

# Science Curriculum

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## Science Curriculum

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## Science Curriculum

### Aims

**The National Curriculum for Science aims to ensure that all pupils:**

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

### Intent

**What are we trying to achieve for our children in Science?**

We want our children to be investigative scientists (able to observe, describe, illustrate, hypothesise, evaluate and interpret data) growing more independent in their learning, making them able to pose scientific questions to be investigated and make decisions on appropriate variables and methods to carry out their investigations. We aim to foster an environment which encourages children to be inquisitive and passionate about Science. Children will have the opportunity to revisit and build on their scientific knowledge, as well as have a better conceptual understanding of Science's application in the real world (especially with regards to global issues) by interleaving the lessons to allow for more frequent retrieval opportunities. Procedural fluency when working scientifically and semantic knowledge will be at the heart of our curriculum supported by a variety of appropriate experiences. Knowledge will be linked, both within Science and cross-curricularly to strengthen and deepen children's understanding of the Sciences. We aim to embed reading and vocabulary into our delivery of Science allowing children frequent opportunities for speaking and listening. The foundation of vocabulary will aid children with their critical thinking vocabulary and reasoning, as well as questioning, clarifying and justifying ideas, to develop their communication skills. In EYFS, the Early Learning Goal 'Understanding of the World' forms a foundation for later Science learning, but their curriculum has been designed to feed into and introduce the skills taught in KS1.

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### Implementation

#### How is the curriculum delivered?

- Through steps of milestone progression across year groups.
- Whole class differentiation through questioning and method of recording.
- Procedural fluency in Working Scientifically (achieved through repetition and practice) will be underpinned by semantic knowledge through the use of appropriate trips, visits and accessing the local library service.
- Content is grouped by scientific subject (Biology, Chemistry, Physics) to help build knowledge links between similar points.
- 2 hours per week delivered in all year groups in KS2 and 1 hour in KS1
- Teaching input is reflective of the pupils' stage of development; high expectations and motivation are always held.
- Content is revisited and recapped using a spaced curriculum model to embed knowledge (detailed further below).
- During the first year of each milestone, BASIC cognitive learning will take place to provide firm foundations of knowledge before ADVANCED and DEEP knowledge acquisition takes place in year 2 of each milestone.

### Impact

#### What difference is the curriculum making?

- Subject content is transferred to Long Term Memory - memory equates to knowledge.
- Clarity of endpoints of each milestone.
- Knowledge is connected through threshold concepts and Scientific areas, making strong, semantically rich schemas for learners.
- Greater knowledge will encourage deeper thinking across all areas of the curriculum.
- Learners will have a foundation of knowledge to support their next steps in education.
- Impact will be monitored by the science coordinators through children's work and progress as well as quality of teaching.

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### Spiral curriculum

Our curriculum is built upon evidence based cognitive science approaches to learning: spaced practice and interleaving. Spaced practice allows for longer breaks between learning opportunities which has been proven to be beneficial for long-term learning compared to massed practice where lessons are taught in blocks. Each term has three 'units' – Biology, Chemistry and Physics, in which a mix of topic areas are covered as opposed to a full half term on one unit i.e. 'plants' or 'electricity' - this is interleaving. Mixing topics in this way helps with spacing and has been shown to strengthen students' ability to choose which concept to apply to a problem. It also highlights the key differences between the three Sciences and helps children to build connections between various areas of learning. Some concepts are grouped when learning is new (Years 1-2) to help minimise overloading the children's working memory.

Forgetting is natural and beneficial – whatever we relearn, we remember better – and the ability to retrieve information improves as the time between learning and recall increases. How quickly we forget information is described as the 'forgetting curve'. Research shows that when repetitions of knowledge are spaced out over time, the slope of the forgetting curve slows. Spaced practice helps children to transfer new knowledge to long-term memory over time by allowing memories to fade and become less accessible before repetition. Repetition after this period of forgetting, signals to the brain that the knowledge is worth remembering and tends to produce stronger memories. Rest and sleep both improve long-term memory; by allowing the brain to rest for a while after learning, knowledge is consolidated.

Encountering information in different contexts (i.e. in different environments, having it presented by different teachers and in a range of scenarios, even the changing physical and emotional states of the learner) can all trigger stronger learning pathways to be created. In our curriculum, topics which had previously only been taught in one year group and not revisited, are now stretched across many years and therefore knowledge is repeatedly built on by different teachers in new learning environments.

An overview of how the Science National Curriculum learning objectives are spaced throughout our curriculum can be found below.

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### Threshold Concepts

In our curriculum, we define the threshold concepts which link all aspects of Science as:

**Diversity** - Our planet is a diverse place; as well as studying the diversity of species and ecosystems, we celebrate diversity through the study of famous Scientists.

**Matter** - Even though all living things have a beginning and an end, everything on our planet is made from molecular matter which cannot be destroyed. As scientists, we explore how plants and animals reproduce, live and eventually die thus passing their matter (or energy) on to another living thing along the food chain. We also explore how this process can be disrupted by our changing world. In Chemistry and Physics, all substances and objects are made up of particles, the structure of which defines its properties and functions.

**Interactive systems** - Interactive systems are in place across all Scientific domains: in Biology, we study the digestive and cardiovascular systems, as well as how living things interact with one another within their ecosystems in order to survive and thrive; in Chemistry, thermodynamics and chemical reactions, and in Physics, the solar system and electrical circuits.

**Measuring, recording and interpreting data** - As scientists, we investigate things for ourselves, making sure we predict outcomes and control certain variables to ensure testing is fair and results are reliable. Interpretation of this data leads us to make our own conclusions on scientific matters.

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### EYFS curriculum

Term introduced	What an EYFS Scientist needs to understand. (Biology, Chemistry, Physics)	What do they need to know?	How can they show they are Scientists?
Autumn	That there are 4 seasons in a year and each has their own characteristics.	<ul style="list-style-type: none"> <li>The names of all 4 seasons and discuss the features of each.</li> <li>Difference between weather and climate within the seasons.</li> <li>The effects of seasons on humans, plants and animals.</li> </ul>	<ul style="list-style-type: none"> <li>Dressing appropriately for the weather.</li> <li>Observing what they see, talking about it and drawing.</li> <li>Comparing leaves and how they change.</li> </ul>
	That the body is made up of different parts.	<ul style="list-style-type: none"> <li>The names of different body parts and their function.</li> <li>To know the 5 senses</li> </ul>	<ul style="list-style-type: none"> <li>Label parts of the body</li> <li>Use their 5 senses appropriately</li> </ul>
	That materials have different properties and functions.	<ul style="list-style-type: none"> <li>Properties of different materials and their uses.</li> <li>Name different types of materials, e.g. metal, plastic, wood, glass</li> <li>Name objects made from different materials</li> <li>Describe the properties of different materials using key vocabulary, e.g. hard, soft, shiny, rough and heavy.</li> </ul>	<ul style="list-style-type: none"> <li>Sort objects by their materials and properties</li> <li>Find different materials in their environment and describe their properties</li> <li>Experimenting the uses of materials for different purposes, e.g. waterproof cover for a cave.</li> </ul>
	That toys and other objects need a force in order to move	<ul style="list-style-type: none"> <li>Forces can be felt on us and we can exert a force on an object</li> </ul>	<ul style="list-style-type: none"> <li>Pushing and pulling toys</li> <li>Experimenting with playdough and cornflour</li> </ul>



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		<ul style="list-style-type: none"> <li>• Solid objects can be changed by squeezing, bending etc</li> </ul>	
<b>Spring</b>	<b>That we need to keep our bodies healthy.</b>	<ul style="list-style-type: none"> <li>• Ways to keep the body healthy</li> <li>• Healthy and unhealthy food</li> <li>• Moving and resting are good for the body</li> </ul>	<ul style="list-style-type: none"> <li>• Exercise to keep the body healthy</li> <li>• Making healthy food choices</li> <li>• Show different ways to keep their bodies fit by moving and resting</li> <li>• Links to Jigsaw PSHE scheme</li> <li>• School nurse teddy clinic</li> <li>• Dentist visit</li> </ul>
<b>Summer</b>	<b>That all living things have a lifecycle.</b>	<ul style="list-style-type: none"> <li>• The lifecycle of a plant.</li> <li>• The lifecycle of an animal.</li> <li>• Humans have a lifecycle.</li> <li>• A lifecycle is constant.</li> </ul>	<ul style="list-style-type: none"> <li>• Ordering a lifecycle.</li> <li>• Discuss the change of humans and plants as the lifecycle progresses.</li> <li>• Caring for eggs</li> <li>• Farm trip</li> </ul>
<b>Throughout the year</b>	<b>That there are similarities, differences, patterns and changes in nature.</b>	<ul style="list-style-type: none"> <li>• There are 4 seasons and the names.</li> <li>• The features of the seasons and what can be expected within them.</li> <li>• There are changes within our locality which we can observe.</li> </ul>	<ul style="list-style-type: none"> <li>• Make comments and observations of what they can see around them.</li> <li>• Compare leaves of different seasons and say how they are different.</li> <li>• Compare 2 pictures and say how they are the same and how they are different, commenting on weather, seasonal changes and saying why there is a difference.</li> </ul>
	<b>That there are different types of weather.</b>	<ul style="list-style-type: none"> <li>• Know the different types of weather and describe them.</li> </ul>	<ul style="list-style-type: none"> <li>• Observe weather and describe it.</li> <li>• Dress appropriately for the weather.</li> </ul>



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Throughout the year		<ul style="list-style-type: none"> <li>Names of the seasons and the features of the weather within them.</li> <li>Understand weather can change and why.</li> </ul>	
	That changes of state can occur within matter.	<ul style="list-style-type: none"> <li>Solids can change into a liquid through the process of melting.</li> <li>Liquids can turn into solids.</li> </ul>	<ul style="list-style-type: none"> <li>Experimenting with melting chocolate from solid to liquid</li> <li>Experimenting with freezing water into solid and then investigating ways to turn into liquid again.</li> <li>Ice used in continuous provision</li> </ul>
	That shadows are caused by an absence of light.	<ul style="list-style-type: none"> <li>The sun gives light during the day</li> <li>The night is dark because there is no sunlight.</li> <li>Shadows are made when something blocks the light</li> </ul>	<ul style="list-style-type: none"> <li>Experiment with making shadow puppets using torches</li> <li>Making shadows outside. Drawing around a friend's shadow.</li> </ul>

### Understanding the World Education Programme

Understanding the world involves guiding children to make sense of their physical world and their community. The frequency and range of children's personal experiences increases their knowledge and sense of the world around them – from visiting parks, libraries and museums to meeting important members of society such as police officers, nurses and firefighters. In addition, listening to a broad selection of stories, non-fiction, rhymes and poems will foster their understanding of our culturally, socially, technologically and ecologically diverse world. As well as building important knowledge, this extends their familiarity with words that support understanding across domains. Enriching and widening children's vocabulary will support later reading comprehension.

### ELG: The Natural World

Children at the expected level of development will:

- Explore the natural world around them, making observations and drawing pictures of animals and plants;

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- 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.

### Years 1 to Year 6 Curriculum

Year 1	Years 1 to Year 6 Curriculum			
	Diversity	Matter	Interactive systems	Measuring, recording and interpreting data
Biology Chemistry Physics	<ul style="list-style-type: none"> <li>• Introduce the names (and images) of: Wild and garden plants.</li> <li>• Introduce the names (and images) of: Evergreen and deciduous trees.</li> <li>• Introduce the names (and images) of: birds, fish, amphibians, reptiles, mammals and invertebrates.</li> <li>• Describe features/ observations of birds, fish, amphibians, reptiles, mammals and invertebrates.</li> <li>• Describe the offspring and growth of animals and humans into adulthood.</li> <li>• Identify how humans resemble their parents in many features.</li> <li>• Investigate the basic needs of animals and humans.</li> <li>• Introduce a range of everyday materials, including wood, plastic, glass, metal, water and rock.</li> </ul>	<ul style="list-style-type: none"> <li>• Introduce the structure of flowering plants.</li> <li>• Introduce the structure of trees</li> <li>• Describe and compare the structure of: birds, fish, amphibians, reptiles, mammals and invertebrates.</li> <li>• Identify the differences between things that are living, that are dead and have never been alive.</li> <li>• Introduce parts of the human body and associate parts of the body with the five senses.</li> <li>• Distinguish between an object and the material from which it is made. (and in doing so, identify and compare the uses</li> </ul>	<ul style="list-style-type: none"> <li>• Observe and describe how seeds and bulbs grow into mature plants.</li> <li>• Find out and describe how plants need water, light, a suitable temperature to grow and stay healthy.</li> <li>• Introduce the groups carnivore, herbivore, omnivore.</li> <li>• 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.</li> <li>• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.</li> <li>• Explain that we see sources of light because the light travels from the source to our eyes.</li> </ul>	<ul style="list-style-type: none"> <li>• Find out and describe how plants need water, light, a suitable temperature to grow and stay healthy.</li> <li>• Compare and group together a variety of everyday materials on the basis of their simple physical properties.</li> <li>• Discriminate between similar sounds.</li> <li>• Experiment with simple series circuits</li> </ul>

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	<ul style="list-style-type: none"> <li>Discriminate between different sounds.</li> <li>Identify the four seasons and observe changes in weather between them.</li> <li>Identify common appliances that run on electricity.</li> </ul>	<ul style="list-style-type: none"> <li>of a variety of everyday materials.)</li> <li>Describe the simple properties of a variety of everyday materials.</li> <li>Observe and name a variety of sources of light.</li> </ul>	<ul style="list-style-type: none"> <li>Observe and name a variety of sources of sound, noticing we hear with our ears</li> <li>Construct a simple circuit.</li> <li>Notice how things move, using simple comparisons such as faster and slower. Compare how different things move.</li> </ul>	
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Year 2	Diversity	Matter	Interactive systems	Measuring, recording and interpreting data
Biology Chemistry Physics	<ul style="list-style-type: none"> <li>Compare and contrast deciduous and evergreen trees.</li> <li>Categorise plants.</li> <li>Illustrate the main differences between birds, fish, amphibians, reptiles, mammals and invertebrates.</li> <li>Compare and contrast carnivores, herbivores and omnivores.</li> <li>Identify the different types of foods required.</li> <li>Identify and name a variety of plants and animals in their habitats, including microhabitats. Explain why a habitat for a plant or animal is suitable</li> </ul>	<ul style="list-style-type: none"> <li>Observe the structural features in a selection of (real) flowering plants.</li> <li>Compare and categorise things that are living, dead and never been alive.</li> <li>Distinguish between an object and the material from which it is made</li> <li>Group objects based on the materials they are made from. Explain groupings</li> <li>Compare and contrast the different properties of materials and use this to explain why certain materials are used for particular purposes</li> </ul>	<ul style="list-style-type: none"> <li>What are the similarities and differences in the growth of seeds and bulbs?</li> <li>Explain the differences in a food chain for a herbivore and a carnivore</li> <li>Identify what is needed for offspring to grow</li> <li>Explain why the sense of touch, smell and hearing are important to a blind person.</li> <li>Categorise a range of animals/plants according to the conditions they require. Explain categories</li> <li>Experiment with changing the shape of solid objects</li> </ul>	<ul style="list-style-type: none"> <li>Plan ways to revive a range of plants (using knowledge of what a plant needs to survive).</li> <li>Categorise materials on the basis of their properties. Explain reasons for groups.</li> <li>Categorise sounds. Compare and contrast sounds based on your own criteria.</li> <li>Notice that things fall down</li> </ul>

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	<ul style="list-style-type: none"> <li>Conclude differences between adult animals / humans and their offspring.</li> <li>Categorise food types and explain why each group is important to humans.</li> <li>Make links between generations in families. Present similarities and differences between parents and their children</li> <li>Compare and contrast weather and identify patterns in day length across the four seasons.</li> <li>Organise images or objects from each season into categories.</li> <li>Explain your categories.</li> <li>Compare and contrast electrical appliances i.e some create heat/ light/ cold</li> </ul>	<ul style="list-style-type: none"> <li>Categorise electrical appliances. Explain the reasons for your categories.</li> </ul>	<ul style="list-style-type: none"> <li>Experiment with ways to block light from reaching our eyes and make shadows, demonstrating that light travels from a source to our eyes.</li> <li>Notice that things require a force (push/pull) in order to move.</li> <li>Modify a circuit to add more components.</li> <li>Experiment with broken circuits and the effect that adding more components has.</li> </ul>	
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Year 3	Diversity	Matter	Interactive systems	Measuring, recording and interpreting data
	<ul style="list-style-type: none"> <li>Identify the different types of teeth in humans and their simple functions</li> </ul>	<ul style="list-style-type: none"> <li>Recognise that soils are made from rocks and organic matter.</li> <li>Identify that animals, including humans, need the right types and</li> </ul>	<ul style="list-style-type: none"> <li>Identify and describe the functions of different parts of flowering plants: <b>roots, stem/trunk, leaves</b> and <b>flowers</b></li> </ul>	<ul style="list-style-type: none"> <li>Observe that some materials change state when they are heated or cooled, and measure or research the</li> </ul>

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	<ul style="list-style-type: none"> <li>Recognise that living things can be grouped in a variety of ways</li> <li>Complete classification keys to help group, identify and name a variety of living things in their local and wider environment</li> <li>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</li> <li>Identify common appliances that run on electricity</li> </ul>	<p>amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat</p> <ul style="list-style-type: none"> <li>Identify that humans and some other animals have skeletons and muscles for support, protection and movement.</li> <li>Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</li> <li>Describe in simple terms how fossils are formed when things that have lived are trapped within rock</li> <li>Compare and group materials together, according to whether they are solids, liquids or gases</li> <li>Recognise that shadows are formed when the light from a light source is blocked by an opaque object</li> <li>Identify how sounds are made, associating some of them with something vibrating</li> <li>Recognise some common conductors and insulators, and associate metals with being good conductors.</li> </ul>	<ul style="list-style-type: none"> <li>Recognise the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow)</li> <li>Identify/describe and draw the way in which water is transported within plants</li> <li>Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</li> <li>Identify and label simple functions of the basic parts of the digestive system in humans</li> <li>Arrange and illustrate food chains, identifying producers, predators, prey, Herbivore, carnivore and omnivore</li> <li>Label names and functions of teeth inc structure</li> <li>Recognise that they need light in order to see things and that dark is the absence of light</li> <li>Notice that light is reflected from surfaces</li> <li>Compare how things move on different surfaces</li> <li>Notice that some forces need contact between two objects, but</li> </ul>	<p>temperature at which this happens in degrees Celsius (°C)</p> <ul style="list-style-type: none"> <li>Find patterns in the way that the size of shadows change.</li> <li>Describe magnets as having two poles</li> <li>Predict whether two magnets will attract or repel each other, depending on which poles are facing.</li> <li>Find patterns between the pitch of a sound and features of the object that produced it</li> <li>Find patterns between the volume of a sound and the strength of the vibrations that produced it</li> <li>Recognise that sounds get fainter as the distance from the sound source increases.</li> <li>Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery</li> </ul>
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# Christ Church CE, Lark Hill and Lewis Street Primary Schools



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			<p>magnetic forces can act at a distance</p> <ul style="list-style-type: none"> <li>• Observe how magnets attract or repel each other and attract some materials and not others</li> <li>• Recognise that vibrations from sounds travel through a medium to the ear</li> <li>• Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers (Inc. scientific symbols)</li> <li>• Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit</li> </ul>	
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Year 4	Diversity	Matter	Interactive systems	Measuring, recording and interpreting data
Biology Chemistry Physics	<ul style="list-style-type: none"> <li>• Categorise living things in a variety of ways</li> <li>• Follow and use classification keys to help group, identify and name a variety of living things in their local and wider environment</li> </ul>	<ul style="list-style-type: none"> <li>• Recognise that soils are made from rocks and organic matter.</li> <li>• Summarise that humans and some other animals have skeletons and muscles for <b>support, protection and movement</b>.</li> <li>• Teach others in simple terms how <b>fossils</b> are formed when things</li> </ul>	<ul style="list-style-type: none"> <li>• Summarise the functions of different parts of flowering plants: <b>roots, stem/trunk, leaves and flowers</b></li> <li>• Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and compare different plants.</li> </ul>	<ul style="list-style-type: none"> <li>• Infer from data that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in <b>degrees Celsius (°C)</b></li> </ul>

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	<ul style="list-style-type: none"> <li>• Categorise different kinds of rocks on the basis of their appearance and simple physical properties (<b>sedimentary, metamorphic and igneous</b>)</li> <li>• Correlate between the pitch of a sound and features of the object that produced it</li> </ul>	<p>that have lived are trapped within rock</p> <ul style="list-style-type: none"> <li>• Investigate whether substances are <b>solids, liquids or gases</b></li> <li>• Explain how magnets have two poles and Predict whether two magnets will attract or repel each other, depending on which poles are facing.</li> <li>• Illustrate how sounds are made, associating some of them with something vibrating</li> <li>• Design a switch which can be used to turn a simple circuit on and off based on knowledge of conductors and insulators.</li> </ul>	<ul style="list-style-type: none"> <li>• Investigate the way in which water is <b>transported</b> within plants</li> <li>• Display the part that flowers play in the life cycle of flowering plants, including <b>pollination, seed formation and seed dispersal.</b></li> <li>• Explain that animals, including humans, need the right types and amount of <b>nutrition</b>, and that they cannot make their own food; they get nutrition from what they eat</li> <li>• Describe the simple functions of the basic parts of the <b>digestive system</b> in humans</li> <li>• Compare and contrast the different types of teeth in humans and their simple functions</li> <li>• <b>Construct and interpret</b> a variety of food chains, identifying <b>producers, predators and prey.</b></li> <li>• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</li> <li>• Conclude how magnets attract or repel each other and attract some materials and not others</li> </ul>	<ul style="list-style-type: none"> <li>• Devise an investigation to show how things move on different surfaces</li> <li>• and that some forces need contact between two objects, but magnetic forces can act at a distance</li> <li>• Find correlation between the volume of a sound and the strength of the vibrations that produced it and that sounds get fainter as the distance from the sound source increases.</li> <li>• Plan an investigation to uncover common conductors and insulators, and associate metals with being good conductors.</li> <li>• Predict whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery</li> </ul>
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			<ul style="list-style-type: none"> <li>Compare and contrast everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials</li> <li>Recognise that vibrations from sounds travel through a medium to the ear</li> <li>Explain the importance of electricity and safety.</li> <li>Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, <b>switches</b> and buzzers</li> </ul>	
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Year 5	Diversity	Matter	Interactive systems	Measuring, recording and interpreting data
Biology Chemistry Physics	<ul style="list-style-type: none"> <li>Describe the changes as humans develop to old age mentally and physically.</li> <li>Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.</li> <li>Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents</li> </ul>	<ul style="list-style-type: none"> <li>Describe the life process of reproduction in some plants and animals.</li> <li>Describe the ways in which nutrients and water are transported within animals, including humans.</li> <li>Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.</li> </ul>	<ul style="list-style-type: none"> <li>Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</li> <li>Recognise the impact of diet, exercise and lifestyle on the way their bodies function</li> <li>Explain the changes the body goes through during puberty for boys and girls.</li> <li><b>Demonstrate that dissolving, mixing and changes of state are</b></li> </ul>	<ul style="list-style-type: none"> <li>Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</li> <li><b>Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</b></li> <li><b>Identify the effects of friction</b></li> </ul>

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	<ul style="list-style-type: none"> <li>Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals</li> <li>Give reasons for classifying plants and animals based on specific characteristics.</li> <li>Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution</li> <li>Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, and response to magnets.</li> <li>Discover the planets in our solar system and their movement relative to the Sun.</li> <li>Research astronauts</li> </ul>	<ul style="list-style-type: none"> <li>Compare everyday materials on the basis of their conductivity (electrical and thermal).</li> <li>Recognise that light appears to travel in straight lines.</li> <li>Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them</li> </ul>	<p>reversible changes</p> <ul style="list-style-type: none"> <li>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.</li> <li>Understand that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes</li> <li>Describe how unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.</li> <li>Recognise that some mechanisms, including gears, levers and pulleys, allow a smaller force to have a greater effect.</li> <li>Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in a simple circuit.</li> <li>Use recognised symbols when representing a simple circuit in a diagram.</li> <li>Compare and give reasons for</li> </ul>	<p>that acts between moving surfaces</p> <ul style="list-style-type: none"> <li>Identify the effects of water resistance</li> <li>Identify the effects of air resistance.</li> <li>Link electrical conductors/ insulators to thermal conductors/ insulators.</li> </ul>
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## Science Curriculum

			<p>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"> <li>Describe the movement of the Moon relative to the Earth and                             <ul style="list-style-type: none"> <li>Use the idea of the Earth's rotation to explain day, night and seasons and the apparent movement of the sun across the sky.</li> </ul> </li> </ul>	
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Year 6	Diversity	Matter	Interactive systems	Measuring, recording and interpreting data
Biology Chemistry Physics	<ul style="list-style-type: none"> <li>Summarise the 6 key stages of a human life and the changes which happen to humans mentally and physically as they develop to old age.</li> <li>Demonstrate the differences in the life cycles of a mammal, an amphibian, an insect and a bird.</li> <li>Organise living things by creating classification keys - common observable characteristics/ similarities and differences, including</li> </ul>	<ul style="list-style-type: none"> <li>Explain how living things changing over time and fossils support the fact that living things inhabited the Earth millions of years ago</li> <li>Illustrate and compare the differences in the ways in which nutrients and water are transported within living things.</li> <li>Explain artificial and natural reproduction in some plants and animals.</li> <li>Show how changes in a plant/ animal's environment can lead to evolution</li> </ul>	<ul style="list-style-type: none"> <li>Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</li> <li>Examine irreversible changes which result in the formation of new materials, including changes associated with burning and the action of acid on bicarbonate of soda</li> <li>Use the idea that light travels in straight lines to predict the direction of reflected light</li> <li>Explain that we see things in colour because light travels from</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate understanding of the main parts of the human circulatory system, as well as the functions of the heart, blood vessels and blood. Interpret HR data from a variety of animals</li> <li>Design a fair test to give reasons for the particular uses of everyday materials, including metals, wood and plastic.</li> <li>Explain that unsupported objects fall towards the Earth because of the force of gravity</li> </ul>

## Science Curriculum

	<p>microorganisms, plants and animals.</p> <ul style="list-style-type: none"> <li>● Give support for how living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents</li> <li>● Demonstrate how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution</li> <li>● Design a fair test to give reasons for the particular uses of everyday materials, including metals, wood and plastic.</li> <li>● Compare the night sky at different times in the year.</li> </ul>	<ul style="list-style-type: none"> <li>● Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</li> <li>● Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</li> </ul>	<p>light sources to our eyes or from light sources to objects and then to our eyes</p> <ul style="list-style-type: none"> <li>● Investigate the effects of water resistance and friction, that act between moving surfaces</li> <li>● Investigate how gears allow a smaller force to have a greater effect.</li> <li>● Construct circuits which clearly show how the brightness of a lamp or the volume of a buzzer are affected by the number and voltage of cells used in the circuit</li> <li>● 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 in parallel circuits.</li> <li>● Illustrate the movements of the Moon, Earth, and other planets, relative to the Sun in the solar system.</li> </ul>	<p>acting between the Earth and the falling object</p> <ul style="list-style-type: none"> <li>● Test the effects of air resistance</li> <li>● Prove that some mechanisms, including levers, pulleys, allow a smaller force to have a greater effect by creating a correlation graph</li> <li>● Investigate electrical conductors/ insulators and thermal conductors/ insulators within parallel circuits.</li> <li>● Analyse data which shows how the Earth's rotation explains day, night and seasons and the apparent movement of the sun across the sky.</li> </ul>
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## Science Curriculum

### Vocabulary

	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<b>Diversity</b>	sunflower broad beans  Arctic polar bear frozen camouflage  woodland hedgehog squirrel insects spider woodlouse snail bee  bird chick	plant dandelion daisy buttercup poppy    wild wildlife ladybird  dairy fruit vegetables	snowdrop bluebell tulip nettle dock clover rose evergreen coniferous deciduous  mammals reptiles amphibians fish adult life cycle offspring	Indigenous flowering plant non-flowering shrub grass algae fern succulent  warm-blooded cold-blooded carbohydrates protein fats oils  habitat	vertebrate invertebrate endoskeleton exoskeleton hydrostatic skeleton nocturnal  igneous sedimentary metamorphic magma fossils  convex concave	insects population  herbivore carnivore omnivore producer consumer molar canine incisor  palaeontology ammonite ichthyosaur plesiosaur ammonite  Carbohydrates	kingdom female male toddler adolescence variation inheritance Charles Darwin  planet crescent moon Gibbous moon Galileo Newton	species phylum class order family genus adaptation evolution genotype syndrome cardiologist natural selection  William Harvey Carl Linnaeus Mary Annings William Wallace fungi

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	chicken duckling duck  season Autumn Winter Spring Summer weather rain sun wind snow hail		oxygen  properties	garden rivers ponds sea rainforest microhabitat		proteins dairy fats sugars vitamins minerals fibre marble chalk granite sandstone slate  peat sandy/chalk/clay soil		
<b>Matter</b>	leaves flowers roots seed stem soil growth  body parts spine germs  materials wood plastic fabric metal	trunk branch bud bulbs  sunlight water food air  soft hard rough smooth waterproof	blossom petal fruit	opaque transparent translucent  absorbent movement respiration sensitivity growth reproduction excretion nutrition	crystals  stigma anther skeleton muscles pelvis cartilage tendon spine mouth teeth saliva oesophagus stomach small intestine large intestine	style stigma stamen  cochlea hammer organ pancreas intestine bicep tricep femur pelvis ribcage  energy	pollen anther filament ovary carpel pistil botanical illustration dissection  cell sperm egg embryo foetus gamete obese	chromosomes blood vessels capillaries atrium ventricles gene iris lens retina cornea pupil  micro-organism bacteria monera protista algae

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## Science Curriculum

	glass sand  star moon sun	shadow			rectum anus nutrients  solid liquid gas particles  light source conductor insulator	precipitation water vapour litter  matter state	oxygenated/ deoxygenated penis testicles breasts genitals  solute solvent solution  ray astronomical lunar spherical hemisphere longitude latitude	non-porous  colloid heterogeneous/ homogeneous
<b>Interactive Systems</b>	life cycle baby child parent  egg caterpillar cocoon butterfly  healthy hygiene  mirror	senses sight taste smell hearing touch  habitat  recyclable  squashing bending twisting	carnivore omnivore herbivore  temperature  orbit	food chain consumer predator producer prey oxygen exercise  force complete circuit	photosynthesis carbon dioxide nutrients fertiliser pollination seed dispersal seed formation  digestive system diet joint  refraction reflection	pollination reproduction chlorophyll xylem transpiration  food chain predators prey  salivary gland  melting freezing condensation	germination asexual/ sexual reproduction  fertilisation pregnancy gestation puberty menstruation metamorphosis  conductivity insulation dissolve evaporate	cardiovascular diffusion osmosis permeable/ semi-permeable membrane disease ultrasound drugs addiction alcohol cigarettes stimulant depressant



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	day night lighter darker  push pull	stretching squeezing  shadows			periscope magnetic pole attract repel orbit absorb pitch  appliance complete circuit cell battery positive/negative wire crocodile clip bulb bright/dim	evaporation development deforestation  vibrating medium auditory transmit sound waves  insulation components voltage current switch	friction filtering sieving melting reaction reactant product  prisms colour spectrum rainbow  air resistance parachute water resistance up-thrust mechanisms transfers levers rotation pulleys gears balancing force resistance force  buzzer emit  gravity mass	Thomas Edison turbine generator fuses motor streamlined  lunar phase equinox solstice
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## Science Curriculum

							weight (Newtons) orbit axis solar system eclipse	
<b>Measuring, recording and interpreting data</b>	look closely observe watch touch feel smell listen same different	stretch waterproof	opaque transparent absorbent battery wire	observe describe compare pictograph block graph bar chart	enquiry variables fair test investigate measure predict diagram classification classify components thermometer	temperature reversible irreversible process pitch note volume frequency	thermal transparency precision separate solubility insoluble anomalies elasticity rust oxidation	pulse filter mixture suspension concentration causal relationships correlation scatter graph

### Scientific sentence starters to be displayed on working walls:

- I wonder if...
- I predict that...
- My hypothesis was right/ wrong because...
- The evidence shows...
- This data suggests that...
- From my observations, I can conclude...
- Scientific research has shown that...

## Science Curriculum

- The pattern I noticed is...

### Useful Links

#### Resources

- Hamilton Trust: <https://www.hamilton-trust.org.uk/science/>
- STEM: <https://www.stem.org.uk/primary-science>
- Resources by year group:
- Explorify: <https://explorify.uk/>
- Explore Physics: <https://www.iop.org/explore-physics>

#### Content Knowledge

1. **Forces** - <https://drive.google.com/file/d/1syx6q7oDYoh3GcJ5TFoB0LCvIU4pKMee/view?usp=sharing>
2. **Energy** - <https://drive.google.com/file/d/1YtBHYgx4l11XeSx-CbT9bW8bjIJXU3ib/view?usp=sharing>
3. **Chemical Changes** - <https://drive.google.com/file/d/1c4hRxyXwJemciaF6ojfaba4NQFvPVGp4/view?usp=sharing>
4. **Genetics and Ecology** - <https://drive.google.com/file/d/122A6rcoXmlp1bTHBTuLbWikNjmSq4Zq7/view?usp=sharing>
5. **Electricity and Magnetism** - <https://drive.google.com/file/d/1ixajFpHUeQ4Zm0tGSM1spSt8RLd5H3sT/view?usp=sharing>
6. **Working Scientifically** - [https://drive.google.com/file/d/1Mq7F4p4Y\\_8Gi2JO5R6Xc2YNC8fsE0AmP/view?usp=sharing](https://drive.google.com/file/d/1Mq7F4p4Y_8Gi2JO5R6Xc2YNC8fsE0AmP/view?usp=sharing)
7. **Knowledge Mats** - [https://docs.google.com/presentation/d/1v9E8a\\_QlkxcZbfaTFsH7LqDFHkthAvVEL1LbvqtYDml/edit?usp=sharing](https://docs.google.com/presentation/d/1v9E8a_QlkxcZbfaTFsH7LqDFHkthAvVEL1LbvqtYDml/edit?usp=sharing)

## Science Curriculum

### Curriculum principles, including SEND adaptations

<b>Intent</b>	<p>Know more; remember more; do more</p> <p>Ambition for all pupils</p> <p>Have an understanding that science is for everybody; all people regardless of race, gender, religion or ethnicity can be a scientist</p> <p>Curriculum begins in EYFS through 'Understanding the world'</p> <p>Misconceptions anticipated and addressed</p> <p>Scientific, critical thinking skills develop throughout the curriculum</p> <p>Working scientifically skills taught explicitly and built on throughout spiral curriculum</p> <p>Curiosity and questioning encouraged</p> <p>Connections between subjects, themes and topics prepare pupils for future science education</p>
<b>Recall</b>	<p>Flashback quizzes used at the beginning of all lessons</p> <p>Concept mapping used in UKS2</p> <p>Chat &amp; play games encourage scientific skills/ communication</p> <p>End of term quizzes encourage pupils to actively remember knowledge</p> <p>Vocabulary on working wall and spiralised</p> <p>Word mats are used to support EAL &amp; SEND pupils' vocabulary</p> <p>Dual coding used to support pupils' understanding and recall</p> <p>Revisiting of skills from previous year groups throughout the spiral curriculum</p>

## Science Curriculum

<b>Memorisation</b>	<p>Dual coding helps pupils to make build schema for new learning</p> <p>My turn; your turn helps to learn new vocab</p> <p>Science starters encourage pupils to speak scientifically</p> <p>Spiral curriculum and lesson format: listen; read; repeat; remember; apply</p> <p>Talk activities allow pupils to embed knowledge</p> <p>Regular repetition of knowledge and skills</p>
<b>Assessment</b>	<p>Termly quizzes completed assessing knowledge from the term</p> <p>Achievement for All documents report on Science</p> <p>Working scientifically assessment (TAPS)</p> <p>Oral and written feedback provided</p> <p>POP tasks used in KS1 &amp; LKS2</p> <p>Concept mapping used in UKS2</p> <p>Science club (pre-teach)</p> <p>Self evaluation allows pupils to reflect on their learning and understanding</p>
<b>Oracy</b>	<p>P4C opportunities</p> <p>Presentation opportunities - this is a working scientifically skill (to present)</p> <p>Planned pair talk and group work improves social interactions e.g. team work &amp; listening skills</p> <p>My turn - your turn for new vocabulary - polysemous vocabulary identified throughout the curriculum</p> <p>Critical thinking opportunities (Explorify starters)</p> <p>Scientific sentence starters on displays encourage scientific communication</p>

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## Science Curriculum

	<p>Story starters throughout curriculum used as hooks - reading opportunities for pupils</p> <p>Sharing opinions and ideas</p>
<b>Adaptation</b>	<p>Deepening activities in lesson (reasoning and critical thinking)</p> <p>Moving on comments deepen HPA understanding</p> <p>Word mats available for LPA &amp; EAL</p> <p>Scaffolding/ writing frames provided for independent activities</p> <p>Staff deployment well considered</p> <p>Coloured backgrounds on all resources</p> <p>Multi sensory activities included throughout lessons</p> <p>Modelling of working scientifically skills</p> <p>Ear defenders/quiet spaces to complete work where necessary</p>
<b>Context and Relevance</b>	<p>Trips and visits for all year groups</p> <p>Experiential learning</p> <p>Science club</p> <p>Literacy links - story starters</p> <p>Classroom displays show diverse scientists</p> <p>Connections with local environment and community</p> <p>World affairs (e.g. global warming) and history (e.g. how knowledge has changed over time)</p>