# Skills Progression of Science Year 6 - Cornerstones

| EYFS | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 |
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| **Introduce:**<br>• Similarities and differences in relation to places, objects, materials and living things.<br>• Discuss the features of their own immediate environment and how it might vary from others.<br>• Make observations of animals and plants and explain why some things occur, and talk about changes.<br>• Know the importance for good health of physical exercise, and a healthy diet, and talk about ways to keep healthy and safe. | **Introduce:**<br>• Everyday materials – types and comparison<br>• Seasonal changes – across 4 seasons<br>• Animals inc humans – 5 animal groups (mammal etc)<br>• Plants – basic structure (stem, leaf, root, flower) | **Recap:**<br>• Animals inc humans – 5 groups<br>• Everyday materials - types<br>• Plants – basic structure<br>• Seasonal changes | **Recap:**<br>• Plants – seeds and bulbs grow healthy, what is needed<br>• Animals inc humans – exercise and hygiene | **Recap:**<br>• Animals including humans – skeleton types and muscles<br>• Rocks and soils – types and formation | **Recap:**<br>• Living things – grouping and classification;<br>• Forces and Magnets – push and pull; magnetic poles; magnetic materials | **Recap:**<br>• Animals inc humans – digestive system; life cycle<br>• Light - shadow formation and changes<br>• Electricity – simple series; switches |
| | | **Introduce:**<br>• Living things – alive/ not alive, suited to habitats<br>• Plants – seeds and bulbs grow healthy, what is needed<br>• Animals inc humans – exercise and hygiene<br>• Materials – everyday uses suitability; bend, twist, stretch, squash | **Introduce:**<br>• Rocks and soils – types and formation<br>• Forces and Magnets – push and pull; magnetic poles; magnetic materials<br>• Light and shadows – shadow formation and changes<br>• Animals inc humans – skeleton and muscles<br>• Plants – structure functions, flower structure | **Introduce:**<br>• States of matter – changing state of solid, liquid, gas; water cycle<br>• Electricity – simple series circuits; switches; conductors and insulators<br>• Sound – vibrations; pitch; volume; distance<br>• Living things – grouping and classification; changing environments<br>• Animals inc humans – digestive system | **Introduce:**<br>• Earth and space – orbit of Earth to sun; orbit of Moon; Earth's rotation<br>• Materials – reversible and irreversible changes; dissolving; separation<br>• Living things – life cycle and reproduction<br>• Animals inc humans – changes in human development<br>• Forces – gravity; resistance; mechanisms | **Introduce:**<br>• Evolution and inheritance – adaptation; change over time; offspring<br>• Light – straight lines; seeing things<br>• Electricity – symbols; brightness/ volume changes<br>• Living things – classification of plant/ animal kingdoms<br>• Animals inc humans – circulatory system; diet, nutrients and exercise |

**Purposes for science:**

It provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity. All children should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, children should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

We use Cornerstones as our planning base and science is taught within the topic if purposeful links can be made. If none are made, science is taught as a discrete subject.

| Year 6 | | | | |
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| | Objective (NC PoS) | Skill | Vocabulary | Key scientists |
| Term 1 and 2 | | | | |
| | Knowledge (specific knowledge) | | | |

**Term 3**

**Evolution and inheritance**

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| **– 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**<br>**- Give reasons for classifying plants and animals based on specific characteristics.**<br>**- Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago**<br>**- Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents**<br>**- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.**<br>• Identify scientific evidence that has been used to support or refute ideas or arguments.<br>• Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.<br>• Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.<br>• Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.<br>• Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.<br>• Use test results to make predictions to set up further comparative and fair tests. | • Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.<br>• Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.<br>• Classify living things, including microorganisms, animals and plants, into groups according to common observable characteristics and based on similarities and differences.<br>• Describe how animals and plants can be bred to produce offspring with specific and desired characteristics (selective breeding).<br>• Describe some significant changes that have happened on Earth and the evidence, such as fossils, that support this.<br>• Explain that living things have changed over time, using specific examples and evidence.<br>• Identify how animals and plants are adapted to suit their environment, such as giraffes having long necks for feeding, and that adaptations may lead to evolution. Identify that living things produce offspring of the same kind, although the offspring are not identical to either parent.<br>• Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.<br>• Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.<br>• Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment.<br>• Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect. | • **Evolution** and **inheritance:** evolve, **adaptation,** inherit, **natural selection, adaptive traits, inherited traits,** mutations, theory of evolution, ancestors, biological parent, chromosomes, genes, Charles Darwin.<br>• Other: selective breeding, artificial selection, breed, cross breeding, genetically modified food, cloning, DNA.<br>• Classifying: Carl Linnaeus, Linnaean system, flowering and non-flowering plants, variation.<br>• **Microorganisms: bacteria,** single-celled, microbes, microscopic, virus, fungi, fungus, mould, antibiotic, yeast, ferment, **microscope,** decompose. | **Charles Darwin (1809 – 1882)**<br>http://www.nhm.ac.uk/nature-online/science-of-natural-history/biographies/charles-darwin/index.html<br><br>**Alfred Russel Wallace (1823 - 1913)**<br>http://www.nhm.ac.uk/nature-online/science-of-natural-history/biographies/wallace/index.html<br><br>**Richard Owen (1804 – 1882)**<br>http://www.nhm.ac.uk/nature-online/science-of-natural-history/biographies/richard-owen/index.html<br><br>**Evelyn Cheesman (1881 – 1969)**<br>http://www.nhm.ac.uk/nature-online/science-of-natural-history/biographies/evelyn-cheesman/index.html<br><br>Previously introduced vocabulary: classification, **offspring, characteristics, habitat, environment,** adapt, **variations**, human, **fossil,** suited, cells, names of different habitats, names of body parts, species, **sedimentary**, lava, **igneous**, **metamorphic**, **magma**, heat, **fossilisation**. |

## Knowledge (specific knowledge)

- Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
- Scientists classify living organisms into broad groups according to their characteristics. Vertebrates are an example of a classification group. There are a number of ranks, or levels, within the biological classification system. The first rank is called a kingdom, the second a phylum, then class, order, family, genus and species.

There are five kingdoms: animals, plants, fungi, protists and monerans. Members of each kingdom have features in common. Microorganisms are microscopic living things found in the fungus, protista and monera kingdoms, and can be helpful or harmful to other living things. Viruses are not included in the kingdoms as they are not living and need a host to survive and reproduce.

Fossils are the remains or traces of once-living things preserved as rock and are over 10,000 years old. The fossil record is ordered from the oldest fossils to the newest fossils and provides a history of Earth. The fossil record is incomplete because soft-bodied animals decayed too quickly to be fossilised, and some fossils are still buried in the ground.

- Animals and plants can be bred to produce offspring with specific and desired characteristics. This is called selective breeding. Examples include cows that produce large quantities of milk or crops that are disease-resistant. Scientists compare fossilised remains from the past to living species that exist today to hypothesise how living things have evolved over time. Humans and apes share a common ancestry and evidence for this comes from fossil discoveries and genetic comparison.

The theory of evolution was developed in the 19th century by the naturalists Charles Darwin and Alfred Russel Wallace. It states that: all life on Earth has evolved from simple life forms to more complex ones over time; all life on Earth has common ancestors and is therefore related, and; living things with characteristics most suited to their environment are more likely to survive and reproduce. The fossil record and the DNA of living and extinct things provide evidence of evolution. An evolutionary tree diagram shows the hypothetical evolutionary relationship between different living things over time.

- An adaptation is a physical or behavioural trait that allows a living thing to survive and fill an ecological niche. Adaptations evolve by natural selection. Favourable traits help an organism survive and pass on their genes to subsequent generations.

There are three different types of plant adaptations: structural, behavioural and chemical. Structural adaptations include modified leaves, roots and trunks. Behavioural adaptations include movement towards the Sun and regulated growth. Chemical adaptations include the presence of stings and poisons.

- Animals that sexually reproduce generate new offspring of the same kind by combining the genetic material of two individuals. Each offspring inherits two of every gene, one from the female parent and one from the male parent.

Inheritance is when living things pass on characteristics following sexual reproduction, such as height, skin colour and eye colour. Variation is the natural differences in characteristics between individuals of the same species. There are two types of variation: continuous and discontinuous variation. Continuous variation contains a range of values, such as the height or mass of different individuals of the same species. Discontinuous variation has a certain number of outcomes, such as eye colour and blood groups. Natural selection is the process behind the theory of evolution. Natural variation within a species may confer a positive, negative or negligible effect on the animal's ability to survive. If the variation has a positive effect, that individual is more likely to survive and pass the positive attribute to subsequent generations. Individuals with a negative characteristic are less likely to survive and reproduce. Natural selection: also known as 'survival of the fittest' .

**Term 4**

**Circulatory system**

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| **– Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood**<br>**- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function**<br>**- Describe the ways in which nutrients and water are transported within animals, including humans**<br>• Describe the ways in which nutrients and water are transported within animals, including humans.<br>• Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.<br>• Identify scientific evidence that has been used to support or refute ideas or arguments.<br>• Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.<br>• Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.<br>• Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.<br>• Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.<br>• Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.<br>• Use test results to make predictions to set up further comparative and fair tests | Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.<br>Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.<br>Explain that the circulatory system in animals transports oxygen, water and nutrients around the body.<br>Explain the impact of positive and negative lifestyle choices on the body.<br>Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.<br>Name and describe the purpose of the circulatory system and the functions of the heart, blood vessels and blood.<br>Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.<br>Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.<br>Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment. | • **Circulatory system**: circulation, **heart**, pulse, heartbeat, heart rate, lungs, breathing, **blood vessels**, blood, pump, transported, **oxygenated blood, deoxygenated blood,** oxygen, arteries, veins, capillaries, chambers, plasma, platelets, white blood cells, red blood cells.<br>• Lifestyle: **drug, alcohol,** smoking, disease, calorie, energy input, energy output.<br>• Other: water transportation, nutrient transportation, waste products.<br><br>Previously introduced vocabulary: carbon dioxide. | **William Harvey (1578 – 1657)** Discovered the circulatory system.<br>http://www.bbc.co.uk/history/historic_figures/harvey_william.shtml |

## Knowledge (specific knowledge)

- Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation. Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
- The human body has different systems that support the seven life processes. The skeletal system supports movement, gives the body shape and protects the organs. The skeletal muscular system supports movement. The endocrine system supports growth. The nervous system supports sensation and movement as it controls almost everything the body does. The digestive system supports nutrition by breaking down food so the body can absorb nutrients. The excretory system supports excretion (getting rid of waste). The reproductive system supports reproduction. The respiratory system supports respiration by taking in oxygen when we breathe in and removing carbon dioxide when we breathe out. The circulatory system supports the transport of oxygen, water and nutrients around the body.
- Exercise benefits your heart by lowering blood pressure, reducing weight, strengthening muscles and lowering stress. The Eatwell guide presents the foods and drinks that contribute to a healthy balanced diet. The five food groups are: fruit and vegetables, carbohydrates, dairy and alternatives, proteins and oils and spreads. Some foods, especially highly processed ones, are high in sugar, salt and fat are not necessary for a healthy, balanced diet. Eating more than the recommended daily amounts of saturated fat, sugar and salt can have a harmful effect on the circulatory system, such as causing high blood pressure and an increased risk of heart disease. Nutrition labels on pre-packaged food help us to know what is in the food we eat. Nutrition labels are often displayed using a traffic light system, so consumers can easily see whether the food contains high (red), medium (orange) or low (green) amounts of sugar, salt and saturated fat. Smoking, drugs and alcohol can have a negative impact on the circulatory system. Smoking can result in cancer and heart disease. Alcohol can cause high blood pressure and increased stroke risk. Drugs can cause collapsed veins and cardiac arrest.
- Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.
- The heart, blood and blood vessels make up the circulatory system. The circulatory system moves blood around the body. The heart is a muscular organ that pumps blood around the body through the blood vessels. Blood vessels are tubes inside the body. The three types of blood vessels are arteries, capillaries and veins. Arteries carry blood from the heart to the rest of the body. Capillaries connect arteries to veins. They allow oxygen and other nutrients to pass from the blood to the tissues, and carbon dioxide and other waste materials to pass from the tissues to the blood. Veins carry blood from around the body back to the heart. Blood is a substance that carries oxygen, other nutrients and hormones around the body. It also carries carbon dioxide and other waste products so they can be excreted. Blood is made up of plasma, platelets, red blood cells and white blood cells. Plasma is a yellowish liquid, mainly water. It carries red blood cells, white blood cells and platelets around the body. Red blood cells carry oxygen and carbon dioxide around the body. White blood cells fight infection and other diseases. Platelets are small cell fragments that clump together to stop bleeding from a cut in a blood vessel.
- A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.
- Resting heart rate is the number of times a heart beats per minute when a person is at rest. Heart rate increases during exercise because the body requires more oxygen to meet its needs. Heart rate can be measured by recording the pulse at different points of the body. A heart rate monitor can also be used to measure the pulse.

**Term 5**
**Light theory**

**- 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.**

- Identify scientific evidence that has been used to support or refute ideas or arguments.
- Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
- Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.
- Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.
- Use test results to make predictions to set up further comparative and fair tests.
- Are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.
- Develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics.

- Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.
- Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.
- Describe, using diagrams, how light behaves when reflected off a mirror (plane, convex or concave) and when passing through a lens (concave or convex).
- Describe, using scientific language, phenomena associated with refraction of light.
- Explain that, due to how light travels, we can see things because they give out or reflect light into the eye.
- Explain the dangers of using lasers and ways to use them safely.
- Explain, using words, diagrams or a model, why shadows have the same shape as the objects that cast them and how shadows can be changed.
- Identify that light travels in straight lines.
- Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
- Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.
- Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
- Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment.

- <u>Reflection:</u> periscope.
- <u>Seeing light:</u> **visible spectrum, prism.**
- <u>How light travels:</u> light waves, wavelength, straight line, **refraction.**

Previously introduced vocabulary: names and properties of materials, absorb.

**Thomas Young (1773 – 1829)** – Wave theory of light. Double-slit experiment.

**Sir David Brewster (1781 – 1868)** - Deduced "Brewster's law" giving the angle of incidence that produces reflected light which is completely polarized; invented the kaleidoscope and the stereoscope, and improved the spectroscope

**Jean-Bernard-Leon Foucault (1819-1868)** – Accurately measured the speed of light

## Knowledge (specific knowledge)

- Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.

Light is a form of energy that travels as waves. Darkness is the absence of light. A light source produces light. Shiny, smooth and light-coloured materials reflect light; dull, rough and dark-coloured materials absorb light. The Sun creates day and night and shadows that move and change. Shadows form when light is blocked. Sunlight contains harmful ultraviolet rays.

- Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.
- Mirrors and lenses are used in a range of everyday objects (telescopes, periscopes, cards and on roads). The human eye has a lens that bends and focuses light on the back of the eye (retina) so that we can see.

Plane mirrors are flat, concave mirrors curve inwards and convex mirrors curve outwards. Plane mirror reflections are the same size, and the right way up but they are reversed. Concave mirrors enlarge the image and concentrate the rays of light into a focal point. Convex mirrors make images smaller and disperse light which reflects a wider view.

- 'White' light is a term used to describe visible, ordinary daylight. White light can be split into a spectrum of colours (rainbow) by droplets of water or prisms.

Refraction is the bending of light as it passes from one transparent material to another. Refracted light creates a visible spectrum when white light shines through a prism or raindrops. The human eye depends on refraction to see.

- Light sources give out light. They can be natural or artificial. When light hits an object, it is absorbed, scattered, reflected or a combination of all three. Light from a source or reflected light enter the eye. Vertebrates, such as mammals, birds and reptiles, have a cornea and lens that refracts light that enters the eye and focuses it on the nerve tissue at the back of the eye, which is called the retina. Once light reaches the retina, it is transmitted to the brain via the optic nerve.

The electromagnetic spectrum includes visible light that humans can see and light that humans cannot see. Visible light is made up of coloured light that when mixed makes white light.

- Lasers are intense beams of light and they should never be pointed at people's faces or aircraft.
- A shadow appears when an object blocks the passage of light. Apart from some distortion or fuzziness at the edges, shadows are the same shape as the object. The distortion or fuzziness depends on the position or type of light source.

Light travels in straight lines.

Light travels in waves in straight lines. Light waves in diagrams are drawn as straight lines with arrowheads that show the direction of travel. The angle at which light hits a reflective surface is the same angle at which it is reflected.

- An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.
- A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make. A variable is something that can be changed during a fair test. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
- The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.

Cones in the retina that are sensitive to red, green and blue light help us to see different colours. When different combinations of cones are stimulated, we see different colours.

Specialised equipment is used to take accurate measurements in standard units. Examples include data loggers plus sensors, such as light (lux), sound (dB) and temperature (°C); timers (seconds, minutes and hours); thermometers (°C) and measuring tapes (millimetres, centimetres, metres).

# Term 6

**Electrical circuits and components**

**- 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**

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

- Ask and answer deeper and broader scientific questions about the local and wider world that build on and extend their own and others' experiences and knowledge.
- Choose an appropriate approach to recording accurate results, including scientific diagrams, labels, timelines, classification keys, tables, models and graphs (bar, line and scatter), linking to mathematical knowledge.
- Compare and give reasons for variations in how components in electrical circuits function (brightness of lamps; volume of buzzers and function of on or off switches).
- Create circuits using a range of components and record diagrammatically using the recognised symbols for electrical components.
- Explain how the brightness of a lamp or volume of a buzzer is affected by the number and voltage of cells used in a circuit.
- Independently decide which observations to make, when and for how long and make systematic and careful observations, using them to make comparisons, identify changes, classify and make links between cause and effect.
- Plan and carry out a range of enquiries, including writing methods, identifying and controlling variables, deciding on equipment and data to collect and making predictions based on prior knowledge and understanding.
- Report on and validate their findings, answer questions and justify their methods, opinions and conclusions, and use their results to suggest improvements to their methodology, separate facts from opinions, pose further questions and make predictions for what they might observe.
- Take accurate, precise and repeated measurements in standard units, using a range of chosen equipment.

- Flow and measure of electricity: **voltage, amps, resistance, electrons**, volts (V), **current.**
- Circuits: **symbol,** circuit diagram, component, function, filament.
- Variations: dimmer, brighter, louder, quieter.
- Types of electricity: natural electricity, human-made electricity, solar panels, power station.
- Other: positive, negative.

**Thomas Edison (1847-1931).** Inventor of the fuse.

**Benjamin Franklin (1706-90).** Showed that lightning is caused by electricity.

**Alessandro Volta (1745-1827**). Invented the first battery. The volt, the unit of electromotive force, is named after him.

## Knowledge (specific knowledge)

- Questions can help us find out about the world and can be answered using a range of scientific enquiries, including fair tests, research and observation.
- Data can be recorded and displayed in different ways, including tables, bar and line charts, scatter graphs, classification keys and labelled diagrams.

Electricity is a form of energy that makes things work. Circuit components include cells, buzzers, switches, wires, lamps and motors. A collection of components connected by wires in a loop is called a series circuit. Materials that allow electricity to flow through them are called electrical conductors. Materials that do not allow electricity to flow through them are called electrical insulators.

- A circuit needs a power source, such as a battery or cell, with wires connected to both the positive and negative terminals. Other components include lamps, buzzers or motors, which an electric current passes through and affects a response, such as lighting a lamp or turning a motor. When a switch is open, it creates a gap and the current cannot travel around the circuit. When a switch is closed, it completes the circuit and allows a current to flow all the way around it.
- There are recognised symbols for different components of circuits.
- Voltage is measured in volts (V) and is a measure of the difference in electrical energy between two parts of a circuit. The bigger the voltage, the more electrons are pushed through the circuit. The more voltage flowing through a lamp, buzzer or motor, the brighter the lamp, the louder the buzzer and the faster the motor.
- An observation involves looking closely at objects, materials and living things. Accurate observations can be made repeatedly or at regular intervals to identify changes over time, identify processes and make comparisons.
- A method is a set of clear instructions for how to carry out a scientific investigation, including what equipment to use and observations to make. A variable is something that can be changed during a fair test. A prediction is a statement about what might happen in an investigation based on some prior knowledge or understanding.
- The results are information, such as measurements or observations, that have been collected during an investigation. A conclusion is an explanation of what has been discovered, using correct, precise terminology and collected evidence.

An electric current is the flow of electric charge around a circuit. The electric current flows from the cell through all the components and back to the cell.

Electric current is measured using an ammeter. The force that pushes electric charge around a circuit, called the voltage, is measured using a voltmeter. A multimeter measures both electric current and voltage.

- Specialised equipment is used to take accurate measurements in standard units. Examples include data loggers plus sensors, such as light (lux), sound (dB) and temperature (°C); timers (seconds, minutes and hours); thermometers (°C) and measuring tapes (millimetres, centimetres, metres).