

HCAT

Science Physics Curriculum

Purpose of study

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

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.

Subject content

Key stage 1

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

Lower Key stage 2 – years 3 and 4

The principal focus of science teaching in lower key stage 2 is to enable pupils to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.

‘Working scientifically’ is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.

Upper Key stage 2 – years 5 and 6

The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

‘Working and thinking scientifically’ is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read, spell and pronounce scientific vocabulary correctly.

Science – Physics

		KS1	LKS2	UPKS2
		Forces and Magnets	Type	
Effect			<p>I know how to compare how different objects move on the same surface.</p> <p>I know how to compare how the same objects move on different surfaces.</p>	<p>I know how to explain how balanced and unbalanced forces may affect the movement of an object.</p> <p>I know how to explore how different forces effect moving objects (gravity, air resistance, water resistance & friction).</p> <p>I know how to explain the effects of these forces.</p> <p>I know how to explain how levers, pulleys and gears allow a smaller force to have a greater effect.</p>
Magnets			<p>I know that magnets have two poles.</p> <p>I understand through investigation that two magnets can attract or repel each other.</p> <p>I know how to explore the behaviour of different strengths and types of magnets such as bar, ring, button & horseshoe.</p> <p>I know how to investigate and find out which materials are magnetic (metallic and none metallic).</p> <p>I know how to investigate whether all metals are magnetic (different metals, which are/aren't magnetic).</p> <p>I know how to identify how the properties of magnets make them useful in everyday items (strengths/types of magnets – magnets in a fridge door).</p>	

Science – Physics

		KS1	LKS2	UPKS2
Light	Function		<p>I know how to explain that light is need to be able to see.</p> <p>I know how to explain that darkness is the total absence of light.</p> <p>I know how to identify different light sources: fire, bulb, sun.</p>	<p>I know how to explore how different light sources and conditions affect our ability to see (testing quality of light sources, altering darkness and using different materials).</p>
	Seeing		<p>I understand that light from the sun can be dangerous.</p> <p>I know how to identify ways to protect eyes from the sun.</p> <p>I understand that reflection is a process where light hits a surface and bounces back into our eyes (all objects reflect light In order for us to see them, but reflective objects reflect light well, i.e. a mirror).</p>	<p>I know how to explain that objects are seen because they give out or reflect light into the eye.</p> <p>I know how to explain how different colours can be seen.</p>
	Travelling		<p>I understand that light travels in rays.</p> <p>I know how to investigate how light behaves (using a mirror to show light reflecting).</p> <p>I know how to recognise that shadows are formed when light is blocked from an opaque object.</p> <p>I know how to explore patterns in the way that shadows change (i.e. distance of light source, type of material: opaque, translucent, and transparent).</p>	<p>I understand that light travels in straight lines.</p> <p>I know how to investigate the angles of incidence and reflection.</p> <p>I know how to investigate how refraction changes the direction in which light travels.</p> <p>I know how to investigate how a prism changes a ray of light.</p> <p>I know how to explain why shadows have the same shape as the object that casts them.</p>

Science – Physics

		KS1	LKS2	UPKS2
Electricity	Uses		<p>I understand what electricity is (a form of energy resulting from the existence of electrical current).</p> <p>I understand that some items require electricity to work and function.</p> <p>I know how to group items, which use an alternating current (mains electricity) or direct current (a battery/cell).</p> <p>I know how to identify common conductors and insulators.</p> <p>I understand the uses of different conductors and insulators.</p>	
	Making circuits		<p>I know how to identify each component of an electrical circuit (cells, wires, bulbs, buzzers & switches).</p> <p>I know how to construct a simple series circuit.</p> <p>I know how to draw a pictorial representation of a circuit (NOT using symbols – these to be taught in Y6).</p> <p>I know how to explain how a switch works and why they are needed (to open and close a circuit and stop the electrical current).</p>	<p>I know how to explain what voltage means (voltage is a force that makes electricity move through a wire).</p> <p>I know how to explain what current means (current is the flow of electric charge, a current flows through a circuit when a voltage is present).</p> <p>I know how to recognise the symbols that represent the parts of a circuit (bulb, buzzer, motor, cell, wire, lamp, open switch, closed switch).</p> <p>I know how to use symbols when drawing a diagram of a circuit.</p> <p>Note: children are expected to learn only about series circuits, not parallel circuits.</p>
	Investigating circuits		<p>I know how to investigate the way that bulbs work in different circuits (exploring the brightness of bulbs).</p> <p>I know how to identify whether a bulb will light or not based on the circuit.</p> <p>I know how to give reasons why a bulb does not light up in an electrical circuit.</p>	<p>I understand that the brightness of a bulb or volume of a buzzer is related to the voltage of cells used in that circuit.</p> <p>I know how to compare and explain variations in how components function (brightness of bulbs, loudness of buzzer, on/off switches).</p>

Science – Physics

		KS1	LKS2	UPKS2
Seasonal Changes	Four seasons	I know how to identify each of the four seasons. I know how to make observations about each season. I know how to identify the changes that happen in each of the four seasons. I know how to identify the differences between the four seasons. I know how to identify how the length of the day varies during different seasons.		
	Weather	I know how to identify different types of weather (relating to the UK). I know how to make observations about the weather in each season. I know how to describe the weather in each season. I know how to compare the weather in different seasons.		


Science – Physics

		KS1	LKS2	UPKS2
Sound	Function		<p>I understand that sounds are made through vibrations.</p> <p>I know how to identify different sources of sound.</p>	
	Hearing		<p>I know how to recognise that sounds travel from a source to an ear.</p> <p>I know how to investigate ways that different mediums absorb sound.</p> <p>I know how to investigate patterns between the pitch of a sound and features of the object that produced it (different types of instruments, water in bottles, ruler flicked on table).</p> <p>I know how to investigate patterns between the volume of a sound and the strength of the vibrations that produced it.</p>	
	Travelling		<p>I understand that sound travels in waves.</p> <p>I understand that the amplitude of waves effects the volume (taller the waves, louder the sound).</p> <p>I understand that the speed of vibrations effect the pitch (closer the waves, higher the pitch).</p> <p>I know how to explain how sound can travel through solids, liquids and gasses but not a vacuum (sound energy travels from particle to particle).</p>	

Science – Physics

		KS1	LKS2	UPKS2
		Earth and Space	Solar System	
	Sun, Earth & Moon			<p>I understand the difference between a star, planet and celestial body.</p> <p>I know how to explain that the Sun, Earth and Moon are spherical.</p> <p>I know how to use scientific evidence to support the argument that the Sun, Earth & Moon are all spherical.</p> <p>I know how to describe the movement of the Moon relative to the earth (investigate the phases of the moon).</p>
	Day & Night			<p>I know how to explain how day and night relate to the rotation of the Earth.</p> <p>I know how to explain how the rotation of the Earth affects the length of a year.</p> <p>I know how to investigate night and day in different parts of the Earth (investigate longitude and latitude – day and night at different times and durations).</p>

Science – Physics

Science Curriculum in EYFS			
	<p>Understanding the world (educational programme) The natural world : 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.</p>		
Skills and knowledge (Fluid across FS1 FS2)	What does this look like in provision/adult interactions?	Transition into Year 1	Characteristics of effective learning
<ul style="list-style-type: none"> - Explore materials with different properties. - Explore natural materials, indoors and outside (0-3). 	<ul style="list-style-type: none"> - Treasure Baskets for repeated exploration of textures, sounds, smells, and tastes. - Offer lots of different textures for exploration with fingers, feet, and whole body e.g. wet and dry sand, water, paint, and playdough. 	<p>Biology</p> <ul style="list-style-type: none"> - I can explain what a plant is (A plant is a living organism that usually grows in a permanent site, using water for food). - I can identify and name some common plants and trees. - I can name some native plants to the UK. - I can describe the basic structures of a plant. - I can name some common animals. - I can identify and name different animals that are carnivorous, herbivorous, or omnivorous. - I can name the different parts of an animal’s body. - I can recognise and name parts of the body. - I can name the five senses. - I can say which part of the body is associated with each sense. <p>Chemistry</p> <ul style="list-style-type: none"> - I can identify what material an object is made from. - I can identify a range of common materials. - I know the names of different everyday materials. - I can describe materials by saying what they look like and what they feel like. - I can compare materials using the physical properties of them. - I can use my knowledge of the properties of materials to sort them into groups. - I can explain how I have grouped materials based on their physical properties. 	<p>Children in EYFS learn at different rates and abilities through:</p> <ul style="list-style-type: none"> • Playing and exploring – children investigate and experience things, and ‘have a go’. • Active learning – children concentrate and keep on trying if they encounter difficulties and enjoy achievements. • Creating and thinking critically – children have and develop their own ideas, make links between ideas, and develop strategies for doing things.
<ul style="list-style-type: none"> - Use all their senses in hands on exploration of natural materials. - Explore collections of materials with similar and/or different properties. - Explore how things work (3-4). 	<ul style="list-style-type: none"> - Provide interesting natural environments for children to explore freely outdoors. Make collections of natural materials to investigate and talk about. - Provide equipment to support these investigations: magnifying glasses. Encourage children to talk about what they see. Model observational and investigational skills. Ask out loud: “I wonder if...?” Plan and introduce new vocabulary, encouraging children to use it to discuss their findings and ideas. - Provide mechanical equipment for children to play with and investigate e.g., wind-up toys, pulleys, sets of cogs with pegs and boards. 		
<ul style="list-style-type: none"> - 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 (3-4). 	<ul style="list-style-type: none"> - Show and explain the concepts of growth, change and decay with natural materials: plant seeds and bulbs so children observe growth and decay over time, eggshell experiment on science week (seeing how different liquids effect eggshells). - Life cycle of a chick, have incubators in linked around learning and topic. Plan and introduce new vocabulary related to the exploration. Other options to investigate life cycle e.g. butterfly. 		
<ul style="list-style-type: none"> - Talk about the differences between materials and changes they notice (3-4). - Explore and talk about different forces they can feel (3-4). 	<ul style="list-style-type: none"> - Draw children’s attention to forces e.g., 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. - Provide children with opportunities to change materials from one state to another e.g. 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. Link to science week. 		
<ul style="list-style-type: none"> - Explore the natural world around them. - Describe what they see, hear, and feel whilst outside. - Understand the effect of changing seasons on the natural world around them (4-5). 	<ul style="list-style-type: none"> - Provide children with have frequent opportunities for outdoor play and exploration. - 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. - Look for children incorporating their understanding of the seasons and weather in their play. 		
<p>Early Learning Goals</p> <ul style="list-style-type: none"> • Explore the natural world around them, making observations and drawing pictures of animals and plants • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. 			