Powick C of E Primary School

Science Curriculum Document

DIOCESE OF WORCESTER MULTI ACADEMY TRUST
TO LOVE | TO LEARN | TO SERVE

Powick C of E Primary School Substantive and Disciplinary Knowledge in Science

Overview of Substantive Knowledge across Key Stage 1 and Key Stage 2

	Autumn		Spring		Summer	
Year 1	Everyday Materials		Animals, Including Humans		Plants	
	Seasonal Changes					
Year 2	Uses of Everyday Materials		Animals, Including Humans	Living Things and Their Habitats	Plants	
Year 3	Rocks	Forces and Magnets	Animals, Including Humans		Plants	Light
Year 4	Living Things and Their Habitats	Animals, Including Humans	States of Matter		Sound	Electricity
Year 5	Earth and Space	Living Things and Their Habitats	Forces		Properties and Changes of Materials	Animals, Including Humans
Year 6	Light	Electricity	Living Things and Their Habitats	Animals, Including Humans		Evolution and Inheritance

Overview of Disciplinary Knowledge across Key Stage 1 and Key Stage 2

	Methods of Scientific Enquiry	Apparatus and Techniques	Analysis, Presentation and Evaluation of Scientific Data	Development of Scientific Knowledge
KS1	• Asking simple questions and recognising that they can be answered in different ways. • Identifying and classifying. • Performing simple tests.	• Observing closely, using simple equipment. • Gathering and recording data to help answer questions.	• Using their observations and ideas to suggest answers to questions	
LKS2	• Asking relevant questions and using different types of scientific enquiries to answer them. • Setting up simple practical enquiries, comparative and fair tests.	• Making systematic and careful observations. • Taking accurate measurements using standard units, using a range of equipment.	• Gathering, recording, classifying and presenting data in a variety of ways. • Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. • Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.	• Identifying differences, similarities or changes related to simple scientific ideas and processes. • Using straightforward scientific evidence to answer questions or to support their findings.
UKS2	• Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary (fair tests, comparative tests, observation over time, research, pattern seeking) • Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why. • Plan and execute appropriate investigations based on a given or student-led question.	• Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. • Make their own decisions about what observations to make, repeat readings & learn about reliability, developing an increased level of precision and accuracy.	• Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs (in line with Year 6 maths curriculum learning) . • Use test results to make predictions to set up further comparative and fair tests . • Make predictions and complete further investigation – combine with research. • Report and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations, including giving an explanation of trust in results, with reason. • Identify causal relationships in investigations.	• Identify scientific evidence that has been used to support or refute ideas or arguments, including identifying which evidence they have produced supports or refutes ideas or arguments. • Begin to research evidence to support or refute ideas/arguments & begin to separate opinion from fact.

Contents

	Plants					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum	• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees • Identify and describe the basic structure of a variety of common flowering plants, including trees.	• Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	• 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.			
Key Substantive Knowledge	• There are a range of garden plants, wild plants and trees. • Trees can be deciduous or evergreen. • Flowering plants have many parts including roots, stem/trunk, leaves and flowers. • Fruit and vegetables are also plants/part of a plant.	• Plants usually grow from seeds and bulbs. • Plants need warmth, light and water to grow and survive. • Flowering plants make seeds to reproduce and make more plants. Some plants die after producing seeds and others live for many generations	• Plants make their own food in their leaves to provide them with energy, growth, repair and reproduce. • Leaves absorb sunlight and carbon dioxide. • Plants have roots to provide support and to draw moisture from the soil, through stems to take water to the rest of the plant. • The plant makes its food from water and carbon dioxide, using sunlight as energy, in the green parts of plants (mainly leaves). • Flowering plants have evolved specific parts to carry out pollination, fertilization and seed growth. Seed dispersal improves chances of enough seeds germinating and growing to mature. • Seeds and bulbs need the right conditions to germinate. They contain a food store for the first stages of growth (ie until the plant is able to produce its own food).			

Disciplinary Knowledge	• Observing closely, perhaps using magnifying glasses. • Comparing and contrasting familiar plants. • Describing how they were able to identify and group them. • Drawing diagrams showing the parts of different plants including trees. • Keeping records of how plants have changed over time, for example the leaves falling off trees and buds opening. • Comparing and contrasting what they have found out about different plants.	• Observing and recording, with some accuracy, the growth of a variety of plants as they change over time from a seed or bulb. • Observing similar plants at different stages of growth. • Setting up a comparative test to show that plants need light and water to stay healthy.	• Comparing the effect of different factors on plant growth, for example the amount of light, the amount of fertiliser. • Discovering (research and modelling) how seeds are formed by: – Observing the different stages of plant cycles over a period of time; – Looking for patterns in the structure of fruits that relate to how the seeds are dispersed. • Observing how water is transported in plants, for example, by putting cut, white carnations into coloured water. • Observing how water travels up the stem to the flowers.			
Key Vocabulary	bark berry blossom branch bud bulb deciduous evergreen flower food fruit garden leaf/leaves petal root seed soil stalk stem structure trunk wild	cool earth (soil) germinate grow / growth healthy light mature nutrients seedling shade shoot structure sun temperature vegetation warm water wither	absorb anther carpel fertiliser filament function lifecycle nutrients ovary ovule photosynthesis pollen pollination seed dispersal seed formation sepal stamen stigma style transported vary			

Science Capital	Scientists	Jane Colden (Botanist)	Joseph Banks (Botanist)	• George Washington Carver (Agricultural Scientist)			
	Careers	• Farmer • Agronomist • Botanist • Horticultural scientist • Pathologist • Plant breeder • Garden designer • Propagation scientist • Conservationist • Nature warden/ranger • Environmental scientist • Ecotourism Researcher • Field survey worker • Entomologist • Biologist					

	Animals, including humans					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum	• Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). • Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	• Notice that animals, including humans, have offspring which grow into adults. • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	• 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.	• 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.	• Describe the changes as humans develop to old age.	• 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.

Key Substantive Knowledge	• Animals can be birds, fish, amphibians, reptiles, mammals. • Animals can be carnivores, herbivores or omnivores. • The structure of common animals can differ, e.g. wings, tail, beak. feathers, skin. • The human body has different parts.	• Animals, including humans, have offspring which grow into adults. • Humans resemble their parents in many ways. • Animals, including humans, have basic needs for survival. (water, food, air, shelter). • To stay healthy, humans need to exercise, eat the right amounts of different types of food, and stay clean.	• Different animals are adapted to eat different foods. • Humans and many animals have skeletons to support their bodies and protect vital organs. • Muscles are connected to bones and move them when they contract. • Movable joints connect bones together.	• Animals have teeth to help them eat. • Different types of teeth do different jobs • Humans have a digestive system that is made up of different functions. • Food is broken down by the teeth and further in the stomach and intestines where nutrients go into the blood. • The blood takes nutrients around the body • Food chains are used to interpret producers, predators and prey. • Nutrients produced by plants move to primary consumers then to secondary consumers through food chains.	• Puberty is a process that normally occurs in a girl between 10 and 14. • Boys typically go through puberty between the ages of 12 and 16. However, this is not necessarily always the case as everyone is individual and will go through this process at their own rate. • Changes during puberty. • Changes that take place during old age. • Human Life Cycle Foetus, Baby, Childhood, Adolescence, Adulthodd and Old Age.	• The main parts of the circulatory system include the heart and lungs. • The Function of the heart is to pump blood around the body. • We need blood pumped around the body to carry oxygen, water and utrients to our muscles and organs so they work effectively. • When oxygen is used up by the muscles and organs, the blood pumped back to the heart has carbon dioxide in it that needs to be pumped to the lungs to be exhaled (breathed out). • Blood vessels are part of our circulatory system. • Blood is made up of red blood cells, white blood cells and plasma. • Food travels through the digestive system; water and nutrients are transported in animals, including humans travel through the blood. • Diet, exercise, drugs and life style all have an impact on the way our bodies function.

Disciplinary Knowledge	• Compare and contrast animals and humans at first hand or through videos and photographs. • Using their senses to compare different textures, sounds and smells. • Describing how they identify and group them. • Grouping animals according to what they eat.	• Observing, through video or first-hand observation and measurement, how different animals/humans grow • Recording their findings using charts • Asking questions about what things animals/humans need for survival suggesting ways to find answers to their questions. • Describing the main changes as young animal offspring grow into adults (at least: between egg and adult bird; between egg and adult insect; between baby and adult mammal)	• Comparing and contrasting the diets of different animals (including their pets). • Decide ways of grouping them according to what they eat. • Researching different food groups and how they keep us healthy. • Designing meals based (Create /Invent/ Design) on what they find out. • Identifying and grouping animals with and without skeletons. • Observing and comparing their movement. • Exploring ideas about what would happen if humans did not have skeletons.	• Comparing the teeth of carnivores and herbivores. • Suggesting reasons for differences [grouping & classifying]. • Finding out [testing and/or researching] what damages teeth and how to look after them. • Drawing and discussing their ideas about the digestive system. • Comparing them uasing models or images.	• Children can carry out a research enquiry by asking an expert. • Analyse the similarities and difference between how boys and girls experience puberty.	• Identify scientific evidence that has been used to support or refute ideas or arguments. • • Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary; record data and results of increasing complexity using classification keys, tables, scatter graphs, bar and line graphs; report findings from enquiries, including conclusions and degree of trust in results, in writtenforms by reporting and presenting the findings oftheir enquiry. • Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.

Key Vocabulary	Amphibian ankle animal beak bird body claw cub ears egg eyes family feather fin fish fur head leg mouth neck nest nocturnal pets pup reptile scales skin tail tame teeth wild wing wrist	activity adult adulthood air baby balanced diet bird butterfly caterpillar chick child childhood chrysalis dairy develop egg exercise fat food frog frogspawn fruit grains heart rate hygiene insect life-cycle lifestyle live young mammal nuts offspring old pulses reproduction shelter sugar teenager toddler warmth water vegetable young	backbone bones brain carbohydrates contract dietary fat fibre food groups hydrated invertebrates joints minerals muscles nutrition nutrients protect protein starches relax ribs skeleton skull sockets spine sugars support tendons vertebrates vitamins x-ray	anus breakdown canine cavity chemical decay dentin digestion digestive system enamel endoskeleton excrete exoskeleton faeces floride gastric juices gums incisor large intestine molar mouth nerves nutrients oesophagus omnivore plaque premolar pulp cavity reabsorb reabsorption rectum saliva salivary gland sewage small intestine stomach teeth tooth decay	birth chromosomes embryo fallopian tubes fertilisation gestation infancy menstrual cycle ovary ovum penis placenta testes puberty uterus vagina	aerobic air sacs alveoli aorta artery blood vessels bronchi bronchioles capillaries carbon dioxide circulatory system clotting deoxygenated diaphragm diet drugs exercise gaseous exchange haemoglobin heart lifestyle lungs muscles nutrients oxygen oxygenated plasma pulmonary pulse rate red blood cells respiratory system respire trachea transport vein ventricles white blood cells
Science Capital Scientist	• Evelyn Cheeseman	• Louis Pasteur (Germs)	• Marie Curie (X-rays)	• Washington Sheffield (Toothpaste)	• Rosalind Franklin	• William Harvey	

	Careers	• Doctor • Vet • Physiotherapist • Physiologist • Ophthalmologist • Zoologist • Conservationist • Sports scientist • pathologist • Nutritionist (humans or other animals) • Blood/ Heart specialist • Life style coach

	Living things and their habitats					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum		• Explore and compare the differences between things that are living, dead, and things that have never been alive. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. • Identify and name a variety of plants and animals in their habitats, including micro-habitats. • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.		• 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.	• 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.	• Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals • Give reasons for classifying plants and animals based on specific characteristics.

Key Substantive Knowledge		• There are differences between things that are living, things that are dead and things that have never been alive. • Living things survive in different habitats. • Most living things live in habitats to which they are suited. • Different habitats provide for the basic needs of different kinds of animals and plants. • Environmental change can affect plants and animals that live there. • Animals get their food from plants and other animals.		• Living things can be divided into groups based upon their characteristics. • Classification keys can be used for identifying plants and animals. • Specific environments can change habitats and cause dangers. • Different food chains occur in different habitats. • Human activity significantly affects the environment.	• Amphibians such as frogs are laid in eggs then, once hatched, go through many changes until they become an adult. • Some animals, such as butterflies, go through metamorphosis to become an adult. • Birds are hatched from eggs and are looked after by their parents until they are able to live independently. • Repoduction is the process of new living things being made. • Pollination is the transfer of pollen to a stigma to allow fertilisation.	• Living things, including animals, can be classified into broad groups. • Common observational characteristics can beused when classifying living things into groups. • Classification diagrams are a systematic question / answer method for separating a group (for example 'animals') into individual sections, using characteristics. • Classification uses similarities and differences. • We can give reasons for classifying plants and animals by using observational characteristics. • Microorganisms can be classified into broad groups using observational characteristics.

Disciplinary Knowledge		• Sorting and classifying things as to whether they are living, dead or were never alive. • Recording their findings using charts • Describing how they decided where to place things, • Exploring questions such as: 'Is a flame alive? Is a deciduous tree dead in winter?' • Talking about ways of answering their questions. • Constructing a simple food chain that includes humans (e.g. grass, cow, human); • Describing the conditions in different habitats and micro-habitats (under log, on stony path, under bushes); • Finding out how the conditions affect the number and type(s) of plants and animals that live there.		• Using and making simple guides or keys [grouping & classifying] to explore and identify local plants and animals. • Making a guide [grouping & classifying] to local living things. • Raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched.	• Classify animals according to their life cycle. • Compare the gestation times for mammals and look for patterns e.g. in relation to size of animal or length of dependency after birth. • Grow from cuttings and observe whether they grow roots/stem/ leaf/flower from a range of plants e.g. African violet, mint.	• Classify living things using the Linnaen system. • Match groups of animals to their characterisitcs. • Classify creatures based on their characteristics. • Classify living things and represent in a classification diagram. • Set up an investigation over a longer time to examine what microorganisms need in order to grow and survive. • Draw conclusions from data and observations, use evidence to justify ideas, use scientific knowledge and understanding to explain findings. • Use scientific ideas when describing simple processes.

Key Vocabulary			adapted alive animals conditions damp dark dead depend dinosaur environment food chain food source habitat living log micro habitat microscopic obtain plants pond predator prey produce producer provide source suited surroundings variety woodland		Antarctic Circle Arctic Circle anemometer barometer biome characteristics classification climate deforestation desert dominant environmental equator erosion forest fungus/fungi grassland invertebrates key mould organism pollution population region soil survive temperature topography tropical tundra variation vegetation vertebrates	asexual reproduction bulbs clone cuttings fern flowering plant fungi grass life cycle metamorphosis non-flowering interdependence plant group plantlets pores reproduce runners seed formation sexual reproduction sperm	amphibians characteristic classify invertebrates mammals microbes microorganism observable organism reptiles vertebrates
Science Capital	Scientist		Steve Irwin		Carl Linnaeus – classification	Jane Goodall	Sir David Attenborough – the natural world

	Careers	• Farmer • Agronomist • Botanist • Horticultural scientist • Pathologist • Plant breeder • Garden designer • Propagation scientist • Conservationist • Nature warden/ranger • Environmental scientist • Water quality officer • Ecotourism Researcher • Field survey worker • Entomologist • Marine biologist

	Materials and their properties					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum	• Distinguish between an object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. • Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials on the basis of their simple physical properties.	• Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.			• 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.	

Key Substantive Knowledge	• There are lots of different materials, including wood, plastic, glass, metal, water and rock. • Objects can be made from different materials. • Materials have describable properties. • Different materials have different properties. • Materials have similarities and differences.	• Everyday materials are suitable for particular uses. • You have to study the properties of a material to decide if it is useful for a particular job. • Some solid objects can be changed by squashing, bending, twisting and stretching. • Some materials are found in nature (natural) and other are made by humans (mad-made).			• Smaller materials are able to fall through the holes in the sieve, separating them from larger particles. • The solid particles will get caught in the filter paper but the liquid will be able to get through. • The liquid changes into a gas, leaving the solid particles behind. • Solid particles are very close together, meaning solids, such as wood and glass hold their shape. • Liquids can flow and take the shape of their container because the particles are more loosely packed than solids and can move around each other. • Gas particles are further apart than solid or liquid particles and they are free to move around. Examples of gases are oxygen and helium.	
Disciplinary Knowledge	• Performing simple tests to explore questions, for example: 'What is the best material for an umbrella? • Record results in a table. • Compare materials using scientific vocabulary. • Group and sort materials according to their properties.	• Comparing the uses of everyday materials in and around the school with materials found in other places (at home, the journey to school, on visits, and in stories, rhymes and songs). • Observing different materials closely. • Identifying and classifying the uses of different materials. • Recording their observations. • Thinking about unusual and creative uses for everyday materials.			• When exploring thermal insulation , observe the effects over time of different materials and how well they keep what is inside cool. • Observe evaportation when trying to separate a salt and water solution. • Identify properties of materials and clasify them. • Identify if materials are soluble or insoluble. • Compare the rates of solubility in different materials. • Group materials in to groups of reversible and irreversible change. • Indepndently carry out compartive and fair testing involving observation over time.	

Key Vocabulary		absorbent bendy bright cardboard dull floppy freeze float glass hard material melt metal object paper plastic pull push rigid rock rough see-through shiny sink smooth soft squashy stiff stretchy strong water waterproof weak wood	absorb absorbent bend brick buoyancy characteristic elastic flexible function liquid man-made natural opaque pressure property purpose reflective rigid solid squash stretch suitable texture translucent transparent twist useful			Bicarbonate burning change combustion conductor conductivity dissolve evaporate filter filtrate hardness insulation insulator irreversible mixture opaque reaction residue	reversible separate sieve soluble solute solution solvent suspension thermal translucent transparent	
Science Capital	Scientists	Ole Kirk Christiansen (Lego)	John Mcaddams			Spencer Silver			
	Careers	• Research scientist • Inventor • Quality manager • Project manager • Analytical scientist • CAD technician • Design engineer • Materials engineer							

	Rocks					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum			• 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.			
Key Substantive Knowledge			• Rocks have different physical properties and can be compared and grouped. • Simple physical properties of some rocks can be related to their formations. • There are igneous and sedimentary rocks. • Fossils are formed when living things are trapped within sedimentary rocks. • Fossils provide evidence that living things have changed over time. • Soil is made from rocks and organic matter.			
Disciplinary Knowledge			• Observing rocks, including those used in buildings and gravestones. • Exploring how and why they might have changed over time. • Using (equipment) a hand lens or microscope to help them. • Identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. • Research and discuss the different kinds of living things whose fossils are found in sedimentary rock. • Compare different soils and fossils by identifying similarities and differences between them. • Investigate what happens when rocks are rubbed together (classify according to hardness) or what changes occur when they are in water. • Raise and answer questions about the way soils are formed.			

Key Vocabulary				absorb appearance boulder chalk characteristics clay cobble crystals formed fossil grains granite granule	hard igneous impermeable lava layers limestone magma marble metamorphic mineral organic particles peat pebble permeable	porous properties quartz rock sand sandstone sedimentary silt slate soft soil stone surface texture trapped			
Science Capital	Scientists			Mary Anning					
	Carrers			• Research scientist • Inventor • Quality manager • Project manager • Analytical scientist • CAD technician • Design engineer • Materials engineer.					

	States of Matter					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum				• 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.		
Key Substantive Knowledge				• Solids, liquids and gases are described by observable properties. • Materials can be divided into solids, liquids and gases. • Materials change state when heated or cooled. • Heating causes solids to melt into liquids and liquids evaporate into gases. • Cooling causes gases to condense into liquids and liquids to freeze into solids. • The temperature at which given substances change state are always the same. • Measuring temperature change is recorded using degrees Celsius (°C). • Evaporation and condensation are key parts of the water cycle. • Evaporation is associated with temperature.		
Disciplinary Knowledge				• Grouping and classifying a variety of different materials. • Exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party). • Researching the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. • Observing and recording evaporation over a period of time, such as a puddle in the playground or washing on a line. • Investigating the effect of temperature on washing drying or snowmen melting. • Using data logging equipment to detect/measure and compare temperatures.		

Key Vocabulary					boiling point Celsius condensation cool degree evaporation freezing point	gas gaseous heat liquid melting point molecules oxygen	precipitation rate solid solidify state waste water cycle water vapour	
Science Capital	Scientists				Antoine Lavoisier & Joseph Priestley (Oxygen)			
	Careers	• Research scientist • Inventor • Quality manager • Project manager • Analytical scientist • CAD technician • Design engineer Materials engineer.						

	Seasonal Changes					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum	• Observe changes across the four seasons. • Observe and describe weather associated with the seasons and how day length varies.					
Key Substantive Knowledge	• The sun appears to move during the day, creating sunrise and sunset. • There are four seasons (autumn, winter, spring, summer). • Each season is different. The weather, temperature and number of daylight hours changes with each season. • As the seasons change the weather and the length of the day changes.					
Disciplinary Knowledge	• Observe changes over time. • Compare and contrast each season. • Recording data in tables and charts about the weather. • Making displays of what happens in the world around them, including day length, as the seasons change. • Using data logging equipment to record temperatures. • Using a rain gauge to investigate the amount of rainfall. • Create a chart to record the daylight hours.					

Key Vocabulary		autumn bright cloud cold dark darkness day daily dim frost hot ice length light mist month monthly moon movement rain rain gauge rainbow seasons shadow snow spring summer sun sunlight weather week wind windsock wind vane winter year MONTHS					
Science Capital	Scientists	Chester Greenwood (Earmuffs) Christopher Wren & Robert Hooke (Rain Gauge) James Blyth (Wind Turbine)					
	Careers	• Meteorologist • Climatologist • Environmental scientist					

	Electricity					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum				• 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.		• 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.
Key Substantive Knowledge				• Common appliances run on electricity. • A source of electricity (mains of battery) is needed for electrical devices to work. • Electricity sources push electricity round a circuit. • More batteries will push the electricity round the circuit faster. • Devices work harder when more electricity goes through them. • A complete circuit is needed for electricity to flow and devices to work. • A 'simple series' electrical circuit has basic parts: cells, wires, bulbs, switches and buzzers. • A lamp can be turned on and off in a complete loop with a battery in a 'simple series' circuit. • A switch is used to open and close a circuit. • A lamp can be turned on and off using a switch in a 'simple series' circuit. • Some materials allow electricity to flow easily and these are called conductors. • Materials that don't allow electricity to flow easily are called insulators.		• Electricity is generated (made) and can be transported and used. • There are renewable sources of electricity generation – wind turbines, solar panels, hydro-electric power. • Electricity needs a circuit in order to flow. • There are universally agreed electrical symbols. • Circuit diagrams can be drawn to show when a circuit works and when a circuit does not work, showing why. • The brightness of a lamp or the volume of a buzzer can be associated with the voltage of cells in a circuit. • Components in a circuit can be used purposefully for everyday life. •
Disciplinary Knowledge				• Observing/noticing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit. • Drawing a labelled diagram of s 'simple series' circuit. • Creating a 'simple series' circuit using the correct equipment. • Investigate which materials are conductors and which are insulators. • Record data using appropriate charts/graphs.		• Idenitfy patterns in the relationship between voltage and output in a circuit. • Idendify and lable circuit. • Carry out comparative and fair testing. • Draw conclusions from data and observations, use evidence to justify ideas, use scientifc knowledge and understanding to explain findings.

Key Vocabulary				alligator clip appliances battery bulb buzzer cell circuit close circuit complete circuit components	conductor connection crocodile clip device electrical electricity insulator loop motor	negative open circuit positive resister series switch symbol wire MATERIALS		brightness conductivity copper wire current dimmer switch fuse generator loudness	parallel circuits power position resistance series circuits socket symbols terminal volts voltage volume
				Thomas Edison and Lewis Latimer (Lightbulb)				Benjamin Franklin – discovery of electricity	
Science Capital	• Electrical scientist • Cardiovascular Technologists and Technicians • Acoustic consultant. • Aerospace engineer. • Broadcast engineer. • CAD technician. • Control and instrumentation engineer. • Design engineer. • Electrical engineer. Electronics engineer.								

	Sound					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum				• 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.		
Key Substantive Knowledge				• Sound travels from its source in all directions and we hear it when it travels to our ears. • Sound travel can be blocked. • Sound spreads out as it travels. • Sound is produced when an object vibrates. • Changing the shape, size and material of an object will change the sound it produces. • Sound moves through all materials by making them vibrate. • Sound vibrations travel through a medium to the ear. • Changing the way an object vibrates changes its sound. • Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds. • Faster vibrations (higher frequencies) produce higher pitched sounds.		
Disciplinary Knowledge				• Finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. • Investigate which materials provides the best insulation against sound. • Create and play their own instruments by using what they have found out about pitch and volume. • Using data logging equipment to detect/measure and compare sounds.		

Key Vocabulary				amplitude auditory decibel dynamic echo frequency instruments insulation muffle mute noise pitch pollution sound source sound wave soundproof tone tuning fork vibrate vibration volume		
Common Misconceptions				Pitch and volume are frequently confused, as both can be described as high or low. 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 load and low sounds are quiet.		
Possible Application of Knowledge and Skills				• Classify sound sources. • Explore making sounds with a range of objects, such as musical instruments and other household objects. • Explore how string telephones or ear gongs work. • Explore altering the pitch or volume of objects, such as the length of a guitar string, amount of water in bottles, size of tuning forks. • Measure sounds over different distances. • Measure sounds through different insulation materials.		

Assessment Opportunities					Pupils: • Can name sound sources and state that sounds are produced by the vibration of the object • Can state that sounds travel through different mediums such as air, water, metal • Can give examples to demonstrate how the pitch of a sound are linked to the features of the object that produced it • Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder • Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases • Can explain what happens when you strike a drum or pluck a string and use a diagram to show how sounds travel from an object to the ear • Can demonstrate how to increase or decrease pitch and volume using musical instruments or other objects • Can use data to identify patterns in pitch and volume • Can explain how loudness can be reduced by moving further from the sound source or by using a sound insulating medium		
Science Capital	Scientists				Alexander Graham Bell (Telephone)		
	Careers				• Audiologist • Acoustic scientist • Acoustic engineer • Sound technician • Music scientist		

	Light					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum			• 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 a solid object. • Find patterns in the way that the size of shadows change.			• 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.
Key Substantive Knowledge			• Light is required to see things and darkness is when light is absent. • Transparent materials let light through them and opaque materials don't let light through. • Beams of light bounce off some materials and this is called reflection. • Shiny materials reflect light beams better than non-shiny materials. • A source of light is something that makes its own light. • Examples of light sources are: the Sun, stars, fire, electric lights, fireflies and glow-worms. • Light travels directly from a light source into your eyes. • Looking at the sun can be dangerous and eye protection is needed. • Shadows are formed when the light from a light source is blocked by a solid object. • Shadow sizes vary depending on the position of a light source.			• There are natural sources of light. • There are man-made sources of light. • Light travels from a source. • Light is relfected off objects. • Light can be refracted. • Light travels into our eyes. • Light appears to travel in straight lines. • Shadows can be formed and change size. • Using a prism, we can split white light into the colours of the rainbow, known as the spectrum.

Disciplinary Knowledge			• Investigate what happens to shadows when the light source moves or the distance between the light source and the object changes, looking for patterns and observing closely. • Investigate the best material to make a shadow puppet. • Record how shadows change throughout the day. • Explore how mirrors reflect light.			• Set up and carry out reliable and accurate scienfitic investigations. • Make and explan predictions. • Make and record accurate observations and conclusions. • Use scientific language to explain their findings. • Be able to ask and answer questions based on their • learning using scientific language.
Key Vocabulary			absence absorb block crescent moon dangerous dark emit gibbous moon kaleidoscope lens light light beam light source light wave matt mirror new moon opaque phases prism protect quarter moon reflect solar system solid source spectrum speed of light sundial translucent transparent wane wax			concave convex cornea iris lens optics pupil rays refraction retina
Science Capital Scientists			Arthur Wilson (Car Mirrors)			Isaac Newton – work on the spectrum

	Careers			• Optical scientist • Camera Design Researcher • Laser physicist

	Forces and Magnets					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum			• 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.		• 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.	
Key Substantive Knowledge			• Objects move differently depending on the surface. • Forces can act upon each other when contact is made between them. • Pushing and pulling can make things move faster or slower or stop them from moving. • Larger masses take a large force (pushes and pulls) to move or stop them. • Pushing and pulling can change the shape of things. • Large forces have bigger effects. • Magnets have two 'poles' – North and South. • Magnets exert attractive and repulsive forces on each other. • Magnets exert non-contact forces, which work through some materials. • Magnets exert attractive forces on some materials. • Magnet forces are affected by magnet strength, object mass, distance from object and object material. • Everyday materials can be grouped and compared depending on their attraction to a magnet or not. Not all materials are magnetic.		• Water resistance and air resistance are forms of friction. • Friction is sometimes helpful and sometimes unhelpful. • Air resistance is helpful as it stops the skydiver hitting the ground at high speed. • However, friction on a bike chain can make the bike harder to pedal so it is unhelpful. •	

Disciplinary Knowledge			• Comparing how different things move and grouping them. • Raising questions and carrying out tests to find out how far things move on different surfaces. • Gathering and recording data to find answers to their questions. • Exploring the strengths of different magnets and finding a fair way to compare them. • Sorting materials into those that are magnetic and those that are not. • Looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another. • Identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets.		• We will conduct investigations to compare how friction, water resistance and air resistance acts differently on different objects. • We will be conducting a series of enquiries to discover more about the workings of gravity, air resistance, water resistance, friction, gears and pulleys. • We will be considering our independent, dependent and control variables when conducting our various scientific investigations. • Seek patterns between the weight and mass of an object.	
Key Vocabulary			aluminium attract bar magnet brass button magnet contact copper distance force force-meter friction horse-shoe iron magnet magnetic Newton meter nickel non-magnetic North pole pull push repel ring magnet South pole spring steel streamlined strength surface twist		air resistance cams drag Earth forces gears gravity levers mechanisms parachute pulleys surface resistance transference water resistance	
Science Capital – Scientists			William Gilbert (Theory of Magnetism)		Issac Newton – Gravity	

	Careers	• Geomagnetist • Magnetic engineer • Electromagnetic engineer • Radiologist

	Earth and Space					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum					• Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. • 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.	
Key Substantive Knowledge					• It appears to us that the sun moves across the sky during the day. However, the Sun does not move at all. It just seems to us that • the Sun moves because of the movements of the Earth. • It takes a little more than 365 days to orbit the Sun. 365.25 to be exact (which is why we get a leap year every 4 years!) • My (Mercury) Very (Venus) Excellent (Earth) Mom (Mars) Just (Jupiter) Served (Saturn) Us (Uranus) Noodles (Neptune). This is a mnemonic for remembering the order of the planets! • A celestial body is a natural object that exists outside the Earth's atmosphere. • We split the globe into time zones using imaginary lines called meridians. • Asteroid is a small, rocky bodies that orbit, or travel around, the sun. • A Galaxy is a group of stars, clouds of gas, and dust particles that move together through the universe.	
Disciplinary Knowledge					• Make first-hand observations of how shadows caused by the Sun change through the day. • Measure our shadows from the beginning of the school day until the end. • Report and present findings from enquiries. • Place the planets in the solar system in the correct order. • Write a conclusions which explains findings.	

Key Vocabulary						asteroid axis/axes celestial body comet elliptical orbit equator galaxy hemisphere Jupiter latitude light year longitude Mars Mercury meteor	meteorite Neptune orbit Pluto prime Meridian revolve rotation Saturn sphere spherical spin time zone Uranus Venus	
Science Capital	Scientists					Nicolaus Copernicus (1473-1543) Galileo Galilei (1564-1642)		
	Careers	• Aerospace technician • Avionics technician • Satellite technician • Mechanical engineer • Atmospheric scientist • Aerospace engineer • Astronomer						

	Evolution and Inheritance					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
National Curriculum						• 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.
Key Substantive Knowledge						• Living things have changed over time. • Fossils provide information about living things that inhabited the earth millions of years ago. • Animals and plants have adapted to suit their environment. • Adapting can happen in different ways and adaptation may lead to evolution. • Living things produce offspring of the same kind. • Normally offspring vary and are not identical to their parents. • Scientific ideas have changed over time. • There are positive and negative effects of science development and which parts of our lives rely on science.
Disciplinary Knowledge						• Investigate in our own environments the habitats that animals and plants find best in which to thrive. • Classify living things along with their habitats and adaptive traits. • Make comparisons between modern humans and those of sane genus and family. • Plan and carry out scientific investigation, making predictions and conclusions beased upon scienfific knowledge and findings.
Key Vocabulary						adaptation chromosomes competition DNA dominant genes environment evolution evolutionary change fossil records genes identical inherit inheritance natural selection offspring recessive genes sexual reproduction species survival of the fittest vary

Science Capital	Scientists						Charles Darwin – evolution work
	Careers	• Palaeontologist • Botanist • Palaeoanthropologist • Geneticist • Ecologist • Evolutionary Biologist • Biologist.					