

St. Andrew's CE Junior School

Science Progression Map

Written by R Hyde, October 2025



The following document sets out the substantive knowledge (the subject-specific content) and the disciplinary knowledge (how we go about enquiries) taught at St. Andrew's, as outlined in the 2014 National Curriculum. The progression map below, separated into the respective year groups across Key Stage 2, details the key areas of understanding in each unit of work.

The 'Working Scientifically' strand of the National Curriculum includes:

- **Asking questions** that are the starting points for different types of science enquiry
- **Planning enquiries** that systematically require more independent decision making
- **Observing closely** and communicating these observations via increasingly more elaborate diagrams
- **Taking measurements** according to relevant age-related strands of the Mathematics curriculum
- **Recording results** appropriately, using a variety of tables, tally charts and images
- **Presenting results**, in a range of ways, including age-appropriate charts and graphs
- **Interpreting results** by spotting patterns and describing relationships
- **Drawing conclusions** and presenting them orally and in writing
- **Making predictions** about further results or investigations, by drawing on what has been learnt

- **Evaluating enquiries** by suggesting improvements and discussing the degree of trust in secondary sources and their results

These are further informed by several different enquiry approaches, as identified by the Primary Science Teaching Trust, in order to answer relevant scientific questions. These are noted in the 'aims' of the National Curriculum, and include:

- Comparative/fair testing
- Research
- Observation over time
- Identifying, grouping and classifying
- Problem-solving

Details of the substantive knowledge in year group is arranged into the sub-categories of Biology, Chemistry and Physics. These are explicitly referred to in lessons and children have a working understanding of their wider position within scientific understanding.

Staff may refer to the three disciplines in the following ways:

-**Biology**, the study of life and living organisms

-**Chemistry**, the science of what our world is made of, the matter of properties and their states

-**Physics**, the understanding of how our world works from the smallest particles to the largest galaxies

Each unit is accompanied by one or more significant scientists that classes may study as part of their learning. Additionally, common, age-relevant misconceptions that may occur within a unit of work are listed as well as scientific vocabulary that should be used in lessons in said units.

Working Scientifically

Disciplinary knowledge and elements of scientific enquiry

	Lower Key Stage 2	Upper Key Stage 2
Asking Questions	-Ask a range of Yes/No questions to aid sorting -Ask a range of research questions linked to a topic -Ask a range of question to undertake a fair test -Ask a range of question about what might happen over time or that is looking for a pattern	-Ask a range of Yes/No questions to aid sorting and decide which ways of sorting will give useful information -Ask a range of questions recognising that some can be answered through research and others may not -Ask a range of questions and identify the type of enquiry that will help to answer the questions -Ask further questions based on results.
Planning enquiries	-Put appropriate headings onto intersecting Venn and Carroll diagrams- -Choose a research source from a range provided -Decide what to change and what to measure or observe -Decide how often to take a measurement	-Identify specific clear questions that will help to sort without ambiguity -Choose suitable sources to use -Recognise and independently control variables where necessary - Decide how often to take a measurement
Observing closely	-Compare objects based on more sophisticated, observable features and present observations in labelled diagrams -Make a range of relevant observations linked to the question.	-Compare not only based on physical properties but also on knowledge gained through previous enquiry -Make a range of relevant observations linked to the question.
Taking measurements	-Measure using standard units (according to age-related mathematics) where not all the numbers are marked on the scale, and take repeat readings where necessary -Use technology to measure over time	- Measure using standard units using equipment that has scales involving decimals (according to age-related mathematics), and take repeat readings where necessary -Use technology to measure over time.
Recording results	-Prepare own tables to record data	-Prepare own tables to record data, including columns for taking repeated readings
Presenting results	-Sort objects and living things into groups using intersecting Venn and Carroll diagrams -Present what they learnt verbally or using labelled diagrams, bar charts, or time graphs	-Create branching databases (tree diagrams) and keys to enable others to name livings things and objects -Present what they learnt in a range of ways e.g. different graphic organisers, line graphs etc.
Interpreting results	-Spot patterns in the classification data, particularly two criteria with no examples - e.g. there are no living things with wings and no legs. -Answer questions using simple scientific language and refer directly to their evidence when answering their question.	-Talk about the features that items share and do not share based on the information in the key etc. -Answer questions using scientific evidence gained from a range of sources. Describe causal relationships, change over time and identify patterns.
Drawing conclusions	-Draw simple conclusions, when appropriate, for patterns - e.g. a flying insect with no legs might always crash land.	-Use data to show that items grouped together have more things in common than with things in other groups

	-Where appropriate provide oral or written explanations for their findings.	-Provide detailed oral or written explanations for their findings.
Making predictions	-Use results from an investigation to make a prediction about a further result.	-Use test results to make predictions for further investigations
Evaluating enquiries	-Suggest improvement (e.g. a wider range of objects) and suggest new questions arising from the investigation -Suggest limitations to research (e.g. only had one book) and suggest new questions arising from the investigation. -Suggest improvements (e.g. measurement method) and suggest new questions arising from the investigation.	-Explain using evidence that the branching database or classification key will only work for the living things or materials it was created for. -Talk about their degree of trust in the sources they used. -Explain their degree of trust in their results (e.g. precision in measurements, variables that may not have been controlled, and accuracy of results.

Year 3

Substantive knowledge

Plants Significant scientist – George Washington Carver (peanut botanist)	<u>Key objectives</u> - Identify and describe the functions of different parts of flowering plants: roots; stem/trunk; leaves; and flowers. - Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. - Investigate the way in which water is transported within plants. - Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	
	<u>Key learning</u> Many plants, but not all, have roots, stems/trunks, leaves and flowers/blossom. The roots absorb water and nutrients from the soil and anchor the plant in place. The stem transports water and nutrients/minerals around the plant and holds the leaves and flowers up in the air to enhance photosynthesis, pollination and seed dispersal. The leaves use sunlight and water to produce the plant's food. Some plants produce flowers which enable the plant to reproduce. Pollen, which is produced by the male part of the flower, is transferred to the female part of other flowers (pollination). This forms seeds, sometimes contained in berries or fruits which are then dispersed in different ways. Different plants require different conditions for germination and growth.	<u>Key vocabulary</u> photosynthesis, pollen, insect/wind pollination, male, female, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal), air, nutrients, minerals, soil, absorb, transport
		<u>Common misconceptions</u> Some children may think: - plants eat food - food comes from the soil via the roots - flowers are merely decorative rather than a vital part of the life cycle in reproduction - plants only need sunlight to keep them warm - roots suck in water which is then sucked up the stem.
Animals, including humans Significant scientist – Wilhelm Rontgen (x-rays)	<u>Key objectives</u> - 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. - Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	
	<u>Key learning</u> Animals, unlike plants which can make their own food, need to eat in order to get the nutrients they need. Food contains a range of different nutrients – carbohydrates	<u>Key vocabulary</u> Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine

	(including sugars), protein, vitamins, minerals, fats, sugars, water – and fibre that are needed by the body to stay healthy. A piece of food will often provide a range of nutrients. Humans, and some other animals, have skeletons and muscles which help them move and provide protection and support.	Common misconceptions Some children may think: • certain whole food groups like fats are ‘bad’ for you • certain specific foods, like cheese are also ‘bad’ for you • diet and fruit drinks are ‘good’ for you • snakes are similar to worms, so they must also be invertebrates • invertebrates have no form of skeleton.
Rocks Significant scientist -Mary Anning	<u>Key objectives</u> • Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. • Recognise that soils are made from rocks and organic matter.	
	<u>Key learning</u> Rock is a naturally occurring material. There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft. They have different sizes of grain or crystal. They may absorb water. Rocks can be different shapes and sizes (stones, pebbles, boulders). Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil. Some rocks contain fossils. Fossils were formed millions of years ago. When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water.	<u>Key vocabulary</u> rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, soil, types of soil (e.g. peaty, sandy, chalk, clay)
		<u>Common misconceptions</u> Some children may think: • rocks are all hard in nature • rock-like, man-made substances such as concrete or brick are rocks • materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer ‘natural’ • certain found artefacts, like old bits of pottery or coins, are fossils • a fossil is an actual piece of the extinct animal or plant • soil and compost are the same thing.
Light Significant scientist – Isaac Newton, James Clerk Maxwell	<u>Key objectives</u> • 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.	

	<u>Key learning</u> We see objects because our eyes can sense light. Dark is the absence of light. We cannot see anything in complete darkness. Some objects, for example, the sun, light bulbs and candles are sources of light. Objects are easier to see if there is more light. Some surfaces reflect light. Objects are easier to see when there is less light if they are reflective. The light from the sun can damage our eyes and therefore we should not look directly at the sun and can protect our eyes by wearing sunglasses or sunhats in bright light. Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface and blocks some of the light. The size of the shadow depends on the position of the source, object and surface.	<u>Key vocabulary</u> light, light source, Sun, sunlight, dangerous <u>Common misconceptions</u> Some children may think: • we can still see even where there is an absence of any light • our eyes ‘get used to’ the dark • the moon and reflective surfaces are light sources • a transparent object is a light source • shadows contain details of the object, such as facial features on their own shadow • shadows result from objects giving off darkness.
Forces and magnets Significant scientist – Sir Isaac Newton, Galileo Galilei, Andre Marie Ampere, The Wright Brothers	<u>Key objectives</u> • 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.	
	<u>Key learning</u> A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes.	<u>Key vocabulary</u> Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole

	A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract. For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts.	<u>Common misconceptions</u> Some children may think: • the bigger the magnet the stronger it is • all metals are magnetic.
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Year 4

Substantive knowledge

Living things and their habitats Significant scientist – Jane Goodall, Sir David Attenborough	<u>Key objectives</u> • Recognise that living things can be grouped in a variety of ways. • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. • Recognise that environments can change and that this can sometimes pose dangers to living things.	
Animals, including humans Significant scientist – Joseph Lister (antispectics)	<u>Key learning</u> Living things can be grouped (classified) in different ways according to their features. Classification keys can be used to identify and name living things. Living things live in a habitat which provides an environment to which they are suited (Year 2 learning). These environments may change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the environment to change. This can be in a good way (i.e. positive human impact, such as setting up nature reserves) or in a bad way (i.e. negative human impact, such as littering). These environments also change with the seasons; different living things can be found in a habitat at different times of the year.	<u>Key vocabulary</u> Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate <u>Common misconceptions</u> Some children may think: • the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain • there is always plenty of food for wild animals • animals are only land-living creatures • animals and plants can adapt to their habitats, however they change • all changes to habitats are negative.
	<u>Key objectives</u> • Describe the simple functions of the basic parts of the digestive system in humans. • Identify the different types of teeth in humans and their simple functions. • Construct and interpret a variety of food chains, identifying producers, predators and prey.	<u>Key vocabulary</u> Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain

	The food is swallowed and passes down the oesophagus to the stomach. Here the food is broken down further by being churned around and other chemicals are added. The food passes into the small intestine. Here nutrients are removed from the food and leave the digestive system to be used elsewhere in the body. The rest of the food then passes into the large intestine. Here the water is removed for use elsewhere in the body. What is left is then stored in the rectum until it leaves the body through the anus when you go to the toilet. Humans have four types of teeth: incisors for cutting; canines for tearing; and molars and premolars for grinding (chewing). Living things can be classified as producers, predators and prey according to their place in the food chain.	<u>Common misconceptions</u> Some children may think: • arrows in food chains mean ‘eats’ • the death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain • there is always plenty of food for wild animals • your stomach is where your belly button is • food is digested only in the stomach • when you have a meal, your food goes down one tube and your drink down another • the food you eat becomes “poo” and the drink becomes “wee”.
States of matter Significant scientist – Joseph Priestly (discovered oxygen), Anders Celsius, Daniel Farenheit (invented the thermometer)	<u>Key objectives</u> • Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	
	<u>Key learning</u> A solid keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level,	<u>Key vocabulary</u> solid, liquid, gas, heating, cooling, state change, melting, freezing, melting point, boiling, boiling point, evaporation, condensation, temperature, water cycle

	horizontal surface. A gas fills all available space; it has no fixed shape or volume. Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid. Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0oC. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100oC. Evaporation is the same state change as boiling (liquid to gas), but It happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. Condensation is the change back from a gas to a liquid caused by cooling. Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.	<u>Common misconceptions</u> Some children may think: • ‘solid’ is another word for hard or opaque • solids are hard and cannot break or change shape easily and are often in one piece • substances made of very small particles like sugar or sand cannot be solids • particles in liquids are further apart than in solids and they take up more space • when air is pumped into balloons, they become lighter • water in different forms – steam, water, ice – are all different substances • all liquids boil at the same temperature as water (100 degrees) • melting, as a change of state, is the same as dissolving • steam is visible water vapour (only the condensing water droplets can be seen) • clouds are made of water vapour or steam • the substance on windows etc. is condensation rather than water • the changing states of water (illustrated by the water cycle) are irreversible • evaporating or boiling water makes it vanish • evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.
Sound Significant scientist – Alexander Graham Bell, Galileo Galilei	<u>Key objectives</u> • Identify how sounds are made, associating some of them with something vibrating. • Recognise that vibrations from sounds travel through a medium to the ear. • Find patterns between the pitch of a sound and features of the object that produced it. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. • Recognise that sounds get fainter as the distance from the sound source increases.	
	<u>Key learning</u> A sound produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound, but	<u>Key vocabulary</u> Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation

	sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively. Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.	<u>Common misconceptions</u> Some children may think: • sound is only heard by the listener • sound only travels in one direction from the source • sound can't travel through solids and liquids • high sounds are loud and low sounds are quiet. Pitch and volume are frequently confused, as both can be described as high or low.
Electricity Significant scientist – Nicolas Tesla, Thomas Edison, Michael Faraday, Joseph Swan	<u>Key objectives</u> • 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.	
	<u>Key learning</u> Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off.	<u>Key vocabulary</u> Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol
	Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.	(children in Year 4 do not need to use standard symbols for electrical components, as this is taught in Year 6) <u>Common misconceptions</u> Some children may think: • electricity flows to bulbs, not through them • electricity flows out of both ends of a battery • electricity works by simply coming out of one end of a battery into the component.

Year 5

Substantive knowledge

Living things and their habitats Significant scientist -Sir David Attenborough, Jane Goodall (fertility pioneer)	<u>Key objectives</u> - Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. - Describe the life process of reproduction in some plants and animals. <u>Key learning</u> As part of their life cycle, plants and animals reproduce. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis. Plants reproduce both sexually and asexually. Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction which involves only one parent. Gardeners may force plants to reproduce asexually by taking cuttings. Sexual reproduction occurs through pollination, usually involving wind or insects. <u>Key vocabulary</u> life cycle, reproduce, sexual, fertilises, asexual, plantlets, runners, tubers, bulbs, cuttings <u>Common misconceptions</u> Some children may think: - all plants start out as seeds - all plants have flowers - plants that grow from bulbs do not have seeds - only birds lay eggs.
Animals, including humans Significant scientist – Dr. Robert Winston	<u>Key objectives</u> - Describe the changes as a human develops into old age. <u>Key learning</u> When babies are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn many skills. At puberty, a child's body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce. This unit is taught alongside the RSHE curriculum. <u>Key vocabulary</u> Puberty – the vocabulary to describe sexual characteristics <u>Common misconceptions</u> Some children may think: - a baby grows in a mother's tummy - a baby is "made".

Properties and changes of materials Significant scientist – Spencer Silver (inventor of the Post-It note), Andre Geim & Konstantin Novoselov (University of Manchester scientists who discovered graphene)	<u>Key objectives</u> • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. <u>Key learning</u> Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. Mixtures can be separated by filtering, sieving and evaporation. Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible. <u>Key vocabulary</u> Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material <u>Common misconceptions</u> Some children may think: • thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change. Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.
Earth and space	<u>Key objectives</u> • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.

Significant scientist – Galileo Galilei, Nicolas Copernicus, Katherine Johnson, Stephen Hawking	- Describe the movement of the Moon relative to the Earth. - Describe the Sun, Earth and Moon as approximately spherical bodies. - Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.	
	<u>Key learning</u> The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky. The Moon orbits the Earth. It takes about 28 days to complete its orbit. The Sun, Earth and Moon are approximately spherical.	<u>Key vocabulary</u> Sun, Moon, Earth, planets (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, Solar System, rotate, star, orbit
		<u>Common misconceptions</u> Some children may think: - the Earth is flat - the Sun is a planet - the Sun rotates around the Earth - the Sun moves across the sky during the day - the Sun rises in the morning and sets in the evening - the Moon appears only at night - night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.
Forces Significant scientist – Galileo Galilei, John Dunlop	<u>Key objectives</u> - 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.	
	<u>Key learning</u> A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall.	<u>Key vocabulary</u> Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears

	Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object. A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines.	<u>Common misconceptions</u> Some children may think: • the heavier the object the faster it falls, because it has more gravity acting on it • forces always act in pairs which are equal and opposite • smooth surfaces have no friction • objects always travel better on smooth surfaces • a moving object has a force which is pushing it forwards and it stops when the pushing force wears out • a non-moving object has no forces acting on it • heavy objects sink and light objects float.
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Year 6

Substantive knowledge

Living things and their habitats Significant scientist – Carl Linnaeus	<u>Key objectives</u> - Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. - Give reasons for classifying plants and animals based on specific characteristics. <u>Key learning</u> Living things can be formally grouped according to characteristics. Plants and animals are two main groups but there are other living things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms. Plants can make their own food whereas animals cannot. Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has common characteristics. Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms. Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants. <u>Key vocabulary</u> vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, warm-blooded, cold-blooded, insects, spiders, snails, worms, flowering, non-flowering, mosses, ferns, conifers <u>Common misconceptions</u> Some children may think: - all micro-organisms are harmful - mushrooms are plants.
Animals, including humans Significant scientist - Alexander Fleming, John Boyd Orr (milk for schools), Dr. Katherine Dibb (cardiovascular specialist)	<u>Key objectives</u> - Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. - Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. - Describe the ways in which nutrients and water are transported within animals, including humans. <u>Key learning</u> The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are <u>Key vocabulary</u> Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle

	transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system. Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well our heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins.	<u>Common misconceptions</u> Some children may think: • 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.
Evolution and inheritance Significant scientist – Alfred Russel Wallace, Charles Darwin	<u>Key objectives</u> • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	
	<u>Key learning</u> All living things have offspring of the same kind, as features in the offspring are inherited from the parents. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other.	<u>Key vocabulary</u> offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils, evolve, evolution

	Plants and animals have characteristics that make them suited (adapted) to their environment. If the environment changes rapidly, some variations of a species may not suit the new environment and will die. If the environment changes slowly, animals and plants with variations that are best suited survive in greater numbers to reproduce and pass their characteristics on to their young. Over time, these inherited characteristics become more dominant within the population. Over a very long period of time, these characteristics may be so different to how they were originally that a new species is created. This is evolution. Fossils give us evidence of what lived on the Earth millions of years ago and provide evidence to support the theory of evolution. More recently, scientists such as Darwin and Wallace observed how living things adapt to different environments to become distinct varieties with their own characteristics.	<u>Common misconceptions</u> Some children may think: • 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.
Light Significant scientist – Alhazen (link to Year 6 History study), Percy Shaw (cats eyes)	<u>Key objectives</u> • 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.	
	<u>Key learning</u> Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen. Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the	<u>Key vocabulary</u> As for Year 3 – Light, plus straight lines, light rays
		<u>Common misconceptions</u> Some children may think: • we see objects because light travels from our eyes to the object.

	shape of the shadow will be the same as the outline shape of the object.	
Electricity Significant scientist – Nicolas Tesla, Thomas Edison, Michael Faraday, Alessandro Volta	<u>Key objectives</u> • 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.	
	<u>Key learning</u> Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well.	<u>Key vocabulary</u> Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage (Children do not need to understand what voltage is, but will use volts and voltage to describe different batteries)
	You can use recognised circuit symbols to draw simple circuit diagrams.	<u>Common misconceptions</u> Some children may think: • 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.