



Birkwood Primary School Science

Substantive Knowledge, Disciplinary Knowledge, and Vocabulary Progression

Our Key Concepts

• Biology

- The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.

• Chemistry

- All matter (stuff) in the universe is made up of tiny building blocks.

• Physics

- The universe follows unbreakable rules that are all about forces, matter and energy.

• Earth Science

- The earth is one of 8 planets that orbits the sun; it's tilt and spin on its axis leads to night and day/ seasons/climate; the Earth is made up of several layers, including a relatively thin rocky surface which is divided into tectonic plates.

EYFS - End Point (ELG)

- Develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- Develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- Are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future

FS1

FS2

Main Enquiry Question and Sub Questions	Autumn Term Seasonal Changes Plants	Spring Term Seasonal Changes Plants	Summer Term Seasonal Changes Animals	Autumn Term Seasonal Changes	Spring Term Seasonal Changes Plants	Summer Term Seasonal Changes Animals
	What is the weather like in Autumn? What is the weather like in Winter?	What is the weather like in Spring? What can you see outside? What do plants need to grow?	What is the weather like in Summer? What can you see outside? How does a duck grow?	How does our environment change in Autumn? How does our environment change in Winter?	How does our environment change in Spring? How do plants grow?	How does our environment change in Summer? What is the life cycle of a hen?

	What can you see outside?					
Substantive Scientific Knowledge	Know what weather is Know that weather can change Can talk about what it is like in Autumn Can talk about what it is like in Winter	Can talk about what it is like in Spring Know what a seed is Know what a seed needs to grow	Can talk about what it is like in Summer Know that a duck hatches from an egg Know that a duckling grows up Know that we need to care for animals	Know Autumn is a season and talk about changes Know that Winter is a season and talk about changes	Know Spring is a season and talk about changes Know how a healthy plant will grow	Know Summer is a season and talk about changes Know the life cycle of a hen
Vocabulary	Weather, change, sunshine, rain, cloudy, leaves, colours, cold, windy, snowy, Autumn and Winter	Spring, growing, flowers, plants, seed, soil, water, sun	Summer, warm, hotter, egg, crack, duck, hatch, grow, care	Autumn, cold, dark, bare, animals, hibernate, acorns, conkers, sycamore seeds, berries, harvest Winter, colder, frosty, ice, melt, darker	Spring, warm, bud, shoot, blossom, minibeasts, life cycles, seeds, bulbs, roots, stem, leaves, petals	Summer, warmer, hot, light, lighter, Chick, hen, rooster, male, female, egg tooth, develop

Key Stage 1 – End Point (NC)	Lower Key Stage 2 – End Point (NC)	Upper Key Stage 2 – End Point (NC)
The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos. 'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at key stage 1.	The principal focus of science teaching in lower key stage 2 is to enable pupils to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out. 'Working scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.	The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings. 'Working and thinking scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read, spell and pronounce scientific vocabulary correctly.

Birkwood Primary School Geography Curriculum Key Stage 1 and Key Stage 2

Autumn Term 1						
Main Enquiry Question and	Year 1 Humans	Year 2 Use of Everyday Materials	Year 3 Light	Year 4 Animals Including humans	Year 5 Earth & Space	Year 6 Light
	Are all humans the same?	How do the properties of a material	Does the amount of light we	How can we know things about a	What is our solar system made	What affects the way we see

Sub Questions		affect their use?	experience only change at night?	dinosaur when they have been extinct for 65 million years?	up of and how do we know this?	different objects and shadows?
Substantive Scientific Knowledge	<p>Know that feet, legs, arms, hands, torso, head, skin, ears, eyes, nose, mouth and tongue are parts of the body and identify them</p> <p>Know that eyes are associated with sight, ears with sound, nose with smell, tongue with taste and skin with touch</p> <p>Know how to use senses to take in the environment (enquiry)</p> <p>Know the life cycle of a human - Baby, Toddler, Child, Adult, Elderly.</p> <p>Know what a human can do at each stage in the human life cycle.</p> <p>Know that Ibn Sina wrote books about medicine and healing people.</p> <p>Know that he helped guide the modern world towards the idea of using evidence in medicine.</p>	<p>Know that objects are made from materials such as wood, plastic, glass, metal, water, rock.</p> <p>Know that matter (stuff) is made from tiny building blocks</p> <p>Know that materials can have useful properties for a given job (including being waterproof, strong, hard, soft, flexible, rigid, light or heavy).</p> <p>Know that materials can have useful properties for a given job (including being waterproof, strong, hard, soft, flexible, rigid, light or heavy).</p> <p>Know that many types of plastic are waterproof, that steel (a type of metal) is strong, that rock is hard, that cotton wool is soft, that rubber is flexible, that rock is rigid, that polystyrene (a type of plastic) is light and that iron (a type of metal) is heavy .</p> <p>Know how to test materials suitability for a specific job (enquiry).</p> <p>Know that recycling materials is important.</p>	<p>Know that light is a form of energy.</p> <p>Know that energy comes in different forms and can be neither created nor destroyed, only changed from one form to another.</p> <p>Know that we need light to see things and that darkness is the absence of light.</p> <p>Know that light travels in straight lines.</p> <p>Know that light is reflected when it travels from a light source and then 'bounces' off an object.</p> <p>Know that everything that we can see is either a light source or something that is reflecting light from a light source into your eyes.</p>	<p>Know that food passes through the body with the nutrients being extracted and the waste products excreted, and that this process is called digestion</p> <p>Know the names of the different organs in the digestive system.</p> <p>Know the simple functions of the basic parts of the digestive system in humans</p> <p>Know the journey of food consumed through the digestive system.</p> <p>Know that a human has three types of teeth - incisors, canines and molars</p> <p>Know the simple functions of human teeth.</p> <p>Know that all energy for a food chain initially comes from the Sun which is absorbed and turned into energy by plants</p> <p>Know the different names classifications of a food chain.</p> <p>Know that an animal that is eaten by another is called prey, and that an animal that eats other animals is called a predator</p> <p>Know that the first consumer in a food chain is called a primary consumer, the second is called a secondary consumer and above it is called a tertiary consumer.</p>	<p>Know that the Sun, Earth and Moon are spherical in shape.</p> <p>Know that the Sun is a star</p> <p>The Sun and the objects that orbit it are collectively known as our Solar System</p> <p>Know the names of the planets in the solar system independently.</p> <p>Know the difference between heliocentric and geocentric ideas of planetary movement.</p> <p>Know that the Earth spins around an imaginary line through its centre called an axis and that this axis is tilted relative to the Earth's orbit</p> <p>Know that night and day are the result of the Earth rotating on its axis</p> <p>Know that the tilt of the Earth towards and away from the Sun's light as the Earth orbits the Sun leads to the seasons as during winter the light is spread over a wider area (see diagram below)</p> <p>Know that the Moon orbits the Earth roughly every 28 days</p> <p>Know that as the Moon orbits the Sun, different parts of it are lit up by the Sun, which is why we see a different shape lit up on the Moon as the lunar cycle progresses; these are called phases of the Moon</p> <p>Know that the Moon moves</p>	<p>Know that light appears to travel in straight lines.</p> <p>Know that objects are seen because they give out or reflect light into the eye.</p> <p>Know that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.</p> <p>Know that shadows have the same shape as the objects that cast them.</p> <p>Know that translucent objects allow some light to pass through, but some of the light changes direction as it passes through the object.</p> <p>Know that when light passes from one medium to another (e.g. from air to water), it changes direction; this is called refraction; this happens because light travels at different speeds in different media</p> <p>Know that white light comprises all the colours of light</p> <p>Know that a spectrum happens because the different colours that constitute white light travel at different speeds</p> <p>Know how to draw a diagram to show why the shape of a shadow will match the shape of an object</p>

					relative to the Earth. Know that a satellite orbits a planet and that moons are natural satellites	
Vocabulary	growth, birth, reproduction, alive, dead, life cycle, senses, adult, offspring	conductor, brick, paper, cardboard, friction, movement, suitability, surface, stretch, twist, waterproof, deformation, flexible, rigid	Reflective, reflection, visible, bounce, mirror, ray, beam, sun, glare, pupil, retina, travel, opaque, translucent, transparent, shadow	Digestive system, oesophagus, Stomach, gallbladder, mouth, tongue, teeth, small intestine, large intestine, pancreas, rectum, anus, liver, duodenum, canine, incisor, molar, premolar, producer, consumer	Planets, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, solar, lunar, moon, moon phases, rotation, eclipse, orbit, axis, hemisphere, spherical, geocentric, heliocentric	Shadow, filter, reflect, absorb, refract, spectrum, wavelength, prism, visible, lens, incidence, photon
Enquiry	<p>Noticing patterns Chdn discover what is the same and what is different about their bodies.</p> <p>Sc1/1.6 gathering and recording data to help in answering questions</p>	<p><i>Grouping and classifying</i> Simple comparative test Chn test whether different materials are waterproof, flexible and light.</p> <p>Sc1/1.1 asking simple questions and recognising that they can be answered in different ways</p> <p>Sc1/1.3 performing simple tests</p> <p>Sc1/1.5 using their observations and ideas to suggest answers to questions</p> <p>Sc1/1.6 gathering and recording data to help in answering questions</p>	<p>Observing over time Using 'data loggers', chn gather data on light levels over the period of an hour and over the period of 24 hours. Chn interpret the gathered data.</p> <p>Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</p> <p>Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</p> <p>Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</p> <p>Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions</p> <p>Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</p> <p>Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes</p> <p>Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.</p>	<p>Finding out using secondary sources. Grouping and classification. Following learning about human teeth, chn use information and pictures of different teeth from dinosaurs to try to work out what they might have eaten, justifying their answers. (Use language of carnivore, omnivore and herbivore.)</p> <p>Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</p> <p>Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</p> <p>Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes</p> <p>Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.</p>	<p>Observing over different periods of time Chn keep a moon diary over the period of a month (focusing on moon shape) and a moon diary for one clear evening (focusing on position in the sky) and analyse their results.</p> <p>Sc5/1.1 planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</p> <p>Sc5/1.4 using test results to make predictions to set up further comparative and fair tests</p> <p>Sc5/1.5 reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations</p> <p>Sc5/1.6 identifying scientific evidence that has been used to support or refute ideas or arguments.</p>	<p>Noticing patterns Chn to use mirrors and torches to investigate how light travels in straight lines and reflects off mirrors.</p> <p>Sc5/1.5 reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations</p> <p>Sc5/1.6 identifying scientific evidence that has been used to support or refute ideas or arguments.</p>
Autumn Term 2						
Main Enquiry Question and Sub Questions	<p>Year 1 Everyday Materials</p> <p>Are all materials the same?</p>	<p>Year 2 Use of Everyday Materials</p> <p>How do the properties of a material affect their use?</p>	<p>Year 3 Light</p> <p>Why do shadows change during the day?</p>	<p>Year 4 Sound</p> <p>How do instruments make different sounds?</p>	<p>Year 5 Forces</p> <p>How do parachutes work?</p>	<p>Year 6 Electricity</p> <p>How can we alter circuits using different components?</p>

Substantive Scientific Knowledge	<p>Know that an object is made from/of a material and name some examples of materials in the real world</p> <p>Know from observation how to distinguish between and sort materials made of wood, plastic, glass, metal, water, rock</p> <p>Know that materials can be hard, soft, strong, weak, absorbent, heavy, light, solid and runny, smooth and rough; these descriptions denote the properties of a material</p> <p>Know that matter (stuff) is made from tiny building blocks</p>		<p>Know that opaque objects block light creating shadows and that light passes easily through transparent objects</p> <p>Know that opacity/transparency and reflectiveness are properties of a material</p> <p>Know that sunglasses can protect eyes from sunlight but looking at the Sun directly - even with sunglasses - can damage the eyes</p> <p>Know that as objects move towards a light source, the size of the shadow increases</p> <p>Know how to show the changing of shadow size by drawing a diagram with straight lines representing light</p> <p>Know that a data logger can keep track of light levels and that this can be plotted on a graph to show how this changes over the course of a day</p> <p>Know that al-Haytham was the first to explain that we see objects because light reflects from objects into our eyes</p>	<p>Know that energy comes in different forms and can be neither created nor destroyed, only changed from one form to another (retrieval)</p> <p>Know that sound is generated when an object vibrates; some of the energy from the vibrating object is transferred to the air, making the air particles move</p> <p>Know that sound is a form of energy that transfers in a longitudinal wave.</p> <p>Know that sound travels through a medium (e.g. particles in the air) and thus sounds does not travel through a vacuum which has no particles in it at all (eg in space).</p> <p>Know that longitudinal sound waves are detected in the ear by humans and that the brain interprets this as the sounds we hear</p> <p>Know that sound travels at different speeds through different objects; it travels slower than light and this is why we often hear thunder after we see lightning as the light reaches our eye before the sound reaches our ears.</p> <p>Know that pitch is how high or low a sound is and that this is determined by how many vibrations per second are being made by the vibrating object; the number of vibrations per second is called frequency</p> <p>Know that volume is how loud or quiet a sound is and that this is determined by the amount of energy in the wave (e.g. from how</p>	<p>Know that a force is measured in a unit called Newtons, named after a British scientist called Sir Isaac Newton who discovered lots about gravity and how planets move.</p> <p>Know that pull forces can be measured using a device called a force meter.</p> <p>Know that the amount of matter (stuff) in an object is its mass.</p> <p>Know that gravity is a force that acts between all objects in the universe, but that it acts much more strongly between objects that have more mass and that are close together.</p> <p>Know that unsupported objects are pulled towards the Earth by the force of gravity.</p> <p>Know that air resistance is a force felt by an object as it moves through the air.</p> <p>Know air resistance is caused by the object bumping into the gas particles that make up air.</p> <p>Know that the quicker an object moves, the more gas particles it bumps into and the more air resistance it experiences.</p> <p>Know that a falling object will accelerate until its air resistance matches the gravitational force pulling it down; at this point, the object will continue to move at this speed (called its terminal velocity) without getting any quicker or slowing down.</p> <p>Know that a parachute's shape increases the air resistance that a falling object experiences,</p>	<p>Know the recognized symbols for a battery, bulb, motor, buzzer and wire.</p> <p>Know how to draw simple circuit diagrams using the correct symbols and label the voltage correctly</p> <p>Know how to predict whether components will function in a given circuit, depending on whether or not the circuit is complete; whether or not a switch is in an on or off position; and whether or not there is a cell to provide electrical current to the circuit</p> <p>Know that voltage is a measure of the power of a cell to produce electricity; it is a measure of the 'push' of electric current, not the size of the electric current</p> <p>Know that as the number and voltage of cells in a circuit increases, the brightness of a bulb or the volume of a buzzer will increase (though too high a voltage may 'blow' the bulb or buzzer)</p> <p>Know that two bulbs in a circuit can be wired up to create a series circuit or a parallel circuit.</p> <p>Know if one bulb blows in a series circuit the other will not shine as the circuit has been broken.</p> <p>Know if one bulb blows in a parallel circuit there will still be a complete circuit for the other bulb so it will continue to shine.</p> <p>Know how to use this knowledge to explain the advantages of</p>
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				<p>hard or soft a percussion instrument is hit)</p> <p>Know that the volume of a sound is quieter if the listener is further away from the object.</p>	<p>giving it a much lower terminal velocity.</p> <p>Know that water resistance is a force felt by an object as it moves through water; it is caused by the object bumping into the water particles</p> <p>Know that the shape of an object determines how much air resistance or water resistance it experiences.</p> <p>Know that the shapes of object that experience little air resistance or water resistance are described as streamlined.</p> <p>Know how to draw a force diagram with arrows representing the different forces acting on an object.</p> <p>Know that a lever is a rigid length pivoting around a fulcrum .</p> <p>Know that a pulley is a wheel with a fulcrum that supports a moving cable or belt (see diagram below).</p> <p>Know that a gear is a rotating wheel with cut teeth that mesh with the teeth of another gear so that turning one gear turns an adjacent gear in the opposite direction</p> <p>Know that gears, levers and pulleys are simple machines that are used to allow a smaller force to have a greater effect.</p>	<p>using parallel circuits (e.g. in the lighting in homes)</p>
Vocabulary	absorption, matter, property, wood, plastic, glass, metal, water, rock, transparent, waterproof, opaque, materials, stiff, soft, shiny, rough,		wave, mirror, incident ray, image, beam, photons, solid, opaque, transparent, object, source, data logger, Reflective, reflection, visible, bounce, ray, beam, sun, glare, pupil,	Vibration, percussion instrument, wind instrument, string instrument, frequency, transverse wave, longitudinal	Air resistance, water resistance, gravity, buoyancy, mechanism, pulley, streamline, gear, opposing, push, pull,	Electrical current, alternating current, direct current, cells, circuit, voltage, series, conductors, insulators, amps,

	bendy, stretchy, absorbent, smooth, dull, hard.		retina, travel, opaque, translucent, transparent, shadow	wave, medium, vacuum, Amplitude, volume, pitch, particles, dynamics, tone, speaker	accelerate, decelerate, Newton	volts, switches, battery, buzzer
Enquiry	<p>Simple comparative test Chdn compare a variety of materials, deciding which are hard, soft, strong, weak, smooth, rough, etc.</p> <p>Sc1/1.2 observing closely, using simple equipment</p> <p>Sc1/1.3 performing simple tests</p> <p>Sc1/1.4 identifying and classifying</p> <p>Sc1/1.6 gathering and recording data to help in answering questions</p>		<p>Observing over time. On a sunny day, using a metre stick, chn note the changing length of a shadow thrown by a metre stick or other object.</p> <p>Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them</p> <p>Sc4/1.2 setting up simple practical enquiries, comparative and fair tests</p> <p>Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</p> <p>Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</p> <p>Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</p> <p>Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.</p>	<p>Noticing patterns Chn to make a basic guitar or flute with different notes possible to show how different vibrations make notes of different pitch.</p> <p>Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them</p> <p>Sc4/1.2 setting up simple practical enquiries, comparative and fair tests</p> <p>Sc4/1.3 making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</p> <p>Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</p> <p>Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</p> <p>Sc4/1.6 reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions</p> <p>Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</p> <p>Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.</p>	<p>Fair testing Chn to create parachutes, changing a variable to try to isolate what is needed for an effective parachute (e.g. changing parachute material, size, shape, etc)</p> <p>Sc5/1.1 planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</p> <p>Sc5/1.2 taking measurements, using a range of scientific equipment, with increasing accuracy and precision</p> <p>Sc5/1.3 recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs</p> <p>Sc5/1.4 using test results to make predictions to set up further comparative and fair tests</p> <p>Sc5/1.5 reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations</p>	<p>Noticing patterns Chn create circuits to investigate the effect of different voltages on different components.</p> <p>Sc5/1.1 planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</p> <p>Sc5/1.4 using test results to make predictions to set up further comparative and fair tests</p> <p>Sc5/1.6 identifying scientific evidence that has been used to support or refute ideas or arguments.</p>
Spring Term 1						
Main Enquiry Question and Sub	<p>Year 1 Animals & Humans</p> <p>What do all animals have in common?</p>	<p>Year 2 Animals Including Humans</p> <p>Is everything on Earth Alive?</p>	<p>Year 3 Rocks & Fossils</p> <p>Are all rocks made in the same way?</p>	<p>Year 4 Electricity</p> <p>Does electricity flow easily through all objects?</p>	<p>Year 5 Properties & Changes of Materials</p> <p>What happens to salt in</p>	<p>Year 6 Living Things & Their Habitats</p> <p>How do micro-organisms</p>

Questions					water?	differ from each other and how can we identify them?
Substantive Scientific Knowledge	<p>Know and name the 5 main animal groups – Mammal, reptile, amphibian, fish and bird.</p> <p>Know that a trout is an example of a fish; a frog is an example of an amphibian; a lizard is an example of a reptile; a robin is an example of a bird; a rabbit and a human are examples of a mammal and explore further examples of each animal type</p> <p>Know that fish, amphibians, reptiles, birds and mammals are similar in that they have internal skeletons and organs; these are known as vertebrates, which means they are animals that have a backbone</p> <p>Know that fish are different to other animals in having gills so that they can breathe underwater and scaly skin</p> <p>Know that amphibians are different to other animals in that they begin their lives with gills but then develop lungs and breathe on land</p> <p>Know that reptiles are different to other animals in that they breathe air and have scaly skin</p> <p>Know that birds are different to other animals in that they have feathers and wings</p> <p>Know that herbivorous animals eat plants; carnivorous animals eat other animals; omnivorous animals eat both animals and plants</p> <p>Know that a cat is an example of a carnivore; that a rabbit is an example of a herbivore; know that many humans are</p>	<p>Know that a trout is an example of fish, a frog is an example of an amphibian; a lizard is an example of a reptile; a robin is an example of a bird; a rabbit and a human are examples of a mammal</p> <p>Know that herbivorous animals eats plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants</p> <p>Know that animals, including humans, need food, water and air to survive</p> <p>Know that living things move, grow, consume nutrients and reproduce; that dead things used to do these things, but no longer do; and that things that never lived have never done these things.</p> <p>Know that there are many kinds of jobs as a scientist including communicator scientist, teacher scientist, technician scientist and explorer scientist</p> <p>Know that technician scientists are scientists that help other scientists to do their job</p> <p>Know that explorer scientists try to find out new things that no one has ever learned before; many of the most famous scientists in history were explorer scientists</p>	<p>Know that there are three kinds of rocks: igneous, sedimentary and metamorphic</p> <p>Know that granite and basalt are types of igneous rock and that igneous rocks form from molten rock below the Earth's crust</p> <p>Know that limestone and sandstone are types of sedimentary rock which form when small, weathered fragments of rock or shell settle and stick together, often in layers</p> <p>Know that marble and slate are types of metamorphic rock which form when rocks in Earth's crust get squashed and heated in processes such as when tectonic plates press against each other</p> <p>Know that there are human-made rocks which include natural rocks.</p> <p>Know that fossils form when a plant or animal dies and is quickly covered with silt or mud so that it cannot be rotted by microbes or eaten by scavenging animals; in time layers of sediment build, squashing the mud and turning it to stone around the dead plant or animal; the materials in the body are replaced by minerals that flow in water through the rock, leaving a rock in the shape of the animal or plant that was once there</p> <p>Know that fossils can help us learn about things that lived long ago</p> <p>Know that soil is made from tiny particles of rock broken down by the action of weather (weathering)</p> <p>Know that Zhang Heng invented the world's first seismoscope that was able to detect where and when earthquakes had happened</p>	<p>Know that matter (stuff) is made from tiny building blocks</p> <p>Know that electrical energy is one of many forms of energy</p> <p>Know that static electricity is an imbalance of charged particles on a material; it does <u>not</u> operate by flowing around a complete circuit</p> <p>Know that current electricity is the flow of charged particles called electrons around a circuit</p> <p>Know that current electricity is the form of electricity that we use in our lives in lights, computers, televisions, etc</p> <p>Know that electrical current flows well through some materials, called electrical conductors, and poorly through other materials, called electrical insulators</p> <p>Know that conductors have free electrons (tiny, negatively charged particles) and that when electrical current flows around a conductor the electrons move</p> <p>Know that electrical conductivity (how well a material conducts electricity) is an example of a property</p> <p>Know that metals are good electrical conductors</p> <p>Cells, batteries and the mains are all sources of electrical energy</p>	<p>Know that things are composed of a matter commonly in one of three states of matter: solid, liquid or gas</p> <p>Know that things are made of particles (tiny building blocks) and that these are organized differently in each state</p> <p>Know that materials can change state when temperature changes</p> <p>Know that there are bonds between the particles (building blocks) in a solid; as temperature increases, these bonds are somewhat overcome as the particles absorb energy and solids can change into liquids; with a further increase in temperature, the particles become even more energetic and the bonds are overcome entirely so the liquid changes into a gas</p> <p>Know that when solids turn into liquids, this is called melting and that the reverse process is called freezing</p> <p>Know that when liquids turn into gases, this is called evaporation and that the reverse process is called condensation</p> <p>Know that materials can be sorted in a variety of ways based on their properties</p> <p>Know that in some solid materials the bonds between particles break when surrounded by a liquid; this allows the liquid to absorb the solid; when this</p>	<p>Know that fish, amphibians, reptiles, birds and mammals are similar in that they have internal skeletons and organs; these are known as vertebrates, which means they are animals that have a backbone</p> <p>Know that a classification key uses questions to sort and identify different living things (see diagram below)</p> <p>Know that a classification key can be used to identify living things</p> <p>Know that there are three types of micro-organism: viruses, fungi and bacteria; of these three, viruses are often not really considered to be alive by many scientists mainly because they don't have the 'machinery' to reproduce inside them</p> <p>Know that germs are disease-causing micro-organisms.</p> <p>Know that an arthropod is an invertebrate with a hard, external skeleton and jointed limbs</p> <p>Know that insects are a type of arthropod; their bodies consist of six legs, a head, a thorax and an abdomen; most insects also have a pair of antennae and a pair of wings (e.g. wasp)</p> <p>Know that an arachnid (e.g. spider) is a type of arthropod with eight legs and no antennae or wings.</p>

	<p>examples of omnivores (though not vegetarians)</p> <p>Know and sort other examples of carnivore, herbivores and omnivores</p>		<p>(when the Earth's tectonic plates suddenly shift causing massive vibrations</p>	<p>Know that electrical current can flow if there is a complete circuit</p> <p>Know that wires - which contain a conductor inside them, usually made of metal - can allow electrical current to flow around a circuit</p> <p>Know that when electrical current flows through a circuit components within that circuit - such as buzzers which make a noise and bulbs which emit light - begin to work</p> <p>Know that a switch functions by completing or breaking a complete circuit</p> <p>Know how to construct a simple circuit using components</p> <p>Know that exposure to high levels of electrical current can be dangerous</p> <p>Know that Michael Faraday was a scientist who studied electricity</p> <p>Know that he invented the electric motor and showed that the movement of a magnet could create electricity, which is the reason we can generate electricity to power our world</p> <p>Know that he is considered "the father of electricity"</p>	<p>happens, the solid is called a solute, the liquid is called a solvent and the result is a solution; when a solid does dissolve in a liquid it is described as being soluble in that solvent (e.g. sugar in water); when it cannot it is insoluble (e.g. sand in water)</p>	<p>Know that a crustacean is a type of arthropod with two pairs of antennae (e.g. woodlouse).</p> <p>Know that a myriapod is an arthropod with a flat and long or cylindrical body and many legs (e.g. centipede).</p> <p>Know that Jane Goodall is an anthropologist, most famous for her study of chimpanzees, of which she is considered the world's foremost expert</p> <p>Know that Goodall discovered that chimpanzees are much more intelligent than they had ever been thought to be</p> <p>Know that Goodall is also a conservationist and environmentalist, which means she does important work to help protect the planet, in particular animal habitats</p>
Vocabulary	<p>energy, growth, habitat, fish, amphibian, reptile, bird, mammal, offspring, carnivore, herbivore, omnivore, vertebrate, skeleton, organ</p>	<p>birth, decay, energy, reproduction, microhabitat, dead, life cycle, food chain, source, nutrients, consumption, environment</p>	<p>Igneous, sedimentary, metamorphic, Sandstone, Granite, Marble, Pumice, Crystals, anthropic, permeable, impermeable, chemical fossils, animal fossils, mold fossils, cast fossils, organic, top soil, subsoil, base rock</p>	<p>Electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, battery, switch, bulb, conductor, insulator</p>	<p>absorption, bond, condensation, conductor, evaporation, matter, melting, particle, property, reversible, freezing, suitability, surface, waterproof, flexible, rigid, boiling point, melting point, solid, liquid, gas, sublimation, magnetic</p>	<p>micro-organism, virus, thorax, arthropod, abdomen, arachnid, antenna, jointed limbs, Classify, Classification, bacteria, characteristics, microorganism, organism, invertebrates, vertebrates, sexual, asexual, domain, phylum, genus, species</p>

Spring Term 2

Main Enquiry Question and Sub Questions	Animals & Humans What do all animals have in common?	Year 2 Healthy Living Is all food good for us?	Year 3 Forces & Magnets Are all metals attracted to magnets?	Year 4 Solids, Liquids & Gases Does water always melt at the same speed?	Year 5 Properties & Changes of Materials What is the difference between a solid, liquid and gas and what brings about the changes in states?	Year 6 Evolution & Adaptation Why are some animals different from others and why might different types of the same species vary?
Substantive Scientific Knowledge		<p>Know the basic food groups: fruit and vegetables, carbohydrates, protein, dairy, fat and sugary foods</p> <p>Know that proteins are good for growth, carbohydrates for energy and fruit and vegetables provide vitamins and minerals which help keep us healthy (e.g. calcium for healthy bones and teeth)</p> <p>Know that more than half of our diet should be made up of carbohydrates, fruit and vegetables</p> <p>Know that fats and sugary foods should be eaten rarely and in small amounts</p> <p>Know that people need to exercise often to help their body stay strong and fit</p> <p>Know that keeping clean, including washing and brushing teeth, is an important part of staying healthy</p>	<p>Know that a force can be thought of as a push or a pull</p> <p>Know that there are different types of contact force: impact forces (when two surfaces collide), frictional forces (when two surfaces are already in contact) and strain forces (when an elastic material is stretched or squashed)</p> <p>Know that objects move differently on rough and smooth surfaces; objects resist movement more on rough surfaces because there is higher friction as the object moves</p> <p>Know that there are also non-contact forces that can act between objects without them touching and that magnetism is an example of a non-contact force</p> <p>Know that magnets have two poles called north and south</p> <p>Know that like poles (south-south and north-north) of two magnets repel each other and that opposite poles of two magnets (north-south) attract each other</p> <p>Know that there is a magnetic field around a magnet which is strongest at each pole</p> <p>Know that some materials are magnetic, meaning that they are attracted to a magnet, while other materials are non-magnetic</p>	<p>Know that materials can be hard, soft, strong, weak, absorbent, heavy, light, solid and runny, smooth and rough; these descriptions denote the properties of a material</p> <p>Know that matter (stuff) is made from tiny building blocks</p> <p>Know that things are composed of a matter commonly in one of three states of matter: solid, liquid or gas</p> <p>Know that things are made of particles (tiny building blocks) and that these are organized differently in different states</p> <p>Know that materials can change state when temperature changes</p> <p>Know that there are bonds between the particles (building blocks) in a solid; as temperature increases, these bonds are somewhat overcome as the particles absorb energy and solids can change into liquids; with a further increase in temperature, the particles become even more energetic and the bonds are overcome entirely so the liquid changes into a gas</p> <p>Know that when solids turn into liquids, this is called melting and</p>	<p>Know that a given amount of solvent can only absorb a certain amount of solid before no more will dissolve; when this happens the liquid is said to be saturated</p> <p>Know that when a solvent is evaporated from a solution, the original solute is left behind; the remaining solid will often form crystals - the slower the solvent evaporates, the larger the crystals that will be formed</p> <p>Know how to dissolve a solute in a solvent and then how to evaporate the solvent to recover the solute</p> <p>Know that a reversible change is one that can be reversed and that examples of this are mixing, dissolving and changes of state where no chemical reaction takes place</p> <p>Know that an irreversible change is one that cannot be reversed and that examples of this often involve a chemical change where a new material is made, often a gas (e.g. burning, boiling an egg, the reaction of bicarbonate of soda and acid)</p> <p>Know that filtering allows solids and liquids to be separated and</p>	<p>Know that living things adapt to survive in their environment eg. Polar bears have thick fur for warmth and oily paw pads to ensure that they don't freeze to the ice</p> <p>Know that changes to the environment can make it more difficult for animals to survive and reproduce; in extreme cases this leads to extinction, where an entire species dies</p> <p>Know that human activity - such as climate change caused by pollution - can change the environment for many living things, endangering their existence</p> <p>Know that the polar bear is a famous example of climate change endangering the existence of a species; as the climate changes and gets warmer, the sea ice on which polar bears live reduces in amount making it harder for them to survive and reproduce</p> <p>Know that all life on Earth began from a single point around 4.5 thousand million years ago</p> <p>Know that living things change over time and that this gradual change is called evolution</p>

				<p>that the reverse process is called freezing</p> <p>Know that when liquids turn into gases, this is called evaporation and that the reverse process is called condensation</p> <p>Know that when a solid turns into a gas without passing through the liquid state, this is called sublimation</p> <p>Know that the melting point of water is 0° C and that the boiling point of water is 100° C</p> <p>Know that water flows around our world in a continuous process called the water cycle (see diagram below)</p> <p>Know that, along with evaporation, water on the Earth's surface moves to the air in a process called transpiration in which water turns into water vapour (gas) on the surface of leaves on plants</p> <p>Know that rain condenses in clouds and falls to earth as rain, snow or hail in a process called precipitation</p> <p>Know that water flows across the land in rivers and streams in a process called surface run-off and under the ground as groundwater</p>	<p>that sieving allows solids made up of different sizes parts to be separated</p>	<p>Know that natural selection is the cause of this change; natural selection works as there is natural variation within a species; there is also competition to survive and reproduce and that members of a species with advantageous characteristics survive and reproduce - these characteristics are passed down to their offspring; members of a species with less advantageous characteristics do not survive and reproduce - these characteristics are not passed down to offspring (see diagram below)</p> <p>Know that offspring vary and are not identical to their parents</p> <p>Know that the gradual change of species over millions of years can be observed by looking at examples of fossils</p> <p>Know that Charles Darwin posited this theory of evolution by natural selection</p> <p>Know that Darwin was a naturalist whose theory of evolution by natural selection developed while travelling through the Amazon rainforest</p>
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Main Enquiry Question and Sub Questions	Year 1 Seasonal Changes	Year 2 Plants	Year 3 Plants & Animals	Year 4 Living Things & Their Habitats	Year 5 Properties & Changes of Materials	Year 6 Animals Including Humans
Substantive Scientific Knowledge	<p>How does the weather change throughout the year?</p> <p>Know that days are longer in the summer and shorter in winter</p> <p>Know that weather changes through the year, getting hotter in the summer and colder in the winter</p> <p>Know that the four seasons are spring, summer, autumn and winter and know the order of the cycle</p> <p>Know that the winter is likely to bring ice on the ground when water freezes due to the cold</p> <p>Know that the Earth orbits the Sun with one orbit constituting a year of roughly 365 days</p>	<p>How do we keep plants alive?</p> <p>Know that dandelions, rose bushes, grass, ash trees, birch trees and conifers trees are examples of plants.</p> <p>Know that trees can be deciduous or evergreen.</p> <p>Know that living things move, grow, consume nutrients and reproduce; that dead things use to do these things, but no longer do; and that things that never lived have never done these things</p> <p>Know that seeds and bulbs need to be buried underground in soil and that they will grow into adult plants under the right conditions (water, warmth)</p> <p>Know that plants that are deprived of light, food or air will not grow and will die (enquiry)</p> <p>Know the life cycle of a plant.</p> <p>Know that George Washington Carver was a practical scientist and inventor</p> <p>Know that he helped farmers in America to grow more crops by showing them the benefits of growing different things at different times and of using fields for different crops</p>	<p>Do all plants need exactly the same things?</p> <p>Know that evergreen trees maintain their leaves throughout the year and that deciduous trees shed their leaves in autumn</p> <p>Know that flowering plants consist of roots, stem, leaves and flowers, and that a tree's stem is called a trunk</p> <p>Know that plants absorb energy from the Sun; that this energy is consumed by herbivorous animals; and that carnivorous animals eat other animals.</p> <p>Know that seeds and bulbs need to be buried underground in soil and that they will grow into adult plants under the right conditions (water, warmth)</p> <p>Know that the arrows on a food chain show the direction that the energy travels.</p> <p>Know that plants that are deprived of light, food or air will not grow and will die.</p> <p>Know that animals, including humans, need food, water and air to survive</p> <p>Know that different parts of plants have one or more functions (jobs)</p> <p>Know that the roots collect water and minerals from the soil, and hold the plant firmly in the ground</p> <p>Know that the stem holds up the leaves so that they can gather light to make food and holds up the flowers so that they can receive pollen and disperse their fruits; know that the stem also transports water</p>	<p>Are some animals more alike than others?</p> <p>Know that living things move, grow, consume nutrients and reproduce; that dead things use to do these things, but no longer do; and that things that never lived have never done these things.</p> <p>Know that herbivorous animals eats plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants and know animal examples of each.</p> <p>Know that fish, amphibians, reptiles, birds and mammals are similar in that they have internal skeletons and organs; these are known as vertebrates, which means they are animals that have a backbone</p> <p>Know that fish are different to other animals in having gills so that they can breathe underwater and have scaly skin</p> <p>Know that amphibians are different to other animals in that they begin their lives with gills but then develop lungs and breath on land</p> <p>Know that reptiles are different to other animals in that they breath air and have scaly skin</p>	<p>How can you separate very small things like sand, salt and stones from a liquid solution?</p> <p>Know how to separate a mixture of sand, salt and small stones by sieving (to remove the small stones), followed by dissolving in water (so the salt is absorbed), followed by filtering to remove the sand from the mixture, followed finally by evaporation of the water to recover the salt.</p> <p>Know that materials' different properties can be tested through acting upon them, including testing to find whether materials are magnetic, thermally conductive and electrically conductive; know that the various properties of different materials make them suitable for a given function</p> <p>Know how to explain orally and in writing the reasons why various materials are suited or unsuited to a function</p> <p>Know that Marie Curie was a genius physicist, earning two Nobel Prizes</p> <p>Know that Marie Curie discovered two new elements (the building blocks of everything) and made discoveries that suggested that atoms - which were thought to be the smallest building blocks - could be divided into smaller building blocks still</p>	<p>Can you explain the impact of a healthy/ unhealthy lifestyle on the systems within the body?</p> <p>Know that skeletons provide support for muscles and protect the body; for example, the rib cage protects the vital organs in the human body</p> <p>Know the names of key bones in the body, including the rib cage, cranium, mandible, sternum, vertebrae, femur, tibia, fibula, patella, humerus, radius and ulna; know how to label these on a diagram of the human body</p> <p>Know that an adult human body has 206 bones, the longest of which is the femur</p> <p>Know that the heart and lungs are organs protected by the ribcage and understand this as a part of the skeleton</p>

			<p>and minerals from the roots to the other parts of the plant</p> <p>Know that the leaves make food by absorbing light and using its energy to turn carbon dioxide and water into carbohydrates</p> <p>Know that the function of a flower is reproduction, where flowers of the same kind exchange pollen - made by an anther - in a process called fertilisation, and a structure in the flower's ovary called an ovule becomes a seed; the ovary then becomes a fruit which helps the seed leave the plant in a process called dispersal</p>	<p>Know that birds are different to other animals in that they have feathers and wings</p> <p>Know that mammals are different to other animals in that they have fur/hair and they feed milk to their young</p> <p>Know that animals can be grouped based on their physical characteristics (e.g. vertebrates and invertebrates) and based on their behavior (e.g. herbivores, carnivores and omnivores)</p> <p>Know that living things are divided into kingdoms: the animal kingdom, plants, fungi, bacteria, and single-celled organisms</p> <p>Know that a species is a group of living things have many similarities that can reproduce together produce offspring</p>		
Vocabulary	energy, freezing, melting, orbit, reflection, Sun, clouds, wind, snow, ice, spring, summer, autumn, winter	offspring, adult, bulb, seed, survival, temperature	fruit, nectar, anther, ovary, ovule, petal, pollen, stigma, style, stamen, function, exchange, dispersal, fertilization	Organism, variation, classification, vertebrates, invertebrates, reptile, bird, mammal, amphibian, fish, global, local, characteristics, habitat, environment, endangered, extinct, conservation, ecological, deforestation	irreversible, dissolve, soluble, insoluble, solvent, solute, solution, filter, sieve, saturation, crystallization, thermal, chemistry	rib cage, cranium, mandible, sternum, vertebrae, femur, tibia, fibula, patella, humerus, radius and ulna, vital organs, skeleton
Enquiry	<p>Observing over time Noticing patterns Chn keep a weather diary across a period of time and compare this to a pre-made one for a different period of the year, drawing conclusions.</p> <p>Sc1/1.1 asking simple questions and recognising that they can be answered in different ways</p> <p>Sc1/1.2 observing closely, using simple equipment</p>	<p>Observing over time Chn measure the height of a growing plant over a period of days and weeks.</p> <p>Sc1/1.2 observing closely, using simple equipment</p> <p>Sc1/1.6 gathering and recording data to help in answering questions</p>	<p>Observing over time Comparative test Chn give both a parsley plant and a small cactus minimal water over a two week period and observe the changes (perhaps drawing the result)</p> <p>Sc4/1.1 asking relevant questions and using different types of scientific enquiries to answer them</p> <p>Sc4/1.2 setting up simple practical enquiries, comparative and fair tests</p> <p>Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</p>	<p>Grouping and classification. Children to use pictures to put animals into groups in different ways (e.g. where they live, what they eat, how they move, how many legs, etc) moving on to using keys to differentiate between closely related animals.</p> <p>Sc4/1.4 gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</p> <p>Sc4/1.7 using results to draw simple conclusions, make predictions for new values,</p>	<p>Noticing patterns Chn use filtering and evaporation to separate a mixture of sand, salt and stones.</p> <p>Sc5/1.1 planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</p> <p>Sc5/1.5 reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations</p>	<p>Noticing patterns Chn to investigate the effect of exercise on heart rate and how long it takes for their pulse to return to the resting rate after exercising for a minute.</p> <p>Sc5/1.1 planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</p> <p>Sc5/1.2 taking measurements, using a range of scientific equipment, with increasing accuracy and precision</p>

			<p>Sc4/1.5 recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</p> <p>Sc4/1.7 using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</p> <p>Sc4/1.9 using straightforward scientific evidence to answer questions or to support their findings.</p>	<p>suggest improvements and raise further questions</p> <p>Sc4/1.8 identifying differences, similarities or changes related to simple scientific ideas and processes</p>		<p>Sc5/1.3 recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs</p> <p>Sc5/1.4 using test results to make predictions to set up further comparative and fair tests</p> <p>Sc5/1.6 identifying scientific evidence that has been used to support or refute ideas or arguments.</p>
Summer Term 2						
Main Enquiry Question and Sub Questions	Year 1 Plants Are all plants the same?	Year 2 Animals & Adaptation Can all animals survive in the same habitat?	Year 3 Plants & Animals How does our body move and stand up?	Year 4 Living Things & Their Habitats What is the main cause of climate change?	Year 5 Living Things & Their Habitats If life has existed for billions of years, why are there still people alive today?	Year 6 Animals Including Humans Can you explain the impact of a healthy/ unhealthy lifestyle on the systems within the body?
Substantive Scientific Knowledge	<p>Know that a flowering plant consist of roots, stem, leaves and flowers, and that a tree's stem is called a trunk</p> <p>Know a rose bush, a sunflower and a dandelion by sight</p> <p>Know an oak tree, a birch tree and a horse chestnut tree by sight</p> <p>Know that evergreen trees maintain their leaves throughout the year and that deciduous trees shed their leaves in autumn</p> <p>Know that there are many kinds of jobs as a scientist including communicator scientist and teacher scientist</p> <p>Know that teacher scientists teach others - often children - about science</p> <p>Know that communicator scientists help the world to understand about science</p> <p>Know that David Attenborough is a famous communicator scientist who has created and presented some of the most</p>	<p>Know that the arrows on a food chain show the direction that the energy travels</p> <p>Know and complete some common food chains</p> <p>Know and give examples of why animals live in certain habitats</p> <p>Know that polar bears are an example of an animal adapted to its environment - thick fur for warmth and oily paw pads to ensure that they don't freeze to the ice</p> <p>Know that sharks are another example - smooth skin and streamlined shape for quick swimming; and gills for breathing underwater</p> <p>Know that cacti are an example of a plant adapted to its environment - thick skin keeps a store of water safe; sharp spikes keep animals from stealing the water</p>	<p>Know that proteins are good for growth, carbohydrates for energy and fruit and vegetables provide vitamins and minerals which help keep us healthy (e.g. calcium for healthy bones and teeth)</p> <p>Know that getting the right amount of each food group (including over half of the diet made up of fruit, vegetables and carbohydrates) is called a balanced diet</p> <p>Know that lack of a nutrient can cause ill health; for example, a lack of vitamin D leads to a disease called rickets</p> <p>Know that animals, including humans, have a skeleton made up of solid objects</p> <p>Know that some animals (such as insects) have an exoskeleton - a solid covering on the outside of their body</p> <p>Know that many invertebrates (such as earthworms and slugs) have water held inside by muscles which acts like a skeleton</p>	<p>Know that a classification key uses questions to sort and identify different living things</p> <p>Know how to use a classification key to identify living things</p> <p>Know how to create a classification key to sort plants on the school premises</p> <p>Know that changes to the environment can make it more difficult for living things to survive and reproduce; in extreme cases this leads to extinction, where an entire species dies</p> <p>Know that human activity - such as climate change caused by pollution - can change the environment for many living things, endangering their existence</p> <p>Know that many species of living things have already been made extinct as a result of human activity</p>	<p>Know that the life cycle of a living thing is a series of stages of development starting with a fertilized egg in animals or a seed in many plants</p> <p>Know that in most mammals (e.g. dogs) a fertilized egg develops in the womb into an embryo and is then born and fed on milk before it is weaned onto the food that is adapted to eat; it then develops to maturity in a period called adolescence after which it can reproduce and the cycle can begin again</p> <p>Know that in amphibians (e.g. frogs) a fertilized egg develops into an embryo and then hatches into a tadpole; the tadpole develops adult characteristics, metamorphoses into the adult form after which it can reproduce and the cycle can begin again</p> <p>Know that in many insects (e.g.</p>	<p>Know that the heart beats, pumping blood around the body and that blood vessels carry the blood; arteries carry blood away from the heart; veins carry blood towards the heart; capillaries are tiny blood vessels that connect arteries and veins</p> <p>Know that the heart is composed of four chambers: two atria and two ventricles; the aorta is the largest artery in the body and most major arteries branch off from it</p> <p>Know that blood travels around the body transporting nutrients that have been absorbed into the bloodstream from digestion; blood also absorbs oxygen from the lungs and carries it around the body which is used to power the body; this use of oxygen to create energy is called respiration</p>

	<p>famous television programmes ever made about plants and animals</p>	<p>Know that pine trees are adapted to their environment in that they have thick bark and pine cones to protect against cold winters</p> <p>Know and give examples of microhabitats</p> <p>Know that woodlice live under logs - an example of a microhabitat - as they need somewhere dark and damp so that they do not dry out</p> <p>Know that frogs can live in ponds - an example of a microhabitat - as they water in which to lay their eggs (frogspawn)</p>	<p>Know that skeletons provide support for muscles and protect the body; for example, the rib cage protects the vital organs in the human body</p> <p>Know that human skeletons are made up of bones and cartilage</p> <p>Know that muscles can only contract, so they must be arranged in pairs in the body so that as one contracts the other loosens</p> <p>Know that excess of a food group can cause ill health, such as tooth decay due to excess sugar</p> <p>Know that excess fat from fatty foods such as butter and cheese - and created in the body from excess calories - builds up in the body and can cause obesity</p> <p>Know that excess body fat can lead to heart disease and increases the strain on joints and growing bones</p>	<p>Know that the polar bear is a famous example of climate change endangering the existence of a species; as the climate changes and gets warmer, the sea ice on which polar bears live reduces in amount making it harder for them to survive and reproduce</p> <p>Know that Carl Linnaeus was a famous scientist who studied life and created a system for sorting living things into different groups</p> <p>Know that the concept of species and kingdoms (such as the animal kingdom or the plant kingdom) was his invention, and that all living things are given a name that uses his method of classification</p>	<p>butterflies) a fertilized egg develops into wingless feeding form called a larva (caterpillar); the larva feeds then later becomes a pupa (chrysalis) with a protective cocoon; inside this cocoon, the pupa metamorphoses into the adult butterfly after which it can reproduce and the cycle can begin again</p> <p>Know that in birds (e.g. robins) a fertilized egg hatches in a nest (a hatchling) and is fed by its parents until it is ready to fly (i.e. becomes a fledgling); it then leaves the nest and grows into an adult after which it can reproduce and the cycle can begin again</p> <p>Know that humans go through stages of development; they begin as fertilized eggs and then develop into embryos before developing into babies; once they are born, these newborn babies become infants (roughly 2 months to 2 years) then into young children (roughly 2-12 years old); children develop into adults during adolescence (roughly 12-16 years old) at which age they become physically capable of reproduction; as adults develop into old age (roughly 55+ years old) they experience changes in their body which require them to move more carefully and rest more frequently</p> <p><i>NB: the changes of adolescence in humans is taught as part of mandatory sex and relationship education; it must be taught with due sensitivity to children's backgrounds and must reflect the PSHE curriculum</i></p>	<p>Know that when we exercise, our heart beats more frequently so that the oxygen that is used around the body can be replenished; it returns to a resting heart rate afterwards; fitter people tend to have lower resting heart rates</p> <p>Know that drugs are chemicals that have an impact on the natural chemicals in a person's body; know that drugs can be harmful or helpful, depending on what they are and how they are used; know that all drugs can be harmful if overused</p> <p>Know that paracetamol and aspirin are examples of drugs that can be helpful as a painkiller</p> <p>Know that cannabis and cocaine are examples of illegal drugs that can have serious negative effects</p> <p>Know that alcohol and tobacco are examples of drugs that are legal to adults but that can have serious negative effects, such as liver disease and lung disease, respectively</p>
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	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	<p>Know that we can ask questions about the world and that when we observe the world to answer these questions, this is science</p> <p>Know that we can use magnifying glasses to observe objects closely</p> <p>Know that we can test our questions to see if they are true</p> <p>Know that objects can be identified or sorted into groups based on their observable properties</p> <p>Know that we can write down numbers and words or draw pictures to record what we find</p>	<p>Know that we can ask questions about the world and that when we observe the world to answer these questions, this is science</p> <p>Know that we can use magnifying glasses to observe objects closely</p> <p>Know that we can test our questions to see if they are true</p> <p>Know that objects can be identified or sorted into groups based on their observable properties</p> <p>Know that we can write down numbers and words or draw pictures to record what we find</p>	<p>Know that we can ask questions and answer them by setting up scientific enquiries</p> <p>Know how to make relevant predictions that will be tested in a scientific enquiry</p> <p>Know that in a fair test one thing is altered (independent variable) and one thing that may change as a result is measured (dependent variable) while all other conditions are kept the same</p> <p>Know how to use a range of equipment to measure accurately, including thermometers, data loggers, rulers and stopwatches</p> <p>Know how to draw bar charts; how to label a diagram using lines to connect information to the diagram; how to use a coloured key how to draw a neat table; how to use a coloured key how to draw a classification key; how to show the relationship between an independent variable in a two-way table; and how to label specific results in a two-way table</p> <p>Know - with structured guidance - how to write a simple scientific enquiry write-up including an introduction, a list of equipment, a numbered method, a detailing of results and a conclusion</p> <p>Know how to precis a scientific enquiry write-up into a brief oral discussion of what was found in a scientific enquiry</p> <p>Know that scientific enquiries can suggest relationships, but that they</p>	<p>Know that we can ask questions and answer them by setting up scientific enquiries</p> <p>Know how to make relevant predictions that will be tested in a scientific enquiry</p> <p>Know that in a fair test one thing is altered (independent variable) and one thing that may change as a result is measured (dependent variable) while all other conditions are kept the same</p> <p>Know how to use a range of equipment to measure accurately, including thermometers, data loggers, rulers and stopwatches</p> <p>Know how to draw bar charts; 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			<p>do <u>not</u> prove whether a prediction is true</p> <p>Know that scientific enquiries are limited by the accuracy of the measurements (and measuring equipment) and by the extent to which conditions can vary even, and that repeating enquiries, measurements and taking measures to keep conditions as consistent as possible can improve an enquiry</p> <p>Know that the conclusions of scientific enquiries can lead to further questions, where results can be clarified or extended to different contexts (e.g. effect of changing sunlight on a plant - does this work with other plants / different types of light / etc)</p> <p>Know that they can draw conclusions from the findings of other scientists</p> <p>Know that a theory is an explanation of observations that has been tested to some extent and that a hypothesis is an explanation that has not yet been tested, but that can be tested through a scientific enquiry</p>	<p>equipment) and by the extent to which conditions can vary even, and that repeating enquiries, measurements and taking measures to keep conditions as consistent as possible can improve an enquiry</p> <p>Know that the conclusions of scientific enquiries can lead to further questions, where results can be clarified or extended to different contexts (e.g. effect of changing sunlight on a plant - does this work with other plants / different types of light / etc)</p> <p>Know that they can draw conclusions from the findings of other scientists</p> <p>Know that a theory is an explanation of observations that has been tested to some extent and that a hypothesis is an explanation that has not yet been tested, but that can be tested through a scientific enquiry</p>	<p>records as evidence of natural selection)</p>	
	observe, test, magnifying glass, object, record, equipment	properties, observe, test, magnifying glass, object, record, equipment	prediction, measurement, enquiry, dependent variable, independent variable, fair test, similar, theory, hypothesis	prediction, measurement, enquiry, dependent variable, independent variable, fair test, similar, theory, hypothesis	prediction, measurement, enquiry, dependent variable, independent variable, fair test, similar, theory, hypothesis line graph, relationship, outlier	prediction, measurement, enquiry, dependent variable, independent variable, fair test, similar, theory, hypothesis, line graph, relationship, outlier

Disciplinary Knowledge								
SCIENCE		RECEPTION	YEAR 1	YEAR 2	YEAR 3	YEAR 4	Upper KS2 (Y5 and Y6)	
QUESTION		Ask simple questions about immediate environment.	Ask questions and know some can be answered using scientific enquiry.		Identify scientific questions. ie can be investigated through scientific enquiry.		Raise scientific questions and hypothesise	
SCIENTIFIC ENQUIRY	OBSERVE	Qualitative Talk about similarities and differences.	Qualitative and Simple Quantitative		Qualitative and Quantitative		Qualitative and Quantitative	
			Observe change over time. Use Senses/ equipment.	Measure change over time e.g. plant growth. Select equipment	Systematic/ careful observations. Use bar charts, pictograms, tables.	Accurate measurements. Use time graphs and other graphs.	Accurate/ precise measurements, Diagrams, tables, bar and line graphs.	Take repeat readings when appropriate. Scatter graphs.
	CLASSIFY and FIND PATTERNS	Talk and Sort Use simple scientific criteria.	Identify and Classify		Classify and Find Patterns		Classify and Find Patterns	
			e.g. familiar plants, animals, materials Compare and contrast	e.g. living/ dead/ never alive; materials Compare differences	Classify animals/ materials. Link two variables e.g. <i>the closer the magnet the bigger the force.</i>	Use simple classification keys. Link two variables e.g. <i>the more cells in a circuit, the brighter the bulb.</i>	Use complex classification keys. Identify causal relationships.	Develop classification keys. Identify evidence that supports/ refutes causal relationship.
	CONTROL INVESTIGATIONS: comparative and fair testing	Explore objects/ materials/ living things/ resources designed to model scientific processes.	Simple comparative tests		Comparative and fair tests		Design own comparative and fair tests	
			e.g. <i>What is the best material for an umbrella?</i>	e.g. <i>What if plants do not get light and water?</i>	Predict. Fair tests e.g. <i>How does distance affect magnet strength?</i>	Predict. Language of independent and control variable.	Identify when and how to use tests. Recognise and control variables. Make predictions based on previous test results.	
	RESEARCH	Listen and respond to stories about scientific processes/ events/ objects.	Find information using given sources. e.g. <i>animals.</i>	Select information from a range of given sources.	Research using given sources. e.g. <i>research different food groups and how they keep us healthy</i>	Select information to support findings. e.g. <i>research animals</i>	Explore relevant information by using a wide range of secondary sources.	
							Explore how scientific ideas have developed over time.	Identify evidence that has been used to support or refute ideas.

	MODEL	Concrete context. Create drawings and models of their environment	Concrete context Draw diagrams e.g. <i>parts of plants/ the body</i> .	Explore and create drawings and physical models e.g. <i>habitats</i> .	Abstract contexts e.g. processes and phenomena such as forces/ light. Use labelled diagrams and drawings and physical models.	Abstract contexts e.g. processes and phenomena such as sound/ electricity. Create labelled diagrams and drawings and physical models.	Abstract contexts. Evaluate diagrams/ models e.g. states of matter; solar system.	Abstract contexts. Create own versions of models. e.g. circulatory system; light.
CONCLUDE		Explain simple phenomena: How? Why?	Describe what has happened or been observed.	Explain why a simple observation occurred. Evaluate the effectiveness of observations.	Explain an observation or an event in scientific terms. Distinguish between what has been observed and why it happened. Begin to link evidence from secondary sources as well as primary. Suggest improvements.		Evaluate original hypothesis against observed evidence and reach appropriate conclusions. Identify causal relationships. Begin to identify how reliable the data is.	