

Laithe's Primary School

Science Progression and Assessment Guidelines

Science Intent

At Laithe's Primary School, we aim to encourage and develop pupils' curiosity and desire to understand the world around them. Using the methods of scientific enquiry, children will build on a foundation of observation and discussion; as they progress through school they will carry this knowledge on by conducting simple experiments where they will develop their scientific vocabulary, culminating in exploring complex scientific principles, planning out and representing investigative experiments built on the fundamentals learnt throughout their journey through school. Science will be taught as a separate lesson but it will be linked to class Topic work where appropriate to provide children with the opportunity to explore new learning in depth. Science will be promoted throughout school through the 'Science ambassador' role, where KS2 children will showcase different scientific ideas through simple experiments and demonstrations to other children throughout school. We will also have a dedicated science day where children will have the opportunity to develop their scientific curiosity.

The document is set out as a table. The left hand column gives the statutory requirement (objective), by year group, laid down in the programme of study. This column is colour-coded; linked to the different areas of study within the curriculum (see below). The next column expands on these requirements and provides suggestions for possible activities or investigations; explains the objective in more detail; or states pupil's desired knowledge and understanding in relation to the objective. Essential Vocabulary is included for teaching directly and for display on the working wall. Vocabulary related to Scientific Enquiry should be embedded and used throughout each area of study. The middle columns offer a benchmark for assessing children as Secure and Exceeding; by providing teachers with examples of possible success criteria statements related to the relevant Curriculum objective. The right hand column provides ideas that have been designed to support teachers who are unsure about new subject content. The column provides ideas to: aid planning with regard to challenge, develop progression and further discussion within lessons, and assessment for learning within investigations.

Colour										
Area of study	Plants	Animals and Humans	Living things	Materials (Inc. rocks and states of matter)	Movement, Forces and Magnets	Electricity	Sound and hearing	Light and seeing	Earth and Space	Evolution and inheritance

Developing, Secure, Exceeding explained:

Depth of Learning	Cognitive challenge	Nature of progress	Typically, pupils will	Predominant teaching style
Developing	Low level cognitive demand. Involves following instructions.	Acquiring	name, describe, follow instructions or methods, complete tasks, recall information, ask basic questions, use, match, report, measure, list, illustrate, label, recognise, tell, repeat, arrange, define, memorise.	Modelling Explaining
Secure	Higher level of cognitive demand. Involves mental processing beyond recall. Requires some degree of decision making.	Practising	apply skills to solve problems, explain methods, classify, infer, categorise, identify patterns, organise, modify, predict, interpret, summarise, make observations, estimate, compare.	Reminding Guiding
Exceeding	Cognitive demands are complex and abstract. Involves problems with multi-steps or more than one possible answer.	Deepening Understanding	Requires justification of answers. solve non-routine problems, appraise, explain concepts, hypothesise, investigate, cite evidence, design, create, prove.	Coaching Mentoring

Foundation Stage

Area for Learning:	The Natural World ELG	How to support learning	Development Matters Understanding the World	Vocabulary	Planned opportunities
Understand ing the World	<p>Children at the expected level of development will: -Explore the natural world around them, making observations and drawing pictures of animals and plants; -Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class; - Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.</p>	<ul style="list-style-type: none"> • Make use of outdoor areas to give opportunities for investigations of the natural world, for example, provide chimes, streamers, windmills and bubbles to investigate the effects of wind. • Provide interesting natural environments for children to explore freely outdoors. • Make collections of natural materials to investigate and talk about • Encourage positive interaction with the outside world, offering children a chance to take supported risks, appropriate to themselves and the environment within which they are in • Provide story and information books about places, such as a zoo or the beach, to remind children of visits to real places. • Provide equipment to support these investigations. Suggestions: magnifying glasses or a tablet with a magnifying app. • Arouse awareness of features of the environment in the setting and immediate local area, e.g. make visits to shops or a park. • Use the local area for exploring both the built and the natural environment. • Provide children with have frequent opportunities for outdoor play and exploration. • Encourage interactions with the outdoors to foster curiosity and give children freedom to touch, smell and hear the natural world around them during hands-on experiences. • Create opportunities to discuss how we care for the natural world around us. • Offer opportunities to sing songs and join in with rhymes and poems about the natural world. • After close observation, draw pictures of the natural world, including animals and plants. • Observe and interact with natural processes, such as ice melting, a sound causing a vibration, light travelling through transparent material, an object casting a shadow, a magnet attracting an object and a boat floating on water. • Guide children’s understanding by draw children’s attention to the weather and seasonal features. Provide opportunities for children to note and record the weather. Select texts to share with the children about the changing seasons. Throughout the year, take children outside to observe the natural world and encourage children to observe how animals behave differently as the seasons change. Look for children incorporating their understanding of the seasons and weather in their play. • Pose carefully framed open-ended questions, such as “How can we...?” or “What would happen if...?”. • Give opportunities to record findings by, e.g. drawing, writing, making a model or photographing. • Help children to notice and discuss patterns around them, e.g. rubbings from grates, covers, or bricks. • Use correct terms so that, e.g. children will enjoy naming a chrysalis if the practitioner uses its correct name. • Plant seeds and bulbs so children observe growth and decay over time• observe an apple core going brown and mouldy over time• help children to care for animals and take part in first-hand scientific explorations of animal life cycles, such as caterpillars or chick eggs. • Encourage the use of words that help children to express opinions, e.g. ‘busy’, ‘quiet’ and ‘pollution’. 	<p style="text-align: center;"><u>Birth to 3</u></p> <p>Explore materials with different properties.</p> <ul style="list-style-type: none"> • Explore natural materials, indoors and outside. • Explore and respond to different natural phenomena in their setting and on trips. <p style="text-align: center;"><u>Three and Four Year Olds</u></p> <p>Use all their senses in hands-on exploration of natural materials.</p> <ul style="list-style-type: none"> • Explore collections of materials with similar and/or different properties. • Talk about what they see, using a wide vocabulary. • Explore how things work. • Plant seeds and care for growing plants. • Understand the key features of the life cycle of a plant and an animal. • Begin to understand the need to respect and care for the natural environment and all living things. • Explore and talk about different forces they can feel. • Talk about the differences between materials and changes they notice. <p style="text-align: center;"><u>Children in Reception</u></p> <ul style="list-style-type: none"> • Explore the natural world around them. • Describe what they see, hear and feel whilst outside. • Recognise some environments that are different to the one in which they live. • Understand the effect of changing seasons on the natural world around them. 	<p>Talk about what they see, using a wide vocabulary.</p> <p>Introduce vocabulary to enable children to talk about their observations and to ask questions.</p> <p>Encourage focused observation of the natural world.</p> <p>Listen to children describing and commenting on things they have seen whilst outside, including plants and animals.</p> <p>Name and describe some plants and animals children are likely to see, encouraging children to recognise familiar plants and animals whilst outside.</p> <p>Encourage children to use it in their discussions, as they care for living things</p> <p>Plan and introduce new vocabulary related to the exploration and encourage children to use it.</p>	<p>Fruit/Vegetable Tasting – Children talk about some of the things they have observed such as plants, animals, natural and found objects. Children explore the natural world around them. Fruit, vegetable, taste, healthy.</p> <p>Welly Wednesday (Clay Faces) – Children describe what they see, hear and feel whilst outside. Children understand the effect of changing seasons on the natural world around them. See, hear, feel, eyes, nose, mouth, ears, hair, face.</p> <p>Welly Wednesday (Stick Man) – Children describe what they see, hear and feel whilst outside. Children understand the effect of changing seasons on the natural world around them. Hot, cold, sunny, windy, rainy.</p> <p>Welly Wednesday (Bird Feeders) – Children look closely at similarities, differences, patterns and change. same, different. Bird, animal, food, wing, beak, feathers.</p> <p>Home & Habitats – Children talk about similarities and differences in relation to places and living things. Children talk about features of their own immediate environments and how they might vary from one another. House, same, different.</p> <p>Eggucation (the lifecycle of a chicken) – Children make observations and explain why some things occur, and talk about changes. Food, grow, change, hatch, chick, egg.</p> <p>Welly Wednesday (Bug House) – Children look closely at similarities, differences, patterns and change. Grow, bug, woodlouse, ladybird, spider, bee, worm.</p> <p>Welly Wednesday (Planting) - Children understand some important processes and changes in the natural world. Plant, leaf, flower, grow, water, sunlight, soil.</p> <p>Lifecycle of Butterflies - Children make observations about what they have seen. Children understand some important processes and changes in the natural world. Caterpillar, chrysalis, butterfly, cocoon, hatch, change.</p> <p>Cars down a ramp (pushing and pulling) - Children talk about some of the things they have observed such as plants, animals, natural and found objects. Children explore the natural world around them. Push, pull, far, long.</p> <p>Cooking (making soup)/ baking/ making hot chocolate – Children talk about why things happen and how things work. Change, hot, cold, soft, hard, texture.</p> <p>Egg and Cress Sandwiches – Children make observations about what they have seen. Children understand some important processes and changes in the natural world. Grow, cress, egg, texture.</p>

		<ul style="list-style-type: none"> • Provide opportunities to observe things closely through a variety of means, including magnifiers and photographs • Examine change over time, for example, growing plants, and change that may be reversed, e.g. melting ice. • Give opportunities to design practical, attractive environments, for example, taking care of the flowerbeds or organising equipment outdoors. • Provide mechanical equipment for children to play with and investigate. Suggestions: wind-up toys, pulleys, sets of cogs with pegs and boards. • Show and explain the concepts of growth, change and decay with natural materials. • how the water pushes up when they try to push a plastic boat under it• how they can stretch elastic, snap a twig, but cannot bend a metal rod• magnetic attraction and repulsion • Teach skills and knowledge in the context of practical activities, e.g. learning about the characteristics of liquids and solids by involving children in melting chocolate or cooking eggs. • Pose carefully framed open-ended questions, such as “How can we...?” or “What would happen if...?”. • Provide children with opportunities to change materials from one state to another. • Cooking – combining different ingredients, and then cooling or heating (cooking) them• melting – leave ice cubes out in the sun, see what happens when you shake salt onto them (children should not touch to avoid danger of frostbite)Explore how different materials sink and float • Explore how you can shine light through some materials, but not others. Investigate shadows. 			
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Key Stage 1, Year 1

National Curriculum for Science Learning Objective	Description	Vocabulary	Secure	Exceeding	Possible investigation/tasks for <u>progression</u> and further discussion
Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees	Working scientifically to identify and classify, pupils can identify plants in the school’s locality: e.g. daffodils, poppies, dandelions, sunflowers, snowdrops, beans, carrots, tomatoes, strawberries, mint. Identify trees: e.g. oak, ash, horse chestnut, sycamore, fruit tree, spruce, pine, conifer, holly, blackberry or hawthorn. (AP13)	names of locally found wild plants names of locally found garden plants names of locally found flowering plants names of locally found trees names of flowers grown names of vegetables grown e.g. daffodils, poppies, dandelions, sunflowers, snowdrops, beans, carrots, tomatoes, strawberries, mint.	Generally, a variety of common plants and trees and those classified as deciduous and evergreen are identified and named.	Without support, a variety of common plants and trees, and those classified as deciduous and evergreen, are identified and named.	<ul style="list-style-type: none"> •Pupils can name a limited number of plants with prompting. • Pupils can name up to 10 common plants and/or trees with little prompting, ask simple questions and recognise that they can be answered in different ways e.g. Daffodils can be identified as tall Spring flowers like tulips or yellow Spring flowers like crocuses. • Pupils can name over 10 common plants and trees with confidence and certainty gathering and recording data to help in answering simple questions. E.g. which flowers or trees would you expect to see in Spring?

		<p>Identify trees: e.g. oak, ash, horse chestnut, sycamore, fruit tree, spruce, pine, conifer, holly, blackberry or hawthorn. (AP13)</p> <p>Adult vocabulary wild plant garden plants flowering plants deciduous and evergreen</p>			
Identify and describe the basic structure of a variety of common flowering plants, including trees	<p>Working scientifically by observing closely pupils can identify a plant's: Leaves, flowers, petals, fruit, roots, seed, stem and a tree's blossom, leaves, fruit, roots, buds, trunk, branches, twigs seeds.</p> <p>Plants: daffodils, sunflowers Trees: oak, ash. (AP13)</p>	<p>leaf/leaves flower blossom petal fruit berry root bulb seed trunk branch stem bark stalk vegetable</p>	The basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers, are identified and described.	The basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers, is identified and described independently.	<ul style="list-style-type: none"> • Pupils can name some plant/tree parts with prompting. • Pupils can name most plant/tree plants by selecting correct labels to pictures answering simple questions. • Pupils can name all common plants and trees via verbal or written labelling of pictures and diagrams: asking simple questions and suggesting labels for tricky examples such as mushrooms, grasses or cacti. • Using their (pupils) observations and ideas to relate parts of plants to food stuffs: e.g. roots- potatoes and carrots; stems-rhubarb or celery; leaves- cabbage or lettuce; flowers –broccoli or cauliflower; fruits and nuts.
Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.	<p>Working scientifically pupils can identify and classify , across a range of contexts and opportunities, common animals seen in school, at home, on television, on holiday or at garden centre, wood or zoo e.g.</p>	<p>wild animals pets Food fish, Fish, Amphibians, Birds, Mammals (including Humans), Farm animals, Pet animals, Woodland animals</p> <p>e.g. deer, cow, sheep, dog, cat, golf fish, frog, chicken, crow, pidgeon, human (AP 13)</p>	<p>Generally, some common animals that are birds, fish, amphibians, reptiles, mammals and invertebrates are identified and named.</p> <p>Generally, living things can be sorted into groups with justification as to why they have been placed into these groups.</p>	<p>Common, and some exotic, animals are named and classified as birds, fish, amphibians, reptiles, mammals and invertebrates independently.</p>	<ul style="list-style-type: none"> • Pupils can identify and classify a limited number of animals with prompting. • Pupils can identify and classify up to 20 animals with prompting. • Pupils can identify and classify over 20 animals with confidence and certainty.
Identify and name a variety of common animals that are carnivores, herbivores and omnivores	<p>Working scientifically pupils can identify, across a range of contexts and opportunities, using their observations and ideas to suggest what animals eat: Carnivores- meat eaters- tiger, wolf, orca, eagle, hawk. Herbivores-plant eaters- rabbit, zebra, sheep, cow. Omnivores-plant and meat eaters- Human, bear, badger, ape.</p>	<p>names of common animals (that eat other animals/ eat plants) names of common animals (that eat plants and animals) Adult Vocabulary Fish amphibians reptiles birds mammals Carnivores herbivores omnivores Carnivores- meat eaters- tiger, wolf, orca, eagle, hawk. Herbivores-plant eaters- rabbit, zebra, sheep, cow. Omnivores-plant and meat eaters- Human, bear, badger, ape. (AP 13)</p>	A variety of common animals that are carnivores, herbivores and omnivores are identified and named.	A variety of common animals that are carnivores, herbivores and omnivores are independently and confidently identified and named	<ul style="list-style-type: none"> • Pupils can describe the different types of things that animals eat and give an example of a meat-eater, a plant eater and a plant and meat eater. • Pupils can group common animals into groups by what they eat e.g. all cats are carnivores. • Pupils can accurately ascribe the terms carnivore, omnivore or herbivore to most animals.
Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)	<p>Working scientifically by closely observing, pupils can describe the main structural characteristics of common animals and suggest differences and similarities.</p>	<p>tail wing claw fin scales feathers fur beak senses hear/hearing see/seeing touch/touching smell/smelling taste/tasting</p>	<p>Generally, the structure of a variety of common animals, e.g. spine, tail, fur, wings, is described. These structures can then be compared.</p>	The structure of a variety of common animals is described independently. These structures are then compared and reasons for their differences are suggested	<ul style="list-style-type: none"> • Pupils can describe all common chordate animals as having an internal skeleton of bones covered by flesh with visible sense organs, eyes, ears, nose, tongue etc. • Pupils can correctly describe mammals and birds as warm blooded covered with fur and feathers, and fish, reptiles and amphibians as cold blooded; fish as having scales, reptiles and amphibian as having rough or smooth skin. • Using their observations pupils can describe most mammals, reptiles and amphibian as having four limbs (arms and legs or flippers) and suggest examples of those that do not obviously show these e.g. whales, dolphins, snakes or slow worms.
Identify, name, draw and label the basic parts of the	<p>Pupils can identify their: head, neck, shoulders, arms, elbows, wrist, fingers, chest, abdomen, legs, thighs, knees, shins, feet, toes.</p>	<p>body head neck arms elbows legs knees face ears eyes eyebrows eyelashes nose hair mouth teeth tongue feet</p>	<p>The basic parts of the human body are identified, named, drawn and labelled.</p> <p>The part of the body associated with each sense is identified.</p>	<p>Parts of the human body are identified, named, drawn and labelled independently.</p> <p>The part of the body associated with each sense is identified.</p>	<ul style="list-style-type: none"> • Pupils can identify body parts with prompting. • Pupils can identify most body parts by selecting correct labels to pictures etc. • Pupils can identify all body parts accurately drawing and labelling pictures and/or diagrams associating the correct parts with one (or more) of the five senses.

human body and say which part of the body is associated with each sense	Pupils can associate the body part with one of the senses i.e. tongue-taste, nose-smell, ears-hearing, eyes-sight, skin-touch.	toes fingers nails ankle calf thigh hips waist trunk chest shoulders back hands wrist			
Observe changes across the four seasons (Expectation to revisit across academic year)	Working scientifically pupils make on-going observations, perform simple tests, take measurements, gather and record data, across the year, relating to weather, environmental changes (e.g. plant or animal activity), or temperature.	season spring summer autumn winter weather hot/warm cool/cold sun/sunny cloud/cloudy wind/windy rain/rainy snow/snowing hail/hailing sleet frost fog/mist ice/icy rainbow thunder lightning storm light/dark day/night	Changes across the four seasons are observed and discussed.	The changes across the four seasons are observed and discussed independently, and a clear explanation can be given as to how the four seasons in the UK occur.	<ul style="list-style-type: none"> • Pupils can identify general seasonal change as trends across the year. And can identify general characteristics of the seasons e.g. winter being cold or summer being hot. • Pupils can describe the changing seasons with a number of indicators e.g. We make snowmen in winter or we play cricket in summer. • Pupils can associate the changing seasons with a number of indicators to animal and plant behaviour. e.g. leaves fall off deciduous trees in autumn, hedgehogs hibernate in the winter etc.
Observe and describe Weather associated with the seasons and how day length varies. (Expectation to revisit across academic year)	Working scientifically pupils make on-going observations, perform simple tests, take measurements, gather and record data, across the year, relating to weather, environmental changes (e.g. plant or animal activity), or temperature.	questions answers equipment gather measure record sort group test explore observe compare describe similar/similarities different/differences	Generally, the weather associated with the seasons and the variation in day length is observed and described.	Without support, the weather associated with the seasons and the variation in day length is observed and described	<ul style="list-style-type: none"> • Pupils can name the four seasons as Spring, Summer, Autumn and Winter. And can identify general characteristics of the seasons e.g. winter being cold or summer being hot. • Pupils can relate the weather typically associated with each season across a year. e.g. winter snow and frost, spring showers, warm summer sun, autumn rain and winds. Describe winter days as short and summer days as long. • Pupils can give a numerical equivalence to the temperature of the seasons. e.g. using the rhyme "5, 10, 21- winter, spring and summer sun". Explain how the daylight hours vary between mid-winter and mid-summer. Pupils describe appropriate clothing for the season.
Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock	Working scientifically pupils can identify and classify materials in school at home or in the school's locality e.g. wood, plastic, glass, metal, water and rock.	wood, plastic, glass, metal, water and rock.	Generally, a variety of everyday materials are identified and named.	A variety of materials are independently named, identified and compared.	<ul style="list-style-type: none"> • Pupils can identify a limited number of materials with prompting. • Pupils can identify up to 6 materials with prompting questions. • Pupils can identify over 6 materials with confidence and certainty
Describe the simple physical properties of a variety of everyday materials	Working scientifically using their observations, pupils can describe materials in school at home or in the school's locality as being: hard/ soft, stretchy or stiff, shiny/ dull; rough/ smooth; bendy or stiff; waterproof/ non waterproof; absorbent/ non-absorbent; opaque/see-through.	object material wood plastic glass metal water rock brick paper fabrics elastic foil card/cardboard rubber wool clay hard soft stretchy stiff bendy/floppy waterproof absorbent breaks/tears rough smooth shiny dull see through not see through	The simple physical properties, e.g. strength, flexibility and transparency, of a variety of everyday materials are described.	The simple physical properties of a variety of everyday materials are described. More complex physical properties of a variety of materials, e.g. waterproof, rigid, magnetic, hard, conductor, insulator, absorbent, are beginning to be described.	<ul style="list-style-type: none"> • Pupils can describe at least one physical property of a limited number of materials with prompting e.g. metals are heavy. • Pupils can describe some physical properties of a limited number of materials e.g. metals are heavy, wood floats, plastic is bendy; gathering and recording data to help in answering questions. • Pupils can identify the physical properties of a wide range of materials
Compare and group together a variety of everyday materials on the basis of their simple physical properties	Working scientifically to identify and classify, perform simple tests and gather and record data, pupils can give reasons why materials are the same or different.	observe compare describe similar/similarities different/differences	Generally, a variety of everyday materials are grouped and compared on the basis of their simple physical properties, using appropriate vocabulary.	Without support, a variety of everyday materials are grouped and compared on the basis of their simple physical properties.	<ul style="list-style-type: none"> • Pupils can group together similar materials e.g. various different objects all made of metals. • Pupils sort a range of materials into groups with prompting questions. • Pupils sort a range of materials accurately and consistently into groups explaining their reasoning.
Distinguish between an object and the material from which it is made	Working scientifically using their observations and ideas pupils can name a number common objects found in home or school and suggest what material each is made from.		Generally, there is an ability to distinguish between an object and the material from which it is made, with some corrections if needed.	There is an ability independently to distinguish between an object and the material from which it is made.	<ul style="list-style-type: none"> • Identify simple objects made of one material e.g. a ruler as being made of wood or plastic. • Make the distinction between the object and the material it is made from e.g. a drinking glass or a plastic beaker. • Can identify combination materials with confidence e.g. a wooden handle on a metal saucepan.

Key Stage 1, Year 2

National Curriculum for Science Learning Objective	Description	Vocabulary	Secure	Exceeding	Possible investigation/tasks for <u>progression</u> and further discussion
Explore and compare the differences between things that are living, dead, and things that have never been alive.	Asking simple questions and recognising that they can be answered in different ways pupils can explain that living things undertake all of these processes; grow, move, reproduce, sense, use nutrition (have a source of energy for food), excrete waste products, respire. Pupils understand that dead things used to undertake all of these processes. Pupils understand that things that have never been alive do not and have not ever undertaken all of these processes.	living dead never been alive move grow feed have offspring/ young/ babies adult vocabulary life processes reproduce	Generally, the differences between things that are living, that are dead and that have never been alive are explored and compared.	The differences between things that are living, that are dead and that have never been alive are explored and compared.	<ul style="list-style-type: none"> • Pupils can identify and classify some things that are living, dead and have never been alive and can identify one of the processes used to inform their sorting with prompting questions. • Pupils can identify and classify some things that are living, dead and have never been alive and can identify two or three of the processes used to inform their sorting with prompting questions. • Pupils sort things that are living, dead and have never been alive accurately and consistently into groups explaining their reasoning by referring to more than three of the processes used to inform their sorting.
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	Using their observations and ideas to suggest answers to questions pupils can explain that a habitat is a natural environment or home of a number of different plants and animals and can give examples of some habitats. Pupils describe the features of different habitats and explain how those features provide for the basic needs of different animals and plants, including needs for appropriate nutrition and shelter e.g. habitats within the school grounds, woodland, seashore, oceans, rainforest. Pupils explain how animals are suited to their habitat, e.g. a camel is adapted to be able to survive for long periods without drinking; a giraffe is adapted to enable it to reach the leaves of trees that other herbivores cannot reach; a cactus is adapted to conserve water in a dry habitat.	name local habitats e.g. a pond, a woodland, a meadow seashore ocean rainforest damp/wet/dry dark/light hot/warm/cool/cold use <u>comparatives</u> e.g. hotter suited/suitable basic needs depend shelter	Generally, the fact that most living things live in habitats to which they are suited is identified. Generally, the way in which different habitats provide for the basic needs of different kinds of animals and plants is described, e.g. rainforest, coral reefs and the tundra are all habitats where particular kinds of plants and animals might be found.	The fact that most living things live in habitats to which they are suited is independently identified. Without support, the way in which different habitats provide for the basic needs of different kinds of animals and plants is described, e.g. rainforest, coral reefs and the tundra are all habitats where particular kinds of plants and animals might be found.	<ul style="list-style-type: none"> • Pupils match some animals and plants to their habitats and give some reasons for their matching with prompting questions. • Pupils match a range of animals and plants to the most appropriate habitats and give reasons for their matching with prompting questions. • Pupils explain the relationship between animals and plants living in habitats, giving examples from more than two contrasting habitats.
Identify and name a variety of plants and animals in their habitats, including micro-habitats	Pupils can identify and classify animals and plants living within different habitats and using their observations and ideas explain the relationships between the features of the habitats and the needs of the animals and plants. (Link to physical geography on the location of the Equator and the North and South Poles). Pupils can explain that a micro-habitat is a very small habitat and can give examples of micro-habitats e.g. school pond, wormery, greenhouse, leaf litter. – e.g. lions, penguins, polar bears live in a habitat with sufficient prey, appropriate climate, adequate shelter and opportunities to reproduce. (AP13) – e.g. woodlice live in a micro-habitat with sufficient sources of food, adequate shelter, climate conditions and opportunities to reproduce.	name micro-habitats e.g. under log, on stony path, under bushes Polar bear, penguin, camel, wood lice, worm etc	Generally, plants and animals are identified and named. Animal habitats are identified and described.	Without prompts, a variety of plants and animals are named and described. Animal habitats are identified, described and there is an awareness of why habitats are suitable for an animal.	<ul style="list-style-type: none"> • Pupils sort animals and plants into two contrasting habitats. • Pupils identify the animals and plants which live in two contrasting habitats. • Pupils identify the animals and plants which live a range of contrasting habitats and explain the features of the habitats which meet the needs of those animals and plants.
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	Working scientifically, closely observing and gathering and recording data from secondary sources pupils understand that different animals obtain their food from different sources and that the sources of food can be illustrated by using a food chain. Pupils work backwards from knowledge of what herbivores, carnivores or omnivores eat to understand that plants are at the beginning of food chains. Pupils use their developing understanding of food chains for carnivores, to create and explain a food chain for a school dinner e.g. shepherd's pie, fish fingers, chips and peas.	food food chain meat-eater plant-eater plant and meat eater. adult vocabulary sources of food	Generally, simple food chains are described.	More advanced food chains are described and explained.	<ul style="list-style-type: none"> • From a number of deconstructed food chains pupils can identify that a plant is at the beginning of each. • Draw and label a diagram of a simple food chain for a carnivorous animal and for a human meal. • Draw and label diagrams of food chains using appropriate scientific vocabulary for a human meal and at least two carnivorous animals.
Observe and describe how seeds and bulbs grow into mature plants	Working scientifically observing closely, using simple equipment and performing simple tests pupils plant a variety of seeds and bulbs, including flowering and vegetable seeds, gathering and recording data on how the seeds and bulbs grow into mature plants. Pupils learn that seeds can be	seeds bulbs fully grown water light damp/wet/dry dark/light hot/warm/cool/cold use <u>comparatives</u> e.g. hotter	Generally, observations are made and descriptions are given of how seeds and bulbs grow into mature plants.	Observations are clearly made and detailed descriptions are given of how seeds and bulbs grow into mature plants.	<ul style="list-style-type: none"> • Pupils record their observations of how seeds and bulbs grow through drawings or photographs, matching simple labels to the correct stage of a plant's growth. • Pupils draw and label diagrams to record their observations and record simple measurements of how seeds and bulbs grow.

<p>(Expectation to revisit across academic year)</p>	<p>gathered from some mature plants, e.g. sunflower seeds, tomato seeds, beans, and be replanted to begin the plant lifecycle again.</p>	<p>grow/growth healthy shoot seedling wither/limp die dry/crispy soil earth Adult vocabulary mature plants temperature germinate/germination</p>			<ul style="list-style-type: none"> • Pupils take and record standard measures, to show their understanding of how seeds and bulbs grow. They can explain the lifecycle of a plant they have studied, including the replanting of harvested seeds to grow a new plant.
<p>Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy</p>	<p>Working scientifically using simple equipment and performing simple tests pupils plant seeds and bulbs and plan an investigation to enable them to observe the growth and health of the plants under conditions where the water, light and temperature vary, including gathering and recording data of plant growth. Pupils use what they learn from their observations to plan further investigations to test their emerging understanding of the optimal conditions for plant growth.</p>	<p>questions types of scientific enquiry answer similarities differences changes identify classify sort group order observe changes over time notice patterns link careful accurate observations questions equipment gather measure record</p>	<p>The conditions required for plants to grow and stay healthy (food, water, air, warmth and light) are identified and described.</p>	<p>The conditions required for plants to grow and stay healthy (food, water, air, warmth and light) are identified and described in detail. Explanations are offered for changes in living things, e.g. light or water altering plant growth.</p>	<ul style="list-style-type: none"> • Pupils observe and record through drawings or photographs how different conditions of water, light and temperature affect the growth and health of plants. • Pupils give simple explanations why the plants in different conditions grow differently. • Pupils make predict, test, and record, through drawings or photographs, and explain their observations to show understanding of the optimal conditions that plants need to grow and stay healthy. Pupils use their understanding from this investigation to make predictions about what will happen when a different type of plant is studied under varying water, light and temperature conditions and test their predictions through further investigations.
<p>Notice that animals, including humans, have offspring which grow into adults</p>	<p>Pupils learn about the development of humans from babies to older adults, thinking about the capabilities at different stages of development. Pupils identify parents and offspring of animals where the offspring look similar to the parent, and move on to identify parents and offspring which look initially dissimilar. Pupils investigate the lifecycle of some animals, using opportunities for first hand observation where available, undertaking some guided research involving secondary sources</p>	<p>offspring babies young grow change adults older/younger baby/toddler/child/teenager Adult Vocabulary reproduction life cycles develop life cycle</p>	<p>The changes as young animals, including humans growing into adults are described.</p>	<p>The changes as young animals, including humans growing into adults are described well using scientific vocabulary.</p>	<ul style="list-style-type: none"> • Pupils match some parents and offspring, including human babies and adults and animals where parents and offspring look similar e.g. calf – cow, lamb - sheep. • Pupils match a wider range of parents and offspring, including examples where parents and offspring look dissimilar e.g. egg – chicken, spawn – tadpole-frog. Pupils can sort pictures of humans at key stages of development e.g. baby – toddler – child – teenager – adult – older adult, and can identify some changes in capabilities at the different stages. • Pupils demonstrate awareness of the lifecycles of a wider range of animals, including examples where parents and offspring look dissimilar, e.g. butterfly, dragonfly, frog.
<p>Find out about and describe the basic needs of animals, including humans, for survival (water, food and air)</p>	<p>Working scientifically using their observations and ideas pupils think about the basic needs of humans and the signals experienced to indicate hunger and thirst. They undertake practical investigation in PE lessons to identify that humans become out of breath when they undertake vigorous exercise. Pupils are taught that humans eat different types and amounts of food at different stages of development, e.g. babies drink milk and toddlers eat smaller quantities of food than adults. Pupils learn that all animals have similar basic needs for water, food and air, although the types and amounts of food that they eat and amounts of water drunk vary considerably, e.g. investigate the dietary needs of an elephant, a camel, a mouse.</p>	<p>questions types of scientific enquiry answer similarities differences changes identify classify sort group order observe changes over time notice patterns link careful accurate observations questions equipment gather measure record</p>	<p>The basic needs of animals, including humans, for survival are investigated and described.</p>	<p>The basic needs of animals, including humans, for survival are investigated and described using scientific language.</p>	<ul style="list-style-type: none"> • Pupils identify that animals need water, food and air for survival. • Pupils can identify and explain the signals they experience when feeling thirsty, hungry and out of breath. They can give a suggestion as to the health implications of lack of food, water or air. Pupils show understanding of how to care for a pet. • Pupils know that different animals require different amounts of food and water to survive. Pupils can describe why humans eat different types and amounts of food at different stages of development.
<p>Describe the importance for humans of exercise, eating the right amounts of different types of food, and</p>	<p>Pupils can explain the importance for humans of undertaking exercise and the consequences of not taking sufficient exercise for health. Pupils know that the heart is a major organ and working scientifically perform simple tests using simple equipment to discover that its pumping action can be heard or felt as a pulse. Pupils learn about the different</p>	<p>basic needs water food air breathing survival exercise food types fruit and vegetable bread, rice, potato, pasta milk and dairy foods</p>	<p>Generally, the importance for humans of exercise, eating the right amounts of different types of food and hygiene is described.</p>	<p>Without support, the importance for humans of exercise, eating the right amounts of different types of food and hygiene is described in detail</p>	<ul style="list-style-type: none"> • Pupils know that humans need exercise to keep healthy. Pupils can select from a range of foods some which make up a balanced meal. Pupils know that they should wash their hands before eating. • Pupils know that their heart pumps faster when they exercise and that they can feel this as a pulse. Pupils can identify the main food groups and can plan their own balanced meal. Pupils explain why they should wash their hands before preparing and eating food.

<p>hygiene</p>	<p>food groups and find out what role of those food groups is for keeping the body healthy (including fruits and vegetables; meat, fish nuts and eggs, dairy, fats and sugars, grains, cereals and potatoes – extending to use scientific terminology of carbohydrates, proteins, vitamins and minerals). Pupils understand the concept of a balanced diet for human health. Pupils learn about hygiene in relation to food preparation and eating, and the importance of hand washing after using the toilet.</p>	<p>foods high in fat or sugar meat, fish, egg, beans hygiene clean wash healthy medicine drugs Will be introduced to nutrition and nutrients in year 3 so avoid protein, carbohydrates etc</p>			<ul style="list-style-type: none"> • Pupils can identify how exercise impacts positively on the body in relation to heart and circulation of blood and oxygen, and some consequences of taking insufficient exercise. Pupils can explain the consequences for human health of not eating a balanced diet and can name all of the main food groups and their role in keeping the body healthy. Pupils know that germs can make humans unwell and can identify how the spread of germs can be reduced.
<p>Identify and compare the suitability of a variety of materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses</p>	<p>Working scientifically, pupils can identify and classify a number of different materials that could be used to make an object or part of it, e.g. a window frame can be made from wood, plastic or metal. Pupils evaluate how appropriate different materials would be for particular uses by thinking about the functions of the object and properties of the material that make them suitable or unsuitable for a particular purpose, e.g. a ruler or spoon can be made from plastic, wood or metal, but not glass; a waterproof coat can be made from plastic and some fabrics with appropriate properties, but not from paper or metal. Pupils find out that many materials are used for more than one thing, e.g. metal can be used to make coins, parts of a car body and engine, food and drink cans, parts of furniture; wood can be used to make tables, shelves, pencils, picture frames. Pupils use the vocabulary learned in year 1 to describe the properties of materials and sort materials into groups - hard/soft, stretchy/stiff, shiny/dull; rough/smooth; bendy /stiff; waterproof/ non waterproof; absorbent/non-absorbent; opaque/see-through and extend their vocabulary e.g. using terms – transparent, flexible, rigid to apply to their explanations. Pupils learn about some specific materials by using tests that show the properties of some metals influences their use; e.g. copper is a good conductor of electricity so is used in electric cables</p>	<p>suitable/unsuitable use/useful object material property wood plastic glass metal water rock brick paper fabrics elastic foil card/cardboard rubber wool clay hard soft stretchy rigid flexible waterproof absorbent strong/weak rough smooth reflective non reflective transparent opaque translucent</p> <p>(Year1 - vocab) hard soft stretchy stiff bendy/floppy waterproof absorbent breaks/tears rough smooth shiny dull see through not see through</p>	<p>The uses of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock and paper/ cardboard, are identified and compared.</p>	<p>The uses of a variety of everyday materials including wood, metal, plastic, glass, brick/rock and paper/cardboard are identified and compared using scientific vocabulary.</p>	<ul style="list-style-type: none"> • Pupils identify that materials can be used to make a number of different things. Pupils can give suggestions as to why a material would be unsuitable for an object e.g. metal is unsuitable to make a window pane. • Pupils identify three objects which can be made from a number of different materials, can give examples of other materials that are unsuitable to make those objects and are able to say why they are unsuitable in terms of their properties. • Pupils can give more than three examples showing their understanding that a range of materials can be used to make many different objects, clearly explaining the relationship between the properties of the materials and the function of the objects in scientific terms. Pupils could invent a new material which has a number of useful properties.
<p>Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching</p>	<p>Pupils make predictions and working scientifically perform simple tests and use simple equipment to investigate how materials can be changed by squashing, bending, twisting and stretching, recording the results of their investigations. Pupils make further predictions about the properties of other materials based on their initial investigations of similar materials.</p>	<p>shape changed push/pushing pull/pulling twist/twisting squash/squashing bend/bending stretch/stretching pinch/pinching poke/poking roll/rolling squeeze/squeezing</p>	<p>Generally, there is an ability to find out how the shapes of solid objects made from some materials can be changed.</p>	<p>There is an ability to independently find out how the shapes of solid objects made from some materials can be changed.</p>	<ul style="list-style-type: none"> • Pupils can describe how the shapes of some objects can be changed by squashing and know that some objects are too hard to be squashed by hand. • Pupils can describe and record their observations of how some objects are changed by bending, twisting or stretching. Pupils know that the properties of some objects mean that they cannot be bent, twisted or stretched by hand. • Pupils relate their knowledge of the properties of objects to their functions, e.g. wood is a suitable material from which to make a table because it cannot ordinarily be squashed, bent, twisted or stretched; wood is rigid, hard, non-absorbent, waterproof and through the manufacturing process can be made smooth.

Key Stage 2, Year 3

National Curriculum for Science Learning Objective	Description	Vocabulary	Secure	Exceeding	Possible investigation/tasks for <u>progression</u> and further discussion
Identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers	Working scientifically to identify differences or similarities, pupils can name the parts of a range of well-known flowering plants and know that the function is the same despite a difference in appearance, for example a sunflower's stem compared to a daisy's.	part role leaf/leaves flower blossom petal fruit berry root bulb seed trunk branch stem bark stalk water absorb support food notice similarities observations identify differences	Generally, the functions of different parts of flowering plants are identified and described, e.g. the roots absorb water from the soil to feed the plant, the stem helps to support the plants, the leaves use sunlight to provide the plant with energy and the flower helps the plant to reproduce.	The functions of different parts of flowering plants are independently identified and described. The function of other parts of flowering plants begin to be described, e.g. stamen, style, stigma, anther, filament, ovary, etc.	<ul style="list-style-type: none"> • With prompting, pupils recognise the roots, stem, leaves and flowers of a range of everyday flowering plants and know that these have a particular function. • Independently, pupils identify roots, stem, flower and leaves on plants including root vegetables within child's experience. Recall that the root takes in water and can anchor the plant, the stem aids limited movement and supports plant; leaves are necessary as "the factories" to make sugars and the petals and flowers attract insects and identify these on given plants. • Pupils apply the functions to more unusual plants such as cactus, deciduous trees etc. and consider adaptations of a function such as the leaf in a pitcher plant or Venus Fly-trap.
Explore 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	Working scientifically, asking relevant questions and using different types of scientific enquiry pupils can explore requirements for healthy growth making systematic and careful observations of a range of plants and their preferred growing conditions, e.g.: Consider how germination might be affected by heat ... how plants in desert climates grow with limited water and water lilies grow in ponds... etc.	light air water nutrients soil fertiliser growing damp/wet/dry dark/light hot/warm/ cool/cold use comparatives e.g. hotter grow/growth healthy temperature Questions answer changes increase decrease classify sort group order observe changes over time patterns link opinion/fact comparative tests	Generally, the requirements of plants for life and growth, and how these vary from plant to plant are identified and explored.	The requirements of plants for life and growth, and how these vary from plant to plant, are independently identified and explored.	<ul style="list-style-type: none"> • Pupils to plan an experiment that shows that limiting a plant's essential requirements may affect its growth. Pupils should predict; simply record results and draw conclusions on the essential requirements for healthy plant growth. • Pupils will have a working knowledge of requirements and will use this to plan and investigate the requirements for healthy plant growth. Pupils recognise that plants in the local environment will all have these requirements but the rates of germination; growth etc. varies between, varieties, species and locations. • Pupils' investigations inform them of further questions/investigations needed. Pupils recognise that plants globally have essential requirements for growth but these might be specially adapted.
Investigate the way in which water is transported within plants	Working scientifically, pupils investigate, using a variety of tasks and straightforward scientific evidence, to show water movement from its absorption at the roots, through the xylem in the stem and out through the stomata in the leaves.	Structure function/role transported roots moves/movement fair tests variables results independent variable dependent variable controlled variable careful accurate accuracy precision degree of trust equipment gather measure record	Generally, the way in which water is transported within plants is investigated.	Pupils plan their own investigation into the way in which water is transported within plants.	<ul style="list-style-type: none"> • Pupils describe how water is taken in at the root and exits the plant at the leaf. • Pupils explain that the root, stem and leaves of a plant all transport water and will become wilted (flaccid) if lacking in water. • Pupils link the transportation of water through a plant to the transportation of minerals.
Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal	Pupils use evidence from research; observations of flowers in situ; from deconstructing a range of flowers and seed pods to look for plant parts common to all; to explore the role of flowers in the pollination and fertilisation of flowering plants. They will be looking for links between the structure of the fruits and how the seeds are dispersed: e.g. dandelion by wind, blackberries by birds in faeces, teasels in animal fur.	transported life cycle pollination seed formation seed dispersal	The role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal, is explored.	The role of flowers in the life cycle of flowering plants, including pollination, fertilisation, seed formation and seed dispersal, is explored independently.	<ul style="list-style-type: none"> • Pupils can describe that flowering plants have a life-cycle with defined stages. • Pupils can explain that flowering plants have a life cycle with defined stages, some of which are the same in flowering plants such as pollination but other aspects are different such as seed formation and dispersal. • Pupils use the correct scientific vocabulary for the processes: germination, pollination, fertilisation and seed dispersal.
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	Building on the work in year 2 about the criteria for living things and food chains, pupils demonstrate awareness that animals are unable to produce their own food internally, but need to eat in order to take in nutrients. Working scientifically, pupils undertake research (including making systematic and careful observations and gathering and presenting survey data) to identify that animals, including humans, need the right amount and type of nutrition to keep healthy. Building on learning about the food groups in year 2, pupils extend their knowledge using scientific terminology of carbohydrates, proteins, vitamins and minerals and the role of these food groups for keeping the human body healthy.	Nutrition nutrients food types fruit and vegetable bread, rice, potato, pasta milk and dairy foods foods high in fat or sugar meat, fish, egg, beans carbohydrates protein vitamins and mineral fat dietary fibre water balanced diet	Generally, the terms 'nutrition' and a 'balanced diet' are understood. Generally, the fact that animals, including humans, need the right types and amounts of nutrition is identified.	The terms 'nutrition' and a 'balanced diet' are clearly understood. The reasons why humans need the right types and amounts of nutrition are articulated.	<ul style="list-style-type: none"> • Pupils recognise that animals including humans need energy that is provided by eating food. Pupils understand that eating too much food or the wrong types of food can make you gain weight and this is unhealthy. • Pupils can name the different food groups from which food should be selected in order to provide a healthy, balanced diet for humans. • Pupils can identify the main food groups and explain the role of each food group in keeping the body healthy. Pupils apply their knowledge of the different food groups to planning a healthy menu and can explain the consequences for human health of not eating a balanced diet.

<p>Identify that humans and some animals have skeletons and muscles for support, protection and movement</p>	<p>Working scientifically using models, diagrams and other secondary sources, pupils compare a range of animals' skeletal structures; discovering how the bones and muscles interact and combine to allow movement and afford protection. Pupils recognise that invertebrates have an external skeleton and vertebrates have skeletons inside them.</p>	<p>skeleton muscles support protection movement skull ribs spine/vertebra joints sockets bones tendons Similarities differences Adult Vocabulary vertebrate/invertebrate</p>	<p>Generally, the fact that humans and some animals have skeletons and muscles for support, protection and movement is identified.</p>	<p>Without support, the fact that humans and some animals have skeletons and muscles for support, protection and movement is clearly identified and articulated. It is understood that invertebrates do not have a skeleton.</p>	<ul style="list-style-type: none"> Identify that some animals (including humans) have skeletons from pictures/x-rays of skeletons. Identify a limited number of bones and muscles. Recognise that that all vertebrates have a skeletal and muscular system that enables movement, support and protections. Pupils can identify some key human bones e.g. skull, spine, ribcage and muscles e.g. biceps, triceps. Pupils explore the simple mechanics of contraction and relaxation of muscles in combination with bones at joints in vertebrate movement. Increased awareness of the adaptations of invertebrates and how they might be protected, e.g. exoskeletons, shells, etc. and how not having a skeleton enables different movement.
<p>Describe in simple terms how fossils are formed when things that have lived are trapped within sedimentary rock</p>	<p>Pupils can describe that fossils are the traces or impressions of living things from past geologic ages, or the traces of their activities, such as dinosaur footprints.</p>	<p>rock stone pebble boulder soil fossils grains crystals hard/soft texture absorb water let water through marble chalk granite sandstone slate sandy soil clay soil chalky soil peat sedimentary rock formed/made NB Test by scratching Porous permeable/ impermeable</p>	<p>Generally, there is an ability to describe in simple terms how fossils are formed when things that have lived are trapped within sedimentary rock.</p>	<p>The way in which fossils are formed is described and explained using correct scientific language.</p>	<ul style="list-style-type: none"> Pupils show an increased awareness of the many millions of years a fossil takes to make and that a fossil is a mould of a creature's body or activity, not a creature turned to stone. Pupils know fossils only form in sedimentary rocks and can describe in simple terms the chronology of the stages of fossilisation: E.g. - initial entrapment of a creature then repeated layering of sediment Using the correct scientific vocabulary pupils can sequence the formation of fossils.
<p>Recognise that soils are made from rocks and organic matter</p>	<p>Working scientifically, setting up simple practical enquiries, comparative and fair tests, pupils can recognise that soils are different depending on their constituent parts; this is in turn dependant on the local geology and varies across the country.</p>	<p>Rocks, living things. comparative tests fair tests independent variable dependent variable controlled variable careful accurate observations equipment gather measure record evidence present data/evidence/ results bar charts table conclusions prediction magnifying glass microscope</p>	<p>Soils are generally described accurately as being made of rocks and organic matter.</p>	<p>The composition of soils are described and understood. There is some awareness that different proportions of rock and organic matter give rise to different soil types.</p>	<ul style="list-style-type: none"> With support recognise that pebbles and stones are broken rocks, and organic matter is animal and plant debris, and that a mix of these helps make soil. Pupils can describe that soils are a mixture of tiny particles of rock, dead plants and animals, air and water; the amount of which can vary. Pupils explain that sandy, clay, chalky and peat based soils are different mixes of components and that different plants could thrive in them.
<p>Recognise that they need light in order to see things and that dark is the absence of light</p>	<p>Pupils recognise that we see things when light from a source enters our eyes, and without light we are unable to see.</p>	<p>light light source names of light sources e.g. torch dark/darkness transparent opaque translucent</p>	<p>Generally, accurate descriptions of how light is required in order to see are given. It is understood that dark is the absence of light.</p>	<p>Without prompts, a fluent and accurate explanation of how light is required to see, and that dark is the absence of light, is given.</p>	<ul style="list-style-type: none"> Can explain that light is needed to see and apply this in simple terms such as: when eyes are closed we no longer see as light cannot enter our eyes. Pupils can recognise that light can come in many forms including the colours of the rainbow (natural and manmade) and without light we cannot see. Recognise that blocking of light by a solid (opaque) object is what makes a shadow and link this to eclipses and other natural and everyday phenomena.
<p>Notice that light is reflected from surfaces</p>	<p>Working scientifically using straightforward scientific evidence to answer questions or to support their findings, pupils notice that some surfaces, including the moon, are better reflectors than others.</p>	<p>reflect reflective mirror</p>	<p>Generally, it is noticed that light is reflected from surfaces.</p>	<p>It is noticed that light is reflected from surfaces, and explanations are given for this.</p>	<ul style="list-style-type: none"> Pupils can show using pictures or simple diagrams that a reflection is due to light "bouncing" off the surface of the object and if the light is lessened or the surface is not shiny then the clarity of the reflection will be diminished. That light reflects off shiny, light and smooth materials better than dull, dark and rough materials that do not reflect light well. Application of this understanding to the use of reflectivity in everyday usage; bicycle reflectors, car mirrors, ships' periscopes, high visibility vests/coats.
<p>Recognise that light from the sun can be dangerous and that there are ways to protect their eyes</p>	<p>Pupils recognise that even scientists never look directly at the sun and instead use specially adapted telescopes or observe images sent from unmanned space-probes, millions of miles away in space. Pupils MUST KNOW that looking directly at the sun can be dangerous and cause permanent damage even if wearing sunglasses.</p>		<p>Generally, it is understood that the light from the sun can be dangerous and some basic ways of protecting the eyes are understood.</p>	<p>A range of measures to protect the eyes from the dangers of light from the sun are described.</p>	<ul style="list-style-type: none"> Pupils MUST KNOW that looking directly at the sun can be dangerous and cause permanent damage even if wearing sunglasses. Pupils recognise that eyes need protection from the sun just as skin does and that is why sunhats with a peak or sunglasses are worn. Pupil use secondary sources to explore the consequences to eyesight and general health of prolonged exposure to sunlight.
<p>Recognise that shadows are formed when the light from a light source is</p>	<p>Working scientifically reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions, pupils recognise that light rays travel in a straight line and if they hit an</p>	<p>Shadow block direct/direction independent variable dependent variable controlled variable fair test</p>	<p>Shadows are associated with a light source being blocked by something, and patterns are found that</p>	<p>Shadows are associated with a light source being blocked by an opaque object and, without support, patterns are found</p>	<ul style="list-style-type: none"> Recognise that shadows are formed when light is blocked by a solid (opaque) object. Recognise how shadows are formed and that the position of the light source determines the shape and size of the shadow.

<p>blocked by a solid (opaque) object</p>	<p>object they might: pass through, bounce off or be blocked completely. When light is blocked a shadow is formed.</p>		<p>determine the size of shadows.</p>	<p>that determine the size of shadows.</p>	<ul style="list-style-type: none"> Recognise that translucent objects can also make a shadow but this might be indistinct and less clear.
<p>Find patterns in the way that the size of shadows change</p>	<p>Working scientifically, making systematic and careful observations and where appropriate, taking accurate measurements using standard units. Using a range of equipment, pupils investigate shadow length, sharpness of edges, position on the ground, etc.</p>	<p>careful accurate precision equipment gather measure record results evidence present data/evidence/ results bar charts table results conclusions prediction</p>	<p>There is a general awareness that the intensity, distance of light source, angle and object causing the shadow are factors in the size and shape of shadows.</p>	<p>Fluent explanations describing intensity, distance, angle and object, along with evidence from experiments are used to explain patterns in the way that the size of shadows changes.</p>	<ul style="list-style-type: none"> Recognise that shadows are similar in shape to the objects forming them and make simple observations of changes, EG, have got longer/smaller/sharper etc. Recognise and describe how shadows from a source change when the source is moved e.g. shadows from the sun over the course of a day. Apply this to statements such as, "The higher the sun in the sky the shorter the shadow."
<p>Compare how things move on different surfaces</p>	<p>Pupils recognise there are forces in action when items are moved on different surfaces (friction) and working scientifically recording findings using simple scientific language, drawings, labelled diagrams, bar charts, and tables.</p>	<p>force push/pushing pull/pulling</p>	<p>The term friction is used to describe how things move on different surfaces.</p>	<p>The terms friction and texture are used without prompt to explain the difference in the way that things move on different surfaces.</p>	<ul style="list-style-type: none"> Investigates surface friction and can conclude that some surfaces slow objects down and others cause them to move more quickly than others. Investigates surface friction and can conclude that rough surfaces slow you down and smooth surfaces don't slow you as much. Apply understanding to grips on tyres and shoes; skiing and ice-skating, etc.
<p>Notice that some forces need contact between two objects, but magnetic forces can act at a distance</p>	<p>Use photographic evidence of forces in action to show how manipulation of forces has enabled advantageous inventions/structures. Consider the characteristics of magnetism and how forces act at a distance: this can be modelled simply and/or applied to relatively new technologies such as electromagnetic repulsion (the bullet train).</p>	<p>contact force non-contact force magnetic force</p>	<p>Generally, it is noticed that some forces need contact between two objects and some forces act at a distance. (E.g. it is observed that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary, e.g. opening a door or pushing a swing.)</p>	<p>It is clearly noticed that some forces need contact between two objects and some forces act at a distance. Questions begin to be asked about forces that make things begin to move, get faster or slow down.</p>	<ul style="list-style-type: none"> Recognise that the unusual property of a force that can act from a distance can be used to make pictures move 'magically'. Recognise that the unusual property of a force that can act from a distance can and is used for both simple and advanced technologies. Pupils use their knowledge and understanding of magnets acting at a distance to explain the 'hanging paperclip' and then relate that to everyday situations like self-closing wardrobe doors.
<p>Observe how magnets attract or repel each other and attract some materials and not others</p>	<p>Using secondary sources, pupils observe the image of the magnetic field made by iron filings when like and not like poles are placed close together. Pupils investigate the attraction of a variety of materials by a magnet.</p>	<p>magnet strength bar magnet ring magnet button magnet horseshoe magnet attract repel</p>	<p>The way in which magnets attract or repel each other and attract some materials and not others is observed.</p>	<p>The way in which magnets attract or repel each other is explained scientifically.</p>	<ul style="list-style-type: none"> Explain in their own terms what happens when poles are brought together, e.g., the magnets 'stick' or 'push' each other away and is aware that materials made of metal will be attracted to a magnet. Independently can describe the effect of magnetism by using the terms attraction and repulsion, and is aware that there are only a few metals that are magnetic, but may not know all names. Can describe magnetism using correct scientific vocabulary and recognises that not just iron, but also steel, nickel and cobalt can be magnetic and will attract.
<p>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</p>	<p>Working scientifically, setting up simple practical enquiries, comparative and fair tests pupils can sort and test a variety of everyday materials on the basis of their magnetic attraction.</p>	<p>magnetic material metal iron steel non-magnetic material attract</p>	<p>Generally, a variety of everyday materials are compared and grouped together on the basis of whether they are attracted to a magnet. Some magnetic materials are identified.</p>	<p>A variety of everyday materials are compared and grouped together on the basis of whether they are attracted to a magnet. Some magnetic materials are identified with reference to their properties.</p>	<ul style="list-style-type: none"> Recognises that when an object 'sticks' to the magnet that it is a magnetic material and not all materials do this. Can independently group and compare everyday objects by testing for magnetism and recognise that certain metal items or items made with a mix of these metals (lodestone) are magnetic whilst some are not. Question why and determine how to test to find out which metals are magnetic.
<p>Describe magnets as having two poles</p>	<p>Working scientifically, setting up simple practical enquiries, comparative and fair tests pupils discover that every magnet has two opposite poles called, for convenience, North and South.</p>	<p>poles north pole south pole</p>	<p>The term poles is generally used to describe magnets.</p>	<p>The term poles is fully understood and used without prompt to describe magnets.</p>	<ul style="list-style-type: none"> Pupils can identify the opposite poles of a bar magnet. Labels a range of magnets to show the two poles; recognises that these align themselves with the earth's magnetic north. Investigate a range of different shaped magnets identifying the correct pole when referred to a norm and explain why when a bar magnet is halved it makes two new magnets.
<p>Predict whether two magnets will attract or repel each</p>	<p>Working scientifically, setting up simple practical enquiries, comparative and fair tests pupils discover what happens when like poles of a magnet and unlike poles of a magnet are presented together.</p>	<p>independent variable dependent variable controlled variable careful accurate precision measure record results evidence present</p>	<p>Generally, the term poles is used to help explain predictions as to whether</p>	<p>The rule that like poles repel and opposite poles attract is used fluently to explain predictions as to whether</p>	<ul style="list-style-type: none"> Recognises that the magnet needs turning around if it doesn't attract or repel as expected. Pupils can explain that opposites attract (N and S) and like repel (S and S; N and N).

other, depending on which poles are facing		data/evidence/ results bar charts table conclusions prediction	magnets will attract or repel each other.	magnets will attract or repel each other.	<ul style="list-style-type: none"> Pupils can accurately and consistently predict the outcome of placing the poles of known magnets together.
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Key Stage 2, Year 4

National Curriculum for Science Learning Objective	Description	Vocabulary	Secure	Exceeding	Possible investigation/tasks for <u>progression</u> and further discussion
Recognise that living things can be grouped in a variety of ways	Working scientifically identifying differences, similarities or changes related to simple scientific ideas and processes and building upon the work on Plants and Animals, including humans, undertaken in Key Stage 1. Pupils use a variety of secondary resources and conduct surveys of their local environment to produce a list of living things (both plant and animal) which they then sort into groups.	fish amphibians reptiles birds mammals vertebrates invertebrates name some invertebrates classify sort group	Reasons are given for classifying plants and animals based on specific characteristics.	Accurate, fluent reasons are given for classifying plants and animals based on specific characteristics.	<ul style="list-style-type: none"> Pupils identify simple ways in which plants and animals could be sorted e.g. flowering and non-flowering plants; warm and cold blooded animals. Pupils use a number of different methods to sort plants or animals using more than one physical characteristic or environmental factor e.g. whether the plant is wind or animal pollinated or if the animal is a herbivore or carnivore. Pupils begin to routinely and accurately ascribe plants and animals according to their taxonomic group. E.g. chordate animals as mammals, reptiles, amphibian, birds or fish.
Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment	Working scientifically pupils closely observe and research a variety of plants and/or animals using straightforward scientific evidence of characteristics that can be used to identify them e.g. colour of flower, shape of leaf, number of legs, were the animal lives etc. and use these observed characteristics to sort them into groups.	classification keys fish amphibians reptiles birds mammals vertebrates invertebrates	Generally, a variety of living things in the local and wider environment are identified and named, using classification keys to assign them to groups. Generally, vertebrate animals, Invertebrates and plants are put into groups.	A wide variety of living things in the local and wider environment are identified and classified more systematically, e.g. flowering plants, and nonflowering plants.	<ul style="list-style-type: none"> Pupils use one observable characteristic to sort animals and plants into groups. Pupils use more than one observable characteristic to sort animals and/or plants using simple Venn or Carroll diagrams to construct a simple branched identification. Pupils use interconnecting Venn diagrams or Carroll diagrams with two criteria to construct branched or number identification keys to sort animals and plants.
Recognise that environments can change and that this can sometimes pose dangers to specific habitats	Building upon the work done in Year 2 on habitats pupils work scientifically to observe change within a local environment or habitat and then report their findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions noting any impact upon the population or distribution of living things within that habitat.	environment human impact natural disaster habitat suitable name positive human impact name negative human impact	Generally, it is recognised that environments are constantly changing and that this can sometimes pose dangers to specific habitats.	It is clearly recognised that environments are constantly changing and the dangers to specific habitats that this can pose are explained clearly.	<ul style="list-style-type: none"> Pupils make observations and draw simple conclusions e.g. paths are made where we walk because the plants cannot live when they are trampled. Pupils identify one factor that has changed within the environment or habitat and note the effect that this has had on the chances of survival of those organisms which rely on it. E.g. the school pond has become full of algae so that the fish have less oxygen. Pupils can explain that a number of different factors can affect the diversity or abundance of plant or animal growth and can ascribe these factors to the positive or negative influence of human activity.
Construct and interpret a variety of food chains, identifying producers, predators and prey	Building upon the work done in Year 1 where pupils group animals by what they eat- describing the animal as a herbivore, carnivore or omnivore; Pupils construct simple food chains from observation, pictures, stories or secondary research.	carnivore herbivore omnivore producer consumer predator prey food chain	A range of food chains are constructed or interpreted. The terms predator and prey are used correctly.	A wide range of food chains are constructed and interpreted. The terms predator and prey are fully understood and used accurately.	<ul style="list-style-type: none"> Pupils start each food chain with a plant describing this plant as a producer. Food chains are of one or two steps e.g. grass- cow or lettuce – rabbit - fox. Pupils construct food chains of a variety of lengths correctly identifying the producer, a predator and a prey animal. Pupils consistently and accurately construct food chains within a defined habitat, correctly identifying: the producer, specific predator/prey relationships and the top predator. Pupils add arrows to show energy flow within the food chain.
Describe the simple functions of the basic parts of the digestive system in humans	Working scientifically using secondary sources, pupils draw diagrams or construct models to describe the tissues and organs of the digestive system in humans.	digestive system nutrition nutrients oesophagus (gullet) stomach small intestine large intestine rectum anus mouth	The simple functions of the parts of the digestive system in humans, e.g. mouth, oesophagus, liver, stomach, small intestine, large	The functions of the parts of the digestive system in humans, e.g. mouth, oesophagus, liver, stomach, small intestine, large	<ul style="list-style-type: none"> List the main parts of the digestive system e.g.: mouth, teeth, tongue, oesophagus, stomach, pancreas, small and large intestines, appendix, rectum and anus. Accurately label a diagram of the digestive system correctly sequencing the named tissues and organs.

			intestine and rectum, are described and identified.	intestine and rectum, are described and identified accurately and without support.	<ul style="list-style-type: none"> Describe the functions of the organs in the human digestive system in terms of: ingestion as taking in food; digestion as physically or chemically breaking food down into soluble nutrients; absorption as taking nutrients into the blood for transport and excretion as getting rid of undigested waste.
Identify the different types of teeth in humans and their simple functions	Using diagrams, models, biological samples or secondary sources, pupils can name the four types of teeth as: canine, incisor, premolar and molar.	mouth teeth canines incisor molar pre-molar saliva tongue rip, tear, chew, grind, cut	<p>Generally, the different types of teeth in humans, e.g. molars, incisors and canines, and their simple functions, are identified.</p> <p>Generally, it is recognised that: canines are used for tearing and ripping food, incisors are to help bite off and chew pieces of food and molars are to help crush and grind food.</p>	<p>The different types of teeth in humans, e.g. molars, incisors and canines, and their simple functions, are identified independently.</p> <p>The functions of the teeth are clearly recognised and links are made to the shape of the teeth</p>	<ul style="list-style-type: none"> Pupils relate the position of the teeth in the human mouth to the mechanical processes of eating describing the functions of the teeth in simple terms such as cutting or grinding. Pupils accurately ascribe the function of the four types of human teeth explaining how the structure and shape is adapted to the job it has.
Compare and group materials together, according to whether they are solids, liquids or gases	Working scientifically identifying differences, similarities or changes related to simple scientific ideas and processes pupils closely observe and can describe the properties of: <ul style="list-style-type: none"> Solids- as having a fixed shape, non-flowing and incompressible. Liquids - as having no fixed shape, flowing to fill the bottom of a container and incompressible. Gases - as having no fixed shape, completely filling any container and compressible. 	states of matter solid liquid gas air oxygen powder grain/granular crystals change state ice/water/steam water vapour heated/heating cooled/cooling temperature degrees Celsius melt freeze solidify melting point molten boil	Materials are compared and grouped together according to whether they are solids, liquids or gases.	Materials are independently and accurately grouped and compared according to their state of matter.	<ul style="list-style-type: none"> From observations and/or research pupils can sort a number of common objects into S/L/G. Pupils can consistently and accurately sort a wide range of objects into S/L/G. Pupils can use knowledge of the physical properties of solids, liquids and gases to determine whether tricky substances such as mists, foams, gels, pastes are S/L/G.
Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	Working scientifically using results from practical activities pupils investigate the physical results of heating and cooling water. Draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests.	boiling point evaporate/evaporation condense/condensation water cycle precipitation transpiration	<p>Generally, the four main stages of the water cycle are understood and the part played by evaporation, condensation and precipitation in the water cycle is identified.</p> <p>Generally, the rate of evaporation is associated with temperature.</p>	<p>The four main stages of the water cycle are understood independently and this process can be articulated and explained clearly and accurately.</p> <p>Without support, the part played by evaporation and condensation in the water cycle is identified, and the rate of evaporation is associated with temperature.</p>	<ul style="list-style-type: none"> Pupils can make general statements from the outcomes of observations or practical activities such as; puddles evaporate in the sunshine or condensation forms on the windows when it is cold outside. Pupils relate the water evaporating from seas and lakes to the formation of clouds; when it rains water vapour condenses into raindrops; relate the rate of evaporation to the ambient temperature of the surroundings. Pupils research or construct models to show how water is constantly evaporating and condensing in different local and geographical areas to set up the water cycle and weather patterns. Pupils can identify that: snow, sleet, hail and rain are all forms of condensed water.
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)	Working scientifically and with reference to 'Be Safe' pupils undertake practical activities making systematic and careful observations and where appropriate, taking accurate measurements using standard units. They use a range of equipment, for example thermometers and data loggers to investigate the physical results of heating and cooling on a range of materials found in the classroom and home.	observations questions answers equipment gather measure record results evidence present data/evidence/results keys bar charts table results conclusions prediction thermometers data loggers	Generally, it is observed that some materials change when they are heated or cooled and the temperature at which this happens is measured in degrees Celsius. This builds on the teaching in mathematics.	It is consistently observed that some materials change when they are heated or cooled and the temperature at which this happens is measured in degrees Celsius. This builds on the teaching in mathematics.	<ul style="list-style-type: none"> Pupils can describe the effect of heating some substances as melting and/or boiling. Pupils can describe the effect of heating and cooling some substances as melting, boiling, freezing and condensing and construct a simple temperature chart showing the changes of state from solid to liquid or liquid to gas. Pupils observe that the melting and freezing point of substances are the same. From practical investigation and secondary research pupils construct a temperature scale mapping the melting and boiling points of a wide range of substances e.g. alcohol, mercury, water, cooking oil, tar, gases including air and/or oxygen. (link to negative numbers in mathematics).

<p>Identify common appliances that run on electricity</p>	<p>Pupils can identify, across a range of contexts and opportunities, common electrical appliances seen in school, home, or local community.</p>	<p>Electricity appliances/device mains plug</p>	<p>Generally, all common electrical appliances are named and described as battery, solar or mains powered.</p>	<p>The terms battery, solar and mains powered are fully understood and used to describe a range of common appliances.</p>	<ul style="list-style-type: none"> • Pupils list a number of common appliances such television, washing machine, torch, radio, computer, toaster, oven, vacuum cleaner and explain how they would ensure their and others' safety when used. • Pupils can identify electrical appliances that could be used in a variety of given situations and can sub- divide these into mains power and battery driven appliances. • Pupils can construct a comprehensive list of electrical appliances found in a wide range of situations and make comparative judgements into the advantages and disadvantages of using mains or battery power.
<p>Construct a simple series electrical circuit identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers</p>	<p>Undertaking practical activities pupils work scientifically to assemble simple series circuits that contain a varying number of cells, bulbs, switches and buzzers.</p>	<p>electrical circuit complete circuit circuit diagram circuit symbol components cell battery wires switch bulb positive/negative connect/connection buzzer motor Adult Vocabulary series circuit terminal</p>	<p>Generally, the terms cells, wires, bulbs, switches and buzzers are used to describe simple circuits that have been constructed independently.</p>	<p>The terms cells, wires, bulbs, switches and buzzers are used fluently and without prompt to plan, construct and diagnose problems with simple circuits.</p>	<ul style="list-style-type: none"> • With help pupils can safely construct simple series circuits that work and can give some simple statements about how changing components affected the circuit and with prompting can name the components they used. • With little help pupils can construct working circuits undertake simple 'fair test' investigations and make general statements about the results of their changes. • Pupils work independently, problem solving as necessary, to consistently construct circuits that work carrying out simple investigations accurately recording and reporting their findings using correct scientific vocabulary.
<p>Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit</p>	<p>Undertaking practical activities pupils work scientifically to assemble simple series circuits that contain switches in a variety of places.</p>	<p>loose connection short circuit wire crocodile clip bulb bright/dim switch open and closed complete circuit fast(er)/slow(er)</p>	<p>Without support, it is recognised that a switch opens and closes a circuit and this is associated with whether or not a lamp lights in a simple series circuit.</p>	<p>It is recognised that a switch opens and closes a circuit and this is associated with whether or not a lamp lights in a simple series circuit. A simple circuit is represented in a diagram using recognised symbols.</p>	<ul style="list-style-type: none"> • Pupils add one switch to a circuit and explain in terms of completing the circuit whether the lamp will light when the switch is open or closed. • Pupils can add a number of switches to a circuit and explain in terms of completing a circuit that all switches have to be closed for the lamp to light. • Pupils construct a number of different types of switch e.g. gate switch or pressure switch and suggest where these would be best positioned within a circuit to fulfil a specific task e.g. a pressure switch under a carpet in a burglar alarm.
<p>Identify whether or not a lamp will light in a simple series circuit based on whether or not the lamp is part of complete loop with a battery</p>	<p>Using a variety of physical, virtual or diagrammatic representations of simple series circuits pupils can decide whether a lamp will light.</p>		<p>Generally, it is identified whether or not a lamp will light in a simple series circuit and this is based on whether or not the lamp is part of a complete loop with a battery.</p>	<p>Independently, it is identified whether or not a lamp will light in a simple series circuit and this is based on whether or not the lamp is part of a complete loop with a battery.</p>	<ul style="list-style-type: none"> • Pupils can correctly predict the outcome when given a representation that can be followed with a finger and with some prompting. • Pupils can independently correctly predict the outcome when using standard representations. • Pupils accurately and consistently predict the outcome using a wide variety of representations of series circuits.
<p>Recognise some common conductors and insulators, and associate metals with being good conductors</p>	<p>Working scientifically, pupils undertake practical activities to assemble simple series circuits that can be used to test the electrical conductivity of a number of materials, gathering, recording, classifying and presenting data in a variety of ways.</p>	<p>conductor insulator metal/non metal</p>	<p>Generally, some common conductors and insulators are recognised, and metals are beginning to be associated with being good conductors.</p>	<p>A wide variety of conductors and insulators are independently recognised and metals are associated with being good conductors.</p>	<ul style="list-style-type: none"> • Pupils can relate the results of experimentation to say whether a material is an electrical conductor or insulator. • Using the results of experimentation pupils can predict whether similar substances to those tested are electrical conductors or insulators e.g. all metals are conductors or all plastics are insulators. • Pupils can predict the electrical conductivity of a number of different materials including composite materials and use their knowledge and understanding of conductivity to explain the structure of electrical component such as wires or switches.
<p>Identify how sounds are made, associating some of them with something vibrating</p>	<p>Setting up simple practical enquiries, comparative and fair tests, pupils can describe a number of different ways that a sound can be made e.g. by hitting, rubbing, shaking or blowing a number of objects and/or musical instruments.</p>	<p>sound sound source noise vibrate/vibration tune</p>	<p>Generally, the way in which sounds are made is identified, and with prompting, some of them are associated with something vibrating.</p>	<p>The way in which sounds are made is clearly identified, and some of them are associated with something vibrating.</p>	<ul style="list-style-type: none"> • By observing and reporting pupils say, in simple terms, what happens when an object that is making a noise e.g. a tuning fork, is placed against the skin, into water or onto a suspended ping pong ball. • Pupils conduct a sound survey and relate the rapid movement of the object or one piece of an object to an individual sound. • Pupils identify which part of a musical instrument 'makes' the noise, describing it as vibrating.
<p>Recognise that vibrations from sounds travel through a medium to the ear</p>	<p>Working scientifically setting up simple practical enquiries and fair tests, pupils describe how the sound from a vibrating object or musical instrument reaches the ears.</p>	<p>Travel vibration/s ear ear drum solid/liquid/gas instrument percussion strings brass woodwind tuned instrument</p>	<p>Generally, the word vibrations is used to describe how sounds travel through various media to the ear.</p>	<p>Fluent and clear explanations about how vibrations from sounds travel through various media to the ear are given.</p>	<ul style="list-style-type: none"> • Pupils place their ears on a table and state what they hear when another pupil lightly taps on the other end of the table giving reasons. • Pupils explain why they can hear music when in the bath or how whales and dolphins can communicate at sea. • Using a particle model pupils can give reasons why little or no sound is heard when a bell is placed in a vacuum jar.

<p>Find patterns between the pitch of a sound and features of the object that produced it</p>	<p>Building upon the Year 2 work on everyday uses of material, pupils ask relevant questions and use different types of scientific enquiries to answer them. They investigate the outcomes in terms of pitch by changing the physical dimensions, or materials, of the object making the sound.</p>	<p>high/low pitch</p>	<p>Generally, patterns are found between the pitch of a sound and features of the object that produced it.</p>	<p>Independently, patterns are found between the pitch of a sound and features of the object that produced it.</p>	<ul style="list-style-type: none"> • Pupils describe in simple terms what happens when the length of the sound producer is changed e.g. cutting straw oboes with scissors, blowing down different sized tubes, hitting different length nails or pipes. • Pupils change the material an object is made from. Do plastic pipes make the same sound as metal pipes? Does a glockenspiel sound the same as a xylophone? • Pupils use their knowledge and understanding of the patterns of pitch linked to the physical properties of objects to design and/or construct their own variable pitch musical instrument.
<p>Find patterns between the volume of a sound and the strength of the vibrations that produced it</p>	<p>Building upon earlier work on how sounds are made; pupils undertake a range of fair test practical activities by changing the physical dimensions of the action creating the sound, to investigate the outcomes in terms of volume.</p>	<p>volume loud/quiet fainter vibrations</p>	<p>Without support, patterns are found between the volume of a sound and the strength of the vibrations that produced it.</p>	<p>Patterns are found between the volume of a sound and the strength of the vibrations that produced it. It is beginning to be understood that sound needs a medium through which to travel, and the speed of sound in air, water and solids is observed.</p>	<ul style="list-style-type: none"> • Pupils describe in simple terms that the bigger the action the louder the sound produced e.g. hitting a drum harder will produce a louder sound. • Pupils can give reasons in terms of vibrations why playing loud music might be bad for their ears. Pupils can suggest ways they could soundproof their bedrooms. • Using a particle model; pupils can give reasons why a bell that is muffled and then hit will not be as loud as a bell that is hit without a muffler. Pupils can suggest reasons why a car exhaust silencer works and what materials might be inside the silencer.
<p>Recognise that sounds get fainter as the distance from the sound source increases</p>	<p>Pupils work scientifically making systematic and careful observations and where appropriate, taking accurate measurements using standard units. They use a range of equipment, for example data loggers or sound meters, to investigate how volume is affected by distance.</p>	<p>muffle strength of vibrations insulation vibrations sound source</p>	<p>Generally, the rule 'the greater the distance, the fainter the sound' is used and understood.</p>	<p>The rule of distance and faintness is used fluently in explanations, along with other factors that may affect our hearing, such as the media through which the vibrations are travelling.</p>	<ul style="list-style-type: none"> • Pupils produce graphical representations of their findings and report in simple terms that volume decreases as distance from the sound source increases. • Pupils can explain in a number of different contexts how the knowledge of the relationship between volume and distance from source is useful e.g. when crossing the road at night or fog sirens giving the proximity to dangerous rocks. • Using a particle model pupils can explain how the vibrations/ displacement decreases as the sound energy dissipates.

Key Stage 2, Year 5

National Curriculum for Science Learning Objective	Description	Vocabulary	Secure	Exceeding	Possible investigation/tasks for <u>progression</u> and further discussion
Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird	Pupils compare the life cycles using the processes of fertilisation, and development to adulthood: – Mammal: internal fertilisation; internal development; live birth; infant; child; adolescent; adult* – Amphibian: external fertilisation; egg; external development; tadpole; frog-let; adult* – Insect: external fertilisation; egg; pupa; chrysalis; imago; adult* – Bird: internal fertilisation: egg: chick; fledgling; adult* * adult- capable of reproduction	Life cycle reproduction sexual asexual mammal amphibian insect bird fish reptile eggs live young fertilise	Generally, the life cycles common to a variety of animals, including humans (birth, growth, development, reproduction and death) are described.	There is a sound understanding and knowledge of all basic life processes. Without support, the life cycles common to a variety of animals, including humans (birth, growth, development, reproduction and death) are described.	<ul style="list-style-type: none"> • Pupils can describe in general terms the stages of development in one type of animal. • Pupils can compare the life cycles of two or more types highlighting similarities e.g. amphibians, birds and insects all lay eggs. • Pupils can accurately detail the life cycles of all types of animals comparing similarities and differences and making conclusions to the advantages and disadvantages of these differences.
Describe the life process of reproduction in some plants and animals	Pupils observe nature, conduct practical activities and use secondary sources to describe the processes of reproduction in plants and animals.	pollination reproduce seed formation seed dispersal pollen germination stamen stigma plantlets e.g. spider plant runners e.g. strawberry plant	Generally, without prompting, the life processes of reproduction in some plants and animals are described.	Independently, the life processes of reproduction in some plants and animals are understood and described.	<ul style="list-style-type: none"> • Pupils can state that plants can reproduce sexually to produce seeds or asexually from bulbs and cuttings. Animals reproduce sexually to give other animals. Micro-organisms e.g. bacteria reproduce asexually to produce exact copies. • Pupils describe sexual reproduction as involving male and female parts from two or more plants or animals (of the same species). • Pupils can accurately describe the processes of plant and animal sexual reproduction using the correct scientific vocabulary. Identifying the sexual components of flowering plants.
Describe the changes as humans develop to old age.	Pupils use observations, discussion with parents, grandparents and other adults as well as secondary sources to Create a human growth time line.	Offspring Baby/toddler/child/adolescent/ Teenager/adult develop	Generally, the changes as humans develop from birth to old age are explained, using appropriate terminology.	The changes that take place as humans develop from birth to old age are explained in depth with appropriate terminology and examples given.	<ul style="list-style-type: none"> • Pupils can describe the development of humans over time in simple terms such as being a baby; being a child being and adult. • Pupils can ascribe approximate ages to the development of humans when: an infant; child; adolescent (teenager); adult; pensioner. • Pupils construct a detailed timeline ascribing significant processes to the thresholds between one phase of development and another e.g. the boundary between infant and child being the ability to walk or child to adolescent being the ability to survive without support.

<p>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</p>	<p>Working scientifically pupils compare through testing, categorising and recording data and results of increasing complexity and using with decision tree diagrams to sort a range of materials according to properties.</p>	<p>hard soft stretchy rigid flexible waterproof absorbent strong/weak rough smooth reflective non reflective transparent opaque translucent solubility electrical conductivity thermal conductivity magnetic</p>	<p>Generally, everyday materials are grouped together and compared based on evidence from comparative and fair tests.</p>	<p>Everyday materials are grouped together and compared independently and accurately based on evidence from comparative and fair tests.</p>	<ul style="list-style-type: none"> • Pupils can say why with reference to tabulated results why materials are grouped together. • Pupils demonstrate awareness that some properties will be categorised by everyday intended use e.g. wooden or plastic handles can be used on saucepans stating the need for the pan to conduct heat whilst the handle needs to insulate. • Pupils demonstrate a greater awareness that some properties will be categorised by intended use e.g. a plastic ruler can be transparent and flexible but durable whereas glass is transparent, durable but brittle. Electrical wire comprises a metal conductor that is flexible and is covered with an insulator (relate to work undertaken on electrical conductors/insulators in Year 4).
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<p>Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</p>	<p>Pupils make a series of observations by working scientifically, taking measurements, and using a range of scientific equipment, with increasing accuracy and precision. They will demonstrate which materials will dissolve to form a clear solution and the materials that dissolve and colour the solution.</p>	<p>melting states of matter solid liquid gas change state dissolve solution soluble insoluble solute solvent particle mix/mixture condensing gas given off</p>	<p>Generally, it is understood how some materials dissolve in liquid to form a solution, and how to recover a substance from a solution can be described. The terms 'soluble' and 'insoluble' are used accurately.</p>	<p>It is independently understood how some materials dissolve in liquid to form a solution and how to recover a substance from a solution is clearly described. The terms 'soluble' and 'insoluble' are used accurately.</p>	<ul style="list-style-type: none"> • Pupils can name three common materials that dissolve in liquid and explain that filtration and sieving will not separate them but the process of evaporation will. • Pupils will know that not all materials will dissolve whilst others do. Pupils can name examples of common materials that dissolve including examples i.e. instant coffee specifically designed to. Pupils can explain the process of evaporation to separate them. • Pupils know that not all materials will dissolve whilst others do even if a discoloured solution is the result. Pupils can name examples of common materials that dissolve including examples. Pupils can explain the process of evaporation to separate them and know that with addition heat the process can be accelerated.
<p>Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through layering, decanting, filtering, sieving and evaporating</p>	<p>Using familiar substances, pupils explore reversible changes, including evaporating to separate dissolved solids. Pupils use filtering to demonstrate that a material dissolved in a liquid cannot be separated by such means and the evaporation process is necessary. Pupils can investigate mixtures comprising solids with solids; solids with liquids and liquids with liquids (i.e. cooking oil and water).</p>	<p>filtering sieving decanting evaporating residue</p>	<p>Knowledge of solids, liquids and gases is used to decide how mixtures might be separated, including through filtering, sieving and evaporating. Knowledge is used to explain, for example, the water cycle.</p>	<p>Independently, clear knowledge of solids, liquids and gases is used to decide how mixtures might be separated, including through filtering, sieving and evaporating.</p>	<ul style="list-style-type: none"> • Pupils can explain how to separate to solids mixed together and how to filter a liquid and solid. Offer a reason why evaporation might be appropriate. • Pupils will respond with a suitable method to separate a given mixture saying why they have selected it. E.g. evaporation is needed for a sugar solution because it is a solution that cannot be separated by filtering but demonstrate when a filter would be practical. • Explain using for example that separating sugar strands from chick peas could be accomplished in two ways. 1) By sieving a dry mixture or 2) adding water and filtering then using their knowledge of evaporation to recover the sugar.
<p>Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</p>	<p>Building on work in Year 1 and Year 2 where pupils identify materials used in their environment. Pupils investigate material properties investigating a range of properties including conductivity and insulation properties (Thermal and electrical). They will note through comparative testing material properties such as flexibility, if magnetic, suitability to be immersed in water and hardness.</p> <p>Working scientifically pupils will report and present findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations. They will use test results to make predictions to set up further comparative and fair tests</p>	<p>scientific definition observe changes over time notice patterns link secondary sources opinion/fact comparative tests fair tests prediction independent variable dependent variable controlled variable careful accuracy precision degree of trust observations equipment gather measure record evidence present data/evidence/results</p>	<p>Generally, reasons are given, based on evidence from tests, for particular uses of everyday materials including metals, wood and plastic.</p>	<p>Without support, clear reasons are given, based on evidence from tests, for particular uses of everyday materials including metals, wood and plastic.</p>	<ul style="list-style-type: none"> • Pupils explain with annotated sketches and tabulated results of categorisation material uses. • Pupils state why, using material properties e.g. their chair has a metal frame with plastic seat whilst the table with metal legs has a wood top covered with a smooth hard surface. Pupils will demonstrate a choice of material to act as an insulator or conductor. • Pupils use a range of criteria. Pupils justify choices of material for particular uses, accurately and consistently explaining in terms of material properties.

	to categorise materials by properties identified through investigation.	bar charts scatter graphs line graphs table conclusions causal relationships			
Demonstrate that dissolving, mixing and changes of state are reversible changes	Pupils investigate changes of state that are reversible to demonstrate the significant difference between melting and dissolving. Using chocolate, butter, candle wax, they will record with annotated sketches effects of heating and cooling. Make comparisons with heating a salt water solution to evaporate the water, and condensing the vapour to recover the salt free liquid and the salt, the original components. Pupils to demonstrate what happens when dissimilar liquids are shaken or stirred and left to settle due to different densities.	not usually reversible new material reversible changes dissolve	It is demonstrated that dissolving, mixing and changes of state are reversible changes.	Independently, it is demonstrated that dissolving, mixing and changes of state are reversible changes. Without support, knowledge of how a mixture can be separated is used to suggest ways in which other similar mixtures might be separated, e.g. salt and water, sand and water.	<ul style="list-style-type: none"> Name an everyday material that will melt if heated and will then solidify if cooled. Pupils can name four materials that when heated will change state from solid to liquid and explain that cooling will be necessary to reverse the change. Pupils will name two materials that will dissolve and explain how to recover the original component liquid and solid/liquid. Pupils can relate reversible change to the water cycle and relate this to removal of salt from a solution created in the classroom using correct scientific vocabulary and simple models to describe scientific ideas.

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	Pupils investigate change associated with heating mixtures to affect permanency with the change i.e. using ingredients to cook small cakes recording distinct changes. Following guidelines for health and safety; demonstrate the effect of burning materials i.e. wood. Observe the effect of leaving steel/steel wool to rust and show examples of material change in the environment i.e. coins or copper left to form patina. Class teacher to show video or safely demonstrate an exothermic reaction i.e. Low percentage peroxide and yeast catalyst reaction. Pupils investigate and record outcome compare to the action of acid on bicarbonate of soda.	burning rusting non-reversible	Changes are beginning to be classified using the terms 'reversible' and 'non reversible'. Knowledge of reversible and non-reversible changes is used to make predictions about whether changes are reversible or not. Generally, it is understood 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, oxidation and the action of acid on bicarbonate of soda.	Changes are described as reversible or non-reversible. Without support, it is understood 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, oxidation and the action of acid on bicarbonate of soda.	<ul style="list-style-type: none"> Pupils plan a safe demonstration to show a permanent change in a material. With reference to annotated drawings pupils explain permanent material change caused by heating, burning as a chemical reaction. Pupils explain the processes of cooking in terms of mixing solids and liquid then heating to effect a permanent change. If bread is baked, explain the effect of proving the dough prior to baking; bread mouldering, or other food decay, as chemical change.
Describe the movement of the Earth and other planets relative to the Sun in the solar system	Building upon the work in Year 3, pupils can explain why it is not safe to view the sun directly, even with sunglasses. Pupils can describe the sun as Sol, a heliocentric star at the centre of our solar system, along with eight orbiting planets.	Earth planets Sun solar system size geocentric model heliocentric model Moon Mercury Venus Mars Jupiter Saturn Uranus Neptune Pluto 'dwarf' planet orbit revolve	Generally, the movement of the Earth relative to the Sun in the solar system is described.	The movement of the Earth relative to the Sun in the solar system is described clearly and independently.	<ul style="list-style-type: none"> Explain that looking directly at the sun is unsafe without specific reason. Using models (no necessary reference to scale) or suitable secondary source, demonstrate planetary motion. Explain that looking directly at the sun is harmful and can damage the eye. Using appropriate models (no necessary reference to scale) or suitable secondary source, demonstrate planetary motion and moon orbit with anticlockwise motion. Explain that looking directly at the sun is harmful and can damage the eye permanently. Using models (no necessary reference to scale) or suitable secondary source, demonstrate planetary motion with anticlockwise motion complete with an explanation of the earth's axial spin. The Earth along with other planets orbit the Sun with approximate concentric paths.

Describe the movement of the Moon relative to the Earth	Working scientifically, in groups pupils use simple models to act out or describe the orbital motion of the moon.	geocentric model heliocentric model orbiting/orbit	Without support, the movement of the Moon relative to the Earth is described.	The movement of the Moon relative to the Earth is fluently described.	<ul style="list-style-type: none"> Describe the moon's orbit as describing a circular anticlockwise circle in a flat plane. Describe the moon's orbit as describing a circular anticlockwise circle in a flat plane with duration of 29.5 days. Describe the moon's orbit as describing an approximate circular anticlockwise path in a flat plane with duration of 29.5 days, and with a single axial spin on its own axis.
Describe the Sun, Earth and Moon as approximately spherical bodies	Working scientifically, using models, pupils refer to a globe or appropriate spherical model and compare this with an equally sized 2D circle representation the sun, moon and earth and describe the difference.	celestial body sphere/spherical	With prompting, the Sun, Earth and Moon are described as <i>approximately</i> spherical bodies.	Independently, the Sun, Earth and Moon are described as approximately spherical bodies.	<ul style="list-style-type: none"> Describe with simple terminology as being, for example, ball shaped. Describe the Sun, Earth and moon as spherical. Describe the sun and moon as approximately spherical and the earth as an oblate spheroid.
Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky	Referring to a globe, or appropriate spherical model, and single light source; describe the shadow and how by rotating the spherical object parts will be in darkness and parts will be illuminated and this will change with rotation anticlockwise. Plot observation of a sundial gnomon to track and record the Sun's apparent movement. Observe effect using computer simulation e.g. Celestia.	rotate/rotation spin night and day shadow clocks sundials astronomical clocks	The idea of the Earth's rotation is used to explain day and night.	The idea of the Earth's rotation is used to explain day and night. Rotation is used to explain the apparent movement of the sun across the sky.	<ul style="list-style-type: none"> Describe how shadows change as the Sun appears to move across the sky. With reference to models and observations explain, in terms of the rotation of the Earth, why shadows change and the Sun appears to move across the sky during the course of the day. Explain times of sunrise and sunset in graphs. Shadows can assist in demonstrating the Sun's apparent movement.

Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object	Make observations of a range of objects of different mass and shape dropped without addition, thrust, or downward force, to record effect. Use secondary sources and models to discuss and report on the notion that all objects that have mass will fall towards the earth's surface.	magnetic force magnet attract fall Earth gravity	It is explained that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.	It is explained, with the aid of an independent diagram, that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.	<ul style="list-style-type: none"> Explain that any object dropped will fall towards the ground (outside) or floor surface inside. Explain with the aid of diagrams, that objects that have mass will fall to the earth's surface once released. This will include reference in annotated diagrams to objects not necessarily falling in a linear path i.e. comparing a sycamore seed with paper cup cake case. Explain with the aid of annotated diagrams of observations, that objects that have mass will fall to the earth's surface once released. Explain the effect of gravitational force in terms it how effects natural phenomena e.g. precipitation or Autumn leaves falling.
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<p>Identify the effects of air resistance, water resistance and friction, that act between moving surfaces</p>	<p>Investigate and record data for a range of comparative tests, using parachutes and paper helicopter designs of different dimensions. Investigate dragging and rolling objects on different textural surfaces. Investigate and record data for a range of comparative tests using a variety of boat designs, and dropping different sized and shaped plastisine objects in a tube/column of water.</p>	<p>air resistance water resistance friction moving surfaces</p> <p>comparative tests fair tests variables independent variable dependent variable controlled variable careful accurate accuracy precision degree of trust observations equipment gather measure record results evidence present data/evidence/results keys bar charts scatter graphs ine graphs table results conclusions causal relationships prediction support/refute</p>	<p>Generally, the effect of drag forces, such as air resistance, water resistance and friction that acts between moving surfaces, is identified.</p> <p>With support, falling objects begin to be explored and questions are raised about the effects of air resistance.</p> <p>Generally, the effects of air resistance are explored by observing how different objects such as parachutes and sycamore seeds fall.</p>	<p>The effect of drag forces, such as air resistance, water resistance and friction that acts between moving surfaces, is identified and debated.</p> <p>Without support, falling objects are explored and questions are raised about the effects of air resistance.</p> <p>The effects of air resistance are explored by observing and recording how different objects such as parachutes and sycamore seeds fall.</p>	<ul style="list-style-type: none"> • Explain with diagrams for reference that movement of objects is affected by an additional force. As the resistance to movement increases, the outcome can be observed and recorded. • Draw and annotate diagrams to illustrate forces acting on an object; including the direction to show friction acts in the opposing direction to motion. • Explain with reference to investigations that frictional force opposes motion in the form of either air, water, or between two surfaces in contact. Explain with reference to annotated sketches and graphs of data that surface area has an effect on force due to friction.
<p>Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect</p>	<p>Identify a range of household and everyday machines which allow a small force to have a greater effect: e.g. bottle openers, wheelbarrow. Plus application of simple machine e.g. changing wheel on a car</p> <p>Make observations and measurements using force meters of 1, 2 and 3 pulley systems to investigate mechanical advantage by lifting 1 kg mass vertically. Make observations and measurements using force meters to investigate simple lever mechanisms on both mechanical advantage, and distance travelled, regarding load and position of the fulcrum.</p>	<p>mechanisms levers pulleys gears force transfers weight, mass</p>	<p>Generally, good explanations of the effects of mechanisms in terms of force and effort are given.</p>	<p>The terms forces, mechanisms and effort are used fluently to describe transference of energy.</p>	<ul style="list-style-type: none"> • Draw and annotate diagrams. • Draw and annotate diagrams with generic terms i.e. lever, fulcrum, and pivot - tabulated results of investigation. • Draw and annotate diagrams with explanation– line graph results.

Key Stage 2, Year 6

National Curriculum for Science Learning Objective	Description	Vocabulary	Secure	Exceeding	Possible investigation/tasks for <u>progression</u> and further discussion
Describe how living things	Observable characteristics could include animals, habitat, diet, physical features e.g. endoskeleton or exoskeleton, number of legs etc.	organism micro-organisms fungus mushrooms flowering/non flowering, habitat , wind/animal	Generally, broad groups are identified and used to classify living things.	Broad groups to identify and classify living things are fully understood and, used	<ul style="list-style-type: none"> • Pupils distinguish between plants and animals grouping them in general terms.

are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals	Plants: flowering/non flowering, habitat, wind/animal pollinated, deciduous or evergreen etc.	pollinated, deciduous or evergreen, endoskeleton or exoskeleton classified	The terminology of similarities, differences, micro-organisms and animals is generally used when describing groups.	appropriately and justified clearly.	<ul style="list-style-type: none"> • Give examples of the five taxonomic groups of vertebrate animals: amphibians, reptiles, fish, birds and mammals or invertebrate: insects, arachnids, crustacean, worms etc. using keys . • Pupils write multi-step identification keys to classify an appropriate range of plants and animals..
Give reasons for classifying plants and animals based on specific characteristics	Use evidence from observations or secondary sources to explain reasons for classification. Pupils describe plants as being flowering or non-flowering; deciduous or evergreen: wind or animal pollinated. Animals as being vertebrate or invertebrate, warm or cold blooded.	classification keys environment fish amphibians reptiles birds mammals vertebrates invertebrates name some invertebrates arachnid mollusc insect crustacean	Generally, suggestions are given as to how to classify plants and animals, with reasons given for the classification.	Reasons for classifying plants and animals are explained and justified.	<ul style="list-style-type: none"> • Pupils describe animals as: <ul style="list-style-type: none"> – Having live births or laying eggs, in water or out. – Living on land or in water. – Having hair, fur, scales or feathers. • Pupils describe plants as: <ul style="list-style-type: none"> – Annual, biennial or perennial. – Fruit, cereal or vegetable giving reasons. • Pupils explain their own methodologies of classification of animals or plants using more than one factor.
Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood	Building on work in Years 3 and Year 4 on the main body parts and internal organs; pupils use secondary sources, models and analogies to describe the circulatory system in terms of transport of essential materials around the body.	circulatory system heart blood blood vessels pumps oxygen carbon dioxide lungs	Generally, the main parts of the human circulatory system are identified and named, and the functions of the heart, blood vessels and blood, including the pulse and clotting, are explained. Scientific names are used for some major organs of body systems and the position of these in the human body can be located.	Independently, the main parts of the human circulatory system are identified and named, and the functions of the heart (including the chambers and the valve) and the blood vessels (veins, arteries) and blood (including the pulse and clotting) are explained. The main functions of the organs of the human body are described without support.	<ul style="list-style-type: none"> • Pupils list the main parts of the circulatory system, including: heart, vein, artery, arteriole, capillary. • Pupils accurately label a diagram of the circulatory system, annotating the heart as a 'double pump' with arteries running away from the heart, capillaries linking arteries to veins (in organs) and veins running towards the heart. • Pupils identify the materials carried by the blood using correct vocabulary i.e. nutrients not food, oxygen and carbon dioxide not air, water, waste, urea.
Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function	Building on work in Year 2 on the importance for health of exercise and eating the right amounts of food; pupils use evidence from observations of practical activities, or research from secondary sources, to describe the impact of diet, exercise, drugs and lifestyle on the way their bodies function.	diet exercise drugs lifestyle	Generally, there is a good understanding on the impact of diet, exercise, drugs and lifestyle on the body's major organs.	There is a fluent and full understanding that diet, exercise, drugs and lifestyle affect many aspects of how the human body functions. Examples are given related to a number of different scenarios.	<ul style="list-style-type: none"> • Pupils list a number of factors both positive and negative that lifestyle might have on health. • Pupils describe the potential detrimental effects of under or over eating i.e. underdevelopment, anorexia, obesity leading to increased risk of type II diabetes, heart disease etc. • Pupils detail in scientific terms what is meant by a balanced diet and what the outcomes of having too much or too little of one particular food group might be. • Pupils explain the physiological effect of a drug e.g. in terms of raised heart rate the effects of caffeine. Analyse the effects of a range of lifestyle choices on health.
Describe the ways in which nutrients and water are transported within animals, including humans	Pupils use evidence from observations or research from secondary sources, to explain how water is absorbed into the body through ingested material.	Nutrients water transported distribute digestive system absorbed digested ingested	Generally, there is a good understanding of water absorption, the circulatory system, sweating and urination. With some fluency, comparisons of plants, animals and human water and nutrient transportation are made.	With some fluency, comparisons of plants, animals and human water and nutrient transportation are made.	<ul style="list-style-type: none"> • Pupils state that soluble nutrients and water are carried in blood (plasma). • Pupils describe that nutrients and water are transported from the digestive system to all cells, tissues and organs through the circulatory system. • Pupils associate the soluble nutrients from ingested and digested food: sugars from carbohydrates; lipids from fats and amino acids from proteins that are transported.
Recognise that living things have changed over time and that fossils provide information about living	Building on the work undertaken in Year 3 on the use of fossil records to find fuels.	Fossils, trace fossil, caste and mould fossil, sediment, fossil record	Generally, there is an understanding that living things have changed over time. Examples are given and fossil evidence used to describe living things that inhabited the Earth millions of years ago.	A wide range of examples are given to describe how living things have changed over time. Clear, well- structured examples show how fossil	<ul style="list-style-type: none"> • Pupils describe how a fossil was formed and that some have common identifiable features with living things; legs, feathers, leaves, shells. • Pupils analyse a number of different fossils and identify features that might suggest which modern animals might have evolved from them. • Pupils compare fossils of different species within a genus, suggesting how the families have changed over time. E.g. the tooth size of big cats or equine

things that inhabited the Earth millions of years ago				evidence can tell us about life on Earth millions of years ago.	hoof shape (or where appropriate skull shape and size from Cro-Magnon to modern human) • Note instances where there has been little change over millions of years e.g. spiders in amber or fossils of ferns in sandstone.
Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents	By building upon the work in Year 2 on offspring, and pupil's personal experience of family and friends, they compare images from a variety of secondary sources.	Offspring evolution characteristics vary/variation inherit/inheritance	It is recognised that living things produce offspring of the same kind, but that normally offspring vary and are not identical to their parents.	It is recognised independently that living things produce offspring of the same kind and explanations are given as to why offspring vary and are not identical to their parents.	<ul style="list-style-type: none"> • Pupils can identify by reference to physical characteristics how human children look like parents and siblings. • Pupils can identify a distinguishing characteristic within family groups. Eg. Roman nose or Hapsburg jaw. • Pupils can describe varying characteristics within breeds e.g. curly haired Poodle and straight haired Labrador and predict what coat a Labradoodle has. What makes a rose a rose? Stripy zebra have uniquely striped offspring.
Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution	Building upon work in Year 2, pupils use evidence from practical investigations/observations, or research from secondary sources, to give reasons why a plant or animal might be suited to its environment.	suited/suitable environment suited adapted/adaptation	Generally, good examples of how different animals and plants are suited to different environments are given. There is an awareness of how adaptation may lead to evolution.	Demonstrate many examples that explain how different environments suit different animals and plants. The theory of evolution is explained in basic terms.	<ul style="list-style-type: none"> • Pupils can describe in simple terms the term adaptation and relate this to one factor e.g. deciduous trees lose their leaves in winter, coniferous trees have small needle shaped leaves, cacti have fleshy stems to store water in a dry environment to reduce water loss. Elephants have big ears to help them stay cool. • Pupils can link a number of adaptations that a plant or animal has that increases its suitability to the environment e.g. an arctic fox having thick white fur as insulation and as camouflage to hide from predators or prey. • Pupils consider a number of different adaptations and make links to them being essential for survival over rivals; thus leading to evolution e.g. research Galapagos finches or giant tortoise.
Recognise that light appears to travel in straight lines	Pupils report findings from practical observations evidencing that light travels in straight lines.	Light light source names of light sources prism reflect refract e.g. torch dark/darkness direct/ direction	Without support, it is recognised that light appears to travel in straight lines.	It is clearly recognised that light appears to travel in straight lines and explanations are offered for why.	<ul style="list-style-type: none"> • Pupils can make simple statements evidencing that light travels in straight lines e.g. if I put an opaque solid object in front of the light source the light is blocked and the object forms a shadow. • Pupils make statements about how light appears to travel based on observable evidence. e.g. light appears to travel in straight lines from a laser pointer or when seen in dust. • Pupils build/use more complex arguments with evidence from a number of sources to explain how 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	Pupils draw conclusions from practical observations to evidence that objects are seen because light travels in straight lines. They use diagrams or models to illustrate their ideas.	reflect reflective Mirror transparent opaque translucent	Independently, idea that light travels in straight lines is used to explain that objects are seen because they give out or reflect light into the eyes.	The idea that light travels in straight lines is fully understood and used to explain that objects are seen because they give out or reflect light into the eyes.	<ul style="list-style-type: none"> • Pupils can explain that in order for an object to be seen it either needs to give out or reflect light. e.g. they describe that they cannot be seen in a dark room until the light is turned on or they shine a torch at the observer. • Pupils can explain what is meant by a field of view and investigate ways in which they can widen this field of view using mirrors. • Pupils can suggest or devise demonstrations that show proof that light appears to travel in straight lines, e.g. set up a series of card windows where a candle/light can be seen in straight lines only, or arrange a set of mirrors so that an image can be viewed from behind a screen at various points in a room.
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	Pupils draw conclusions from practical observations to evidence that objects are seen because light travels from a light source to their eyes in straight lines. They use diagrams or models to illustrate their reasoning.	Questions types of scientific enquiry observe notice comparative tests prediction fair tests variables dependent variable controlled variable accuracy precision degree of trust observations equipment gather measure record evidence present data/evidence/ results line graphs table conclusions	Generally, there is a good understanding of how we see. Explanations and diagrams are used to describe the process.	Fluent, clear and concise explanations and diagrams describe the process of seeing.	<ul style="list-style-type: none"> • Pupils can identify a range of different light sources and confidently state whether the light is emanating from the source or is reflected light from a different source e.g. things in the night sky; stars, aircraft lights as direct sources of light, and the moon or satellites as light reflected. • Pupils can represent light as a line on a diagram showing the path travelled as a straight line from the object to the eye. • Pupils can construct models or draw complex diagrams showing the path that light would take in a series of reflections in plane mirrors e.g. those that would be found in a periscope to see over walls, around corners or behind you.

<p>Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them</p>	<p>Pupils can describe the positional interrelationship between light source, object, and image in the production of shadows.</p>	<p>shadow block absorb</p>	<p>The idea that light travels in straight lines is used to explain why shadows have the same shape as the objects that cast them.</p> <p>With prompting, the size of shadows is predicted when the position of the light source changes.</p>	<p>The shape and size of shadows is predicted when the position of the light source changes.</p> <p>The experience of light is extended by looking at a range of phenomena, including rainbows, colours on soap bubbles, objects looking bent in water, and coloured filters.</p>	<ul style="list-style-type: none"> • Pupils can describe the size and shape of the shadow made by a number of different simple geometrical shapes i.e. a big square object will produce a big square shadow and a small triangular shape will produce a small triangular shadow. • Pupils can explain how the size of a shadow can be adjusted by moving the object closer or further away from the light source e.g. position two different sized squares so that they produce shadows of the same size. • Pupils can adjust the relative positions of objects and light sources, including placing them at different angles from the perpendicular, to change the size and dimensions of shadows at will; as in a puppet theatre.
<p>Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</p>	<p>Pupils build upon the work on electric circuits in Year 4, pupils design and assemble simple series circuits that contain a varying number of cells, lamps and buzzers.</p>	<p>Electricity appliances/device electrical circuit complete circuit circuit diagram circuit symbol components cell battery positive/negative terminal connect/connection increase Decrease identify observe notice patterns link comparative tests fair tests variables prediction independent variable dependent variable controlled variable careful accuracy precision observations equipment gather measure record results evidence present data/evidence/ scatter graphs line graphs table conclusions causal relationships</p>	<p>The brightness of a lamp or the volume of a buzzer is associated with the number and voltage of cells used in the circuit.</p>	<p>Independently, the brightness of a lamp or the volume of a buzzer is associated with the number and voltage of cells used in the circuit, and reasons are given for how changing the number of cells changes the observable results.</p>	<ul style="list-style-type: none"> • Pupils can safely and independently construct simple series circuits giving some general statements about how changing the number of cells changes observable results. • Pupils can undertake simple 'fair test' investigations and make general quantitative statements about how increasing or decreasing the number of cells affects the brightness of the lamps or loudness of the buzzers. • Pupils work systematically to investigate the quantitative results of increasing the total voltage of the cells used in the circuit on the brightness of lamps or the loudness of buzzers; producing reliable and repeatable results; accurately recording and reporting their findings.
<p>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</p>	<p>Pupils build upon the work on electric circuits in Year 4 to design and assemble simple series circuits that contain cells, lamps, buzzers and switches in varying positions around the circuit.</p>	<p>loose connection short circuit wire crocodile clip bulb bright/dim switch buzzer volume motor fast(er)/slow(er) conductor insulator metal/non metal voltage current resistance series circuit</p>	<p>With reminders, comparisons are made and reasons are given for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.</p>	<p>Without support, comparisons are made and reasons are given for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.</p>	<ul style="list-style-type: none"> • Pupils can safely construct simple series circuits giving some general statements about how changing the order of the components, or opening and closing switches, changes the observable results. • Pupils can undertake simple 'fair test' investigations and make general quantitative statements about how changing the positions or order of the components affects the brightness of the lamps or loudness of the buzzers. • Pupils work systematically to design a circuit to fulfil a specific task by changing the position of components, e.g. the total voltage of the switches or cells used in the circuit noting the brightness of lamps or the loudness of buzzers; recording and reporting their findings. • Pupils might suggest additional components and explore the effects of adding additional components e.g. a dimmer switch (variable resistor).
<p>Use recognised symbols when representing a simple circuit in a diagram</p>	<p>Pupils represent electrical components with their own symbols and progress to using recognised pictures or symbols.</p>	<p>Circuit symbol, cell, buzzer, motor, switch, wire, resistor, lamp etc</p>	<p>Generally, most recognised symbols are used appropriately.</p>	<p>Recognised symbols are known and used appropriately and consistently.</p>	<ul style="list-style-type: none"> • Pupil representations of electrical components are a mixture of pictures and symbols of their own design with or without a key. • Pupils use a mixture of pictures and symbols of their own design and standard symbols to represent electrical components including a key. • Pupils accurately and consistently use standard symbols. Wires connecting components are drawn with straight lines.

References

1. National Curriculum for Primary Science programme of study



2. Science Assessment Statements, Essex Education Services
3. Assessing Science, Chris Quigley Education
4. QCA Scheme of work; Primary Science.

