blood
- the blood travels in one loop from the heart to the lungs and around the body
- when we exercise, our heart beats faster to work the muscles more
- some blood in our bodies is blue and some blood is red
- we just eat food for energy
- all fat is bad for you
- all dairy is good for you
- protein is good for you, so you can eat as much as you want
- foods only contain fat if you can see it
- all drugs are bad for you.

Evidence/Activities for key learning:

- Draw a diagram of the circulatory system and label the parts and annotate it to show what the parts do
- *Produce a piece of writing that demonstrates the key knowledge e.g. explanation text of the heart (cross-curricular link: English)*
- *Role play model to explain the main parts of the circulatory system and their role (cross-curricular link: English).*
- Explain both the positive and negative effects of diet, exercise, drugs and lifestyle on the body
- *Present information e.g. in a health leaflet describing impact of drugs and lifestyle on the body (cross-curricular link: English).*

Evidence/Activities for science skills and key learning:

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

Progression/Future learning

This topic is taught again at KS3, so there is no further learning in KS2.