



## Science at The Stoke Poges School

### Curriculum Approach

At The Stoke Poges School, children's discovery of the world around them and their awareness of place begins in Early Years Foundation Stage, where children begin to recognise similarities and differences in relation to places, objects, materials and living things. They begin to explain why some things occur and talk about changes.

Our KS1 and KS2 Science curriculum is designed to ensure pupils are achieving the three key aims of the National Curriculum. This states that through science teaching, all pupils:

- Develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- Develop an 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

<b>Ongoing Themes</b>	<ul style="list-style-type: none"><li>• <b>Working Scientifically</b> – underpins all year groups</li><li>• <b>Animals including humans</b> – covered by all year groups</li><li>• <b>Living things and their habitats</b> – covered by years 2, 4, 5 and 6</li><li>• <b>Plants</b> – covered by years 1, 2 and 3</li><li>• <b>Electricity</b> – covered by years 4 and 6</li><li>• <b>Forces</b> - covered by years 3 and 5</li><li>• <b>Light</b> - covered by years 3 and 6</li><li>• <b>Sound</b> – covered by year 4</li><li>• <b>Materials</b> – covered by years 1, 2, 3, 4 and 5</li></ul>
<b>The Core Concepts of Science</b>	<p><b><u>Physics</u></b></p> <ul style="list-style-type: none"><li>• The universe follows unbreakable rules that are all about forces, matter and energy</li><li>• Forces are different kinds of pushes and pulls that act on all matter that is in the universe. Matter is all the stuff, or mass, in the universe</li><li>• Energy, which cannot be created or destroyed, comes in many different forms and tends to move away from objects that have lots of it</li></ul> <p><b><u>Chemistry</u></b></p> <ul style="list-style-type: none"><li>• All matter (stuff) in the universe is made up of tiny building blocks</li><li>• The arrangement, movement and type of the building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (e.g. hot/cold, soft/hard, light/heavy etc)</li><li>• Matter can change if the arrangement of these building blocks change</li></ul> <p><b><u>Biology</u></b></p> <ul style="list-style-type: none"><li>• Living things are special collections of matter that make copies of themselves, use energy and grow</li></ul>

- Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago
- The different kinds of life, animals, plants, and micro-organisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live

#### **Earth science**

- The Earth is one of eight planets that orbit the sun
- The Earth is tilted and spins on its axis leading to day and night, the seasons and the climate
- The Earth is made up of several layers, including a relatively thin rocky surface which is divided into tectonic plates, and the movement of these plates leads to many geologic events (such as earthquakes and volcanoes) and geographical features (such as mountains)

The knowledge across the three disciplines of science builds sequentially with pupils often revisiting an idea again in a later unit. In Biology, pupils develop their knowledge of organisms, ecosystems and genes. In Chemistry, pupils develop the knowledge of materials, uses of materials and how materials can change. In Physics, pupils develop their knowledge of forces, energy and space.

### **Developing Skills of Working Scientifically**

Science in our school is about developing children's ideas and ways of working which enable them to make sense of the world through investigation, as well as using and applying process skills. The pupils at Stoke Poges work scientifically in a meaningful way. They gain the necessary knowledge first, before working scientifically to deepen and explore this knowledge further. Scientific enquiry is mapped out against the units to ensure balance and coverage.

### **The Principles for teaching and learning Science at The Stoke Poges School**

- All children are active and engaged in their learning
- Scientific resources are organised, accessible and used effectively to optimise learning
- Science lessons include a wide variety of activities. These activities are practical, engaging and 'hands'-on'
- Children and adults use appropriate scientific vocabulary to explain their thinking
- Science displays are used to support learning
- Science lessons are related to the real world and meaningful cross-curricular links are made
- Children have fun, are challenged and make good progress



**Science in Early Years Foundation Stage**

The EYFS framework is structured very differently to the National Curriculum as it is organised across seven areas of learning rather than subject areas. This document demonstrates which statements from the 2020 Development Matters are prerequisite skills for Science within the National Curriculum. The table below outlines the most relevant statements taken from the Early Learning Goals in the EYFS statutory framework and the Development Matters age ranges for Three and Four-Year-Olds and Reception to match the programme of study for Science.

Science		
Expected Previous Learning (3 and 4-Year-Olds)	Communication and Language	<ul style="list-style-type: none"> <li>Understand 'why' questions, like: 'Why do you think the caterpillar got so fat?'</li> </ul>
	Physical Development	<ul style="list-style-type: none"> <li>Make healthy choices about food, drink, activity and tooth brushing.</li> </ul>
	Understanding the World	<ul style="list-style-type: none"> <li>Use all their senses in hands-on exploration of natural materials.</li> <li>Explore collections of materials with similar and/or different properties</li> <li>Talk about what they see, using a wide vocabulary</li> <li>Begin to make sense of their own life-story and family's history</li> <li>Explore how things work</li> <li>Plant seeds and care for growing plants</li> <li>Understand the key features of life cycle of a plant and an animal</li> <li>Begin to understand the need to respect and care for the natural environment and all living things</li> <li>Explore and talk about different forces they can feel</li> <li>Talk about the differences between materials and changes they notice</li> </ul>
Reception	Communication and Language	<ul style="list-style-type: none"> <li>Learn new vocabulary</li> <li>Ask questions to find out more and to check what has been said to them</li> <li>Articulate their ideas and thoughts in well-formed sentences</li> <li>Describe events in some detail</li> <li>Use talk to work out problems and organise thinking and activities. Explain how things work and why they might happen</li> <li>Use new vocabulary in different contexts</li> </ul>
	Physical Development	<ul style="list-style-type: none"> <li>Know and talk about the different factors that support their overall health and wellbeing:               <ul style="list-style-type: none"> <li>Regular physical activity</li> <li>Healthy eating</li> <li>Tooth brushing</li> <li>Sensible amounts of 'screen time'</li> <li>Having a good sleep routine</li> </ul> </li> </ul>

			<ul style="list-style-type: none"> <li>• Being a safe pedestrian</li> </ul>
	Understanding the World		<ul style="list-style-type: none"> <li>• Explore the natural world around them</li> <li>• Describe what they see, hear and feel while they are outside</li> <li>• Recognise some environments that are different to the one in which they live</li> <li>• Understand the effect of changing seasons on the natural world around them</li> </ul>
<b>ELG</b>	Communication and Language	Listening, Attention and Understanding	<ul style="list-style-type: none"> <li>• Make comments about what they have heard and ask questions to clarify their understanding</li> </ul>
	Personal, Social and Emotional Development	Managing Self	<ul style="list-style-type: none"> <li>• Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices</li> </ul>
	Understanding the World	The Natural World	<ul style="list-style-type: none"> <li>• Explore the natural world around them, making observations and drawing pictures of animals and plants</li> <li>• 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</li> <li>• Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter</li> </ul>

**Children in the EYFS setting are beginning to explore, show resilience and build confidence in Science by:**

- Building a foundation of scientific vocabulary and language
- Developing a questioning ethos through adult interactions, inside and outside environment and resources
- Careful planning which includes links to and exploration of the natural world woven throughout the year where it is most appropriate and relevant
- Problem solving in the inside and outside provision through open ended resources and tasks
- Investigating scientific questions in the environment through adult led tasks and adult initiated activities



**Key Stage 1 and 2 Science Overview**

In Key Stage 1 and Key Stage 2 we follow a yearly cycle. In line with the National Curriculum, all of the relevant POS will be taught by the end of the key stage.

Science Progression						
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Autumn Term	<b>Seasons (part 1)</b> Physics  <b>Everyday materials</b> Chemistry	<b>Use of everyday materials</b> Chemistry	<b>Light</b> Physics  <b>Rocks</b> Chemistry	<b>Electricity</b> Physics  <b>Animals, including humans</b> Biology	<b>Earth in space</b> Physics  <b>Forces</b> Physics	<b>Evolution and inheritance</b> Biology  <b>Animals, including humans</b> Biology
Spring Term	<b>Animals, including humans</b> Biology	<b>Living things and their habitats</b> Biology	<b>Animals, including humans</b> Biology  <b>Plants</b> Biology	<b>Living things and their habitats</b> Biology  <b>States of matter</b> Chemistry	<b>Uses and properties of materials</b> Chemistry	<b>Light</b> Physics
Summer Term	<b>Plants</b> Biology  <b>Seasons (part 2)</b> Physics	<b>Plants</b> Biology  <b>Animals, including humans</b> Biology	<b>Forces and magnets</b> Physics	<b>Sound</b> Physics  <b>Animals, including humans</b> Biology	<b>Living things and their environment</b> Biology  <b>Animals, including humans</b> Biology	<b>Electricity</b> Physics  <b>Living things and their habitats</b> Biology

<b>Year 1</b>	Observe plants throughout the year / observe seasonal changes throughout the year (including sunlight, weather and link with plants)
<b>Year 2</b>	Observe plants and animals in the local environment throughout the year
<b>Year 4</b>	Use the local environment throughout the year to identify, study and observe changes in plants and animals in their habitats/ use seasonal changes to observe effect on light, plants and living things
<b>Year 5</b>	Observe life cycles of plants and animals in the local environment throughout the year



Key Stage 1 and 2 Science Knowledge Progression

National Curriculum statements in red are from other linked topics

National Curriculum: Animals, including humans					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p>Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.</p> <p>Identify and name a variety of common animals that are carnivores, herbivores and omnivores.</p> <p>Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets).</p> <p>Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.</p>	<p>Notice that animals, including humans, have offspring which grow into adults.</p> <p>Find out about and describe the basic needs of animals, including humans, for survival (water, food and air).</p> <p>Describe the importance of humans and exercise, eating the right amounts of different types of food, and hygiene.</p>	<p>Identify that animals, including humans, need the right types and amounts of nutrition, and that they cannot make their own food; they get nutrition from what they eat.</p> <p>Identify that humans and some other animals have skeletons and muscles for support, protection and movement.</p>	<p>Describe the simple functions of the basic parts of the digestive system in humans.</p> <p>Identify the different types of teeth in humans and their simple functions.</p> <p>Construct and interpret a variety of food chains, identifying producers, predators and prey.</p>	<p>Describe the changes as humans develop to old age.</p> <p>Learn about the changes experienced in puberty.</p> <p>Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird (Y5 – Living things and their habitats)</p> <p>Describe the life process of reproduction in some plants and animals (Y5 – Living things and their habitats)</p>	<p>Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.</p> <p>Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.</p> <p>Describe the ways in which nutrients and water are transported within animals, including humans.</p> <p>Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals (Y6 – Living things and their habitats)</p> <p>Give reasons for classifying plants and animals based on specific characteristics (Y6 – Living things and their habitats)</p>
<p><b>Key stage 3</b></p> <ul style="list-style-type: none"> <li>Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproduction systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta.</li> <li>The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases.</li> </ul>					

- The effects of recreational drugs (including substance misuse) on behaviour, health and life processes.
- The structure and functions of the gas exchange system in humans, including adaptations to function.
- The mechanism of breathing to move air in and out of the lungs.
- The impact of exercise, asthma and smoking on the human gas exchange system.

### National Curriculum: Plants

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p>Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.</p> <p>Identify and describe the basic structure of a variety of common flowering plants, including trees.</p> <p>Use their local environment throughout the year to explore and answer questions about plants growing in their habitat.</p>	<p>Observe and describe how seeds and bulbs grow into mature plants.</p> <p>Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.</p> <p>Identify and name a variety of plants and animals in their habitats, including microhabitats (Y2 – Living things and their habitats)</p>	<p>Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers.</p> <p>Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant.</p> <p>Investigate the way in which water is transported within plants.</p> <p>Know that plants make their own food.</p> <p>Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</p>	<p>Recognise that living things can be grouped in a variety of ways (Y4 – Living things and their habitats)</p> <p>Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment (Y4 – Living things and their habitats)</p> <p>Recognise that environments can change and that this can sometimes pose dangers to living things (Y4 – Living things and their habitats)</p>	<p>Describe the life process of reproduction in some plants and animals (Y5 – Living things and their habitats)</p>	<p>Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals (Y6 – Living things and their habitats)</p> <p>Give reasons for classifying plants and animals based on specific characteristics (Y6 – Living things and their habitats)</p>

#### Key Stage 3

- Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms.

National Curriculum: Living things and habitats

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p>Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees (Y1 – Plants)</p> <p>Identify and describe the basic structure of a variety of common flowering plants, including trees (Y1 – Plants)</p> <p>Identify and name a variety of common animals, including fish, amphibians, reptiles, birds and mammals (Y1 – Animals, including humans)</p> <p>Describe and compare the structure of a variety of common animals (Y1 – Animals, including humans)</p> <p>Observe changes across the four seasons (Y1 – Seasonal change)</p>	<p>Explore and compare the differences between things that are living, dead, and things that have never been alive.</p> <p>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.</p> <p>Identify and name a variety of plants and animals in their habitats, including micro-habitats.</p> <p>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.</p> <p>Notice that animals, including humans, have offspring which grow into adults (Y2 – Animals, including humans)</p>	<p>Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal (Y3 – Plants)</p>	<p>Recognise that living things can be grouped in a variety of ways.</p> <p>Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.</p> <p>Recognise that environments can change and that this can sometimes pose dangers to living things.</p> <p>Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 – Animals, including humans)</p>	<p>Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.</p> <p>Describe the life process of reproduction in some plants and animals.</p> <p>Find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals.</p>	<p>Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals.</p> <p>Give reasons for classifying plants and animals based on specific characteristics.</p> <p>Know that broad groups, such as micro-organisms, plants and animal can be sub-divided.</p> <p>Be able to classify animals into commonly found vertebrates and invertebrates.</p>

**Key Stage 3**

- Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms.



### National Curriculum: Evolution and inheritance

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	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. (Y2 – Living things and their habitats)	Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 – Rocks)	Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 – Living things and their habitats)		Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.  Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.  Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

**Key Stage 3**

- Heredity as the process by which genetic information is transmitted from one generation to the next.
- A simple model of chromosomes, genes and DNA in heredity, including the part played by Wason, Crick, Wilkins and Franklin in the development of the DNA model.
- The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection.
- Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction.

### National Curriculum: Seasonal Change

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Observe changes across the four seasons.  Observe and describe weather associated with the seasons and how day length varies.		Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 – Light)		Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. (Y5 – Earth and space)	

**Key Stage 3**

- The seasons and the Earth's tilt, day length at different times of year, in different hemispheres.

## National Curriculum: Materials

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p>Distinguish between an object and the material from which it is made.</p> <p>Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock.</p> <p>Describe the simple physical properties of a variety of everyday materials.</p> <p>Compare and group together a variety of everyday materials on the basis of their simple physical properties.</p>	<p>Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.</p> <p>Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.</p>	<p style="color: red;">Compare and group together different kinds of rock on the basis of their appearance and simple physical properties. (Y3 – Rocks)</p> <p style="color: red;">Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Y3 – Rocks)</p> <p style="color: red;">Recognise that soils are made from rocks and organic matter. (Y3 – Rocks)</p>	<p>Explore a variety of everyday materials and develop simple descriptions of the states of matter.</p> <p>Compare and group materials together, according to whether they are solids, liquids or gases.</p> <p>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.</p> <p>Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</p>	<p>Compare and group together everyday materials based on their properties: hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.</p> <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>Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.</p> <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>Demonstrate that dissolving, mixing and changes of state are reversible changes.</p> <p>Explain that some changes result in the formation of new materials, and that change is not usually reversible: changes from burning and the action of acid on bicarbonate of soda.</p>	

### Key Stage 3

- Chemical reactions as the arrangement of atoms.
- Representing chemical reactions using formulae and using equations.
- Combustion, thermal decomposition, oxidation and displacement reactions.
- Defining acids and alkalis in terms of neutralisation reactions. The pH scale for measuring acidity/alkalinity; and indicators.

### National Curriculum: Rocks

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p>Distinguish between an object and the material from which it is made. (Y1 – Everyday materials)</p> <p>Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock. (Y1 – Everyday materials)</p> <p>Describe the simple physical properties of a variety of everyday materials. (Y1 – Everyday materials)</p> <p>Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 – Everyday materials)</p>	<p>Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 – Uses of everyday materials)</p>	<p>Compare and group together different kinds of rock on the basis of their appearance and simple physical properties.</p> <p>Describe in simple terms how fossils are formed when things that have lived are trapped within rock.</p> <p>Recognise that soils are made from rocks and organic matter.</p>			<p>Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Y6 – Evolution and inheritance)</p>
<p><b>Key Stage 3</b></p> <ul style="list-style-type: none"> <li>• The composition of the Earth.</li> <li>• The structure of the Earth.</li> <li>• The rock cycle and the formation of igneous, sedimentary and metamorphic rocks.</li> </ul>					

### National Curriculum: Light and sound

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p>Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 – Animals, including humans)</p>		<p>Recognise that they need light in order to see things and that dark is the absence of light.</p> <p>Notice that light is reflected from surfaces.</p> <p>Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.</p>	<p>Identify how sounds are made, associating some of them with something vibrating.</p> <p>Recognise that vibrations from sound travel through a medium to the ear.</p> <p>Find patterns between pitch of a sound and features of the object that produced it.</p>		<p>Recognise that light appears to travel in straight lines.</p> <p>Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into our eyes.</p> <p>Explain that we see things because light travels from light sources to our eyes or</p>

		<p>Recognise that shadows are formed when the light from a light source is blocked by an opaque object.</p> <p>Find patterns in the way that the size of shadows change.</p>	<p>Find patterns between the volume of a sound and the strength of the vibrations that produced it.</p> <p>Recognise that sounds get fainter as the distance from the sound source increases.</p>		<p>from the light sources to objects and then to our eyes.</p> <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>Extend their experiences of light by looking at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur)</p>
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### Key Stage 3

- The similarities and differences between light waves and waves in matter.
- Light waves travelling through a vacuum; speed of light.
- The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface.
- Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing; the human eye.
- Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras.
- Colours and the different frequencies of light, white light and prisms; differential colour effects in absorption and diffuse reflection.
- Frequencies of sound waves, measured in Hertz; echoes, reflection and absorption of sound.
- Auditory range of humans and animals.
- Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound.
- Waves transferring information for conversation to electrical signals by microphone.

## National Curriculum: Forces and magnets

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	<p>Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 – Uses of everyday materials)</p>	<p>Compare how things move on different surfaces.</p> <p>Notice that some forces need contact between two objects, but magnetic forces can act at a distance.</p> <p>Observe how magnets attract or repel each other and attract some materials and not others.</p>		<p><b>Forces:</b> Explain that unsupported objects fall toward Earth because of the force of gravity acting between the Earth and the falling object</p> <p>Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.</p>	

		<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>Describe magnets as having two poles.</p> <p>Predict whether two magnets will attract or repel each other, depending on which poles are facing.</p>		<p>Recognise that some mechanisms, including levers, pulley and gears, allow a smaller force to have a greater effect.</p>	
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**Key Stage 3**

- Magnetic fields by plotting with compass, representation by field lines.
- Earth's magnetism, compass and navigation.
- Forces as pushes or pulls, arising from the interaction between objects.
- Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces.
- Movement as the turning effect of a force.
- Forces associated with deforming objects.
- Forces measured in Newtons, measurements of stretch or compression as force is changed.

National Curriculum: Electricity					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
			<p>Identify common appliances that run on electricity.</p> <p>Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.</p> <p>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.</p> <p>Recognise that a switch opens and closes a circuit and associate this with</p>		<p>Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in a circuit.</p> <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>Use recognised symbols when representing a simple circuit in a diagram.</p>

			<p>whether or not a lamp lights in a simple series circuit.</p> <p>Recognise some common conductors and insulators, and associate metals with good conductors.</p>		
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**Key Stage 3**

- Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of change.
- Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference to current.
- Differences in resistance between conducting and insulating components.
- Static electricity.

**National Curriculum: Earth and space**

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p>Observe changes across the four seasons. (Y1 – Seasonal change)</p> <p>Observe and describe weather associated with the seasons and how day length varies. (Y1 – Seasonal change)</p>				<p>Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.</p> <p>Describe the movement of the Moon relative to the Earth.</p> <p>Describe the Sun, Earth and Moon as approximately spherical bodies.</p> <p>Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.</p>	

**Key Stage 3**

- Gravity force, weight = mass x gravitational field strength (g), on Earth  $g = 10 \text{ N/kg}$ , different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun.
- Our Sun as a star, other stars in our galaxy, other galaxies.
- The seasons and the Earth's tilt, day length at different times of year, in different hemispheres.
- The light year as a unit of astronomical distance.



**Key Stage 1 and 2 Progression in Working Scientifically Skills**

Year 1 and 2	Year 3 and 4	Year 5 and 6
<b>Asking questions and recognising that they can be answered in different ways</b>		
<p><b>Asking simple questions and recognising that they can be answered in different ways.</b></p> <ul style="list-style-type: none"> <li>While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the way things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions.</li> <li>The children answer questions developed with the teacher often through a scenario.</li> <li>The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered.</li> </ul>	<p><b>Asking relevant questions and using different types of scientific enquiries to answer them.</b></p> <ul style="list-style-type: none"> <li>The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions.</li> <li>The children answer questions posed by the teacher.</li> <li>Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question.</li> </ul>	<p><b>Planning different types of scientific enquiries to answer questions, including recognising and controlling variable where necessary.</b></p> <ul style="list-style-type: none"> <li>Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry.</li> <li>Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.</li> </ul>
<b>Making Observations and taking measurements</b>		
<p><b>Observe closely, using simple equipment</b></p> <ul style="list-style-type: none"> <li>Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations.</li> <li>They begin to take measurements, initially by comparisons, then using non-standard units.</li> </ul>	<p><b>Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.</b></p> <ul style="list-style-type: none"> <li>The children make systematic and careful observations.</li> <li>They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.</li> </ul>	<p><b>Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.</b></p> <ul style="list-style-type: none"> <li>The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale.</li> <li>During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value).</li> </ul>
<b>Engaging in practical enquiry to answer questions</b>		
<p><b>Performing simple tests</b></p> <ul style="list-style-type: none"> <li>The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: test to classify;</li> </ul>	<p><b>Setting up simple practical enquiries, comparative and fair tests</b></p> <ul style="list-style-type: none"> <li>The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher.</li> </ul>	<p><b>Planning different types of scientific enquiries to answer questions, including recognising and controlling variable where necessary.</b></p> <ul style="list-style-type: none"> <li>The children select from a range of practical resources to gather evidence to answer their questions. They carry</li> </ul>

<p>comparative tests; pattern seeking enquiries; and make observations over time.</p> <p><b>Identifying and classifying</b></p> <ul style="list-style-type: none"> <li>Children use their observations and testing to compare objects, materials and living things. They sort and group these things, identifying their own criteria for sorting.</li> </ul>	<ul style="list-style-type: none"> <li>They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking e.g. using tables, Venn diagrams, Carroll diagrams. Children are supported to present the data in different ways in order to help with answering the question.</li> </ul> <p><b>Explanatory note:</b> A comparative test is performed by changing a variable that is qualitative e.g. the type of material, shape of the parachute. This leads to a ranked outcome.</p> <p>A fair test is performed by changing a variable that is quantitative e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship.</p>	<p>out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.</p> <ul style="list-style-type: none"> <li>Children present the same data in different ways in order to help with answering the question.</li> </ul>
<p><b>Gathering and recording data to help in answering questions.</b></p> <ul style="list-style-type: none"> <li>The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing.</li> <li>They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs.</li> <li>They classify using simple prepared tables and sorting things.</li> </ul>	<p><b>Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.</b></p> <p><b>Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.</b></p> <ul style="list-style-type: none"> <li>The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements (given templates, if required, to which they can add headings). They record classifications.</li> </ul>	<p><b>Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.</b></p> <ul style="list-style-type: none"> <li>The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawing, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using labels, Venn diagrams, Carroll diagrams and classification keys.</li> </ul>
<p><b>Answering questions and concluding</b></p>		
<p><b>Using their observations and ideas to suggest answers to questions.</b></p> <ul style="list-style-type: none"> <li>Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources.</li> </ul>	<p><b>Using straightforward scientific evidence to answer questions or to support their findings.</b></p> <ul style="list-style-type: none"> <li>Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence.</li> </ul>	<p><b>Identifying scientific evidence that has been used to support or refute ideas or arguments.</b></p> <ul style="list-style-type: none"> <li>Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer.</li> <li>They talk about how their scientific ideas change due to new evidence that they have gathered.</li> <li>They talk about how new discoveries change scientific understanding.</li> </ul>
<p><b>Using their observations and ideas to suggest answers to questions.</b></p>	<p><b>Identifying differences, similarities or changes related to simple scientific ideas and processes.</b></p>	<p><b>Reporting and presenting findings from enquiries, including conclusions, casual relationships and</b></p>



<ul style="list-style-type: none"> <li>The children recognise 'biggest and smallest', 'best and worst' etc from their data.</li> </ul>	<ul style="list-style-type: none"> <li>Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships.</li> </ul> <p><b>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.</b></p> <ul style="list-style-type: none"> <li>They draw conclusions based on their evidence and current subject knowledge.</li> </ul>	<p><b>explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.</b></p> <ul style="list-style-type: none"> <li>In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.</li> </ul>
<p><b>Evaluating and raising further questions and predictions</b></p>		
	<p><b>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.</b></p> <ul style="list-style-type: none"> <li>They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry.</li> </ul>	<p><b>Reporting and presenting findings from enquiries, including conclusions, casual relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.</b></p> <ul style="list-style-type: none"> <li>they evaluate, e.g. the choice of method used, the control of variable, the precision and accuracy of measurements and the credibility of secondary sources used.</li> <li>They identify any limitations that reduce the trust they have in their data.</li> </ul>
	<p><b>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.</b></p> <ul style="list-style-type: none"> <li>Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface.</li> <li>Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.</li> </ul>	<p><b>Using test results to make predictions to set up further comparative and fair tests.</b></p> <ul style="list-style-type: none"> <li>Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.</li> </ul>
<p><b>Communicating their findings</b></p>		
	<p><b>Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.</b></p> <ul style="list-style-type: none"> <li>They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary.</li> </ul>	<p><b>Reporting and presenting findings from enquiries, including conclusions, casual relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.</b></p> <ul style="list-style-type: none"> <li>They communicate their findings to an audience using relevant scientific language and illustration.</li> </ul>

**Comparative / fair testing**

Changing one variable to see its effect on another, whilst keeping all others the same.

**Research**

Using secondary sources of information to answer scientific questions.

**Observation over time**

Observing changes that occur over a period of time ranging from minutes to months.

**Pattern-seeking**

Identifying patterns and looking for relationships in enquiries where variables are difficult to control.

**Identifying, grouping and classifying**

Making observations to name, sort and organise items.

**Problem-solving**

Applying prior scientific knowledge to find answers to problems.





**Science Vocabulary Progression**

Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<b>Working Scientifically</b>						
Question, answer, observe, observing, equipment, identify, sort, group, compare, differences, similarities, describe, measurement, test, results, secondary sources, record – diagram, chart			Explanations, conclusion, predictions, criteria, classify, changes, data, contrast, evidence, improve, secondary sources, guides, keys, construct, interpret Research – relevant question Equipment – thermometer Data – gather, standard units, record, classify, present Record – drawings, labelled diagrams, keys, bar charts, tables		Plan, variables, measurements, accuracy, precision, repeat readings, predictions, further comparative, fair test, identify, classify and describe, patterns, systematic, quantitative measurements Report data – scientific diagrams, labels, classification keys, tables, scatter graphs, bar graphs, line graphs, conclusions, causal relationships, explanation, degree of trust, oral and written display, presentation, evidence ideas, arguments Biology, physics, chemistry	
<b>Animals, including humans</b>						
Adult, child, baby, animal, bird, fish, head, leg, arm, mouth, face, back, toe, finger, hand, foot	Amphibian, fish, reptile, mammal, bird, herbivore, omnivore, carnivore, head, nose, ear, neck, shoulder, arm, elbow, wrist, hand, back, chest, hip, leg, knee, ankle, foot, wing, beak, tail, fin, sight, smell, touch, taste, hearing	Survival, water, air, food, reproduce, adult, baby, offspring, kitten, calf, puppy, food chain, prey, predator, camouflage, protection, exercise, hygiene, balanced diet	Skeleton, skull, bones, muscles, movement, support, protection, nutrition	Mouth, tongue, teeth, oesophagus, stomach, small intestine, large intestine, nutrients, absorb, canine, incisor, molar, carbohydrate, protein, vitamins, fat	Womb, foetus, embryo, gestation, baby, toddler, teenager, elderly, growth, development, puberty	Function, circulatory system, heart, valve, blood vessel, vein, artery, transport, oxygenated, deoxygenated, lifestyle, drug, cardiovascular, pulse, capillaries, ventricle
<b>Plants</b>						
Plant, leaf, flower, tree, bush, grass, woodland, seed, grow	Deciduous, evergreen, tree, leaf, flower, blossom, petals, fruit, bulb, seed, roots, stem, trunk, branches	Growth, germinate, light, temperature, reproduce, lifecycle	Air, water, transportation, nutrients, soil, reproduction, seed formation, seed dispersal, pollination			
<b>Living things and their habitats</b>						
Carnivore, predator, home, habitat, lifecycle		Living, dead, habitat, desert, species, microhabitat, woodland, meadow, hedgerow, pond		Vertebrates, invertebrates, environment, habitat, classification keys, producers, predators,	Life process, reproduction, offspring, biomes, biodiversity	Characteristic, classification, organism, micro-organism

				prey, consumer, adaptation		
<b>Materials</b>						
Hard, soft, mix, join, wood, plastic, glass, hot, cold	Wood, plastic, glass, paper, metal, rock, hard, soft, rough, smooth, shiny, dull, bendy, stiff	Brick, fabric, elastic, foil, property, solid, waterproof, absorbent, opaque, transparent, squash, bend, flexible, twist, stretch, push, pull, roll, slide, bounce	Soils, organic matter, fossil, crystal, sandstone, granite, marble, pumice, absorbent, crumble, sedimentary, layer, sediment, igneous, magma, lava, gas bubbles, metamorphic, change, squeeze, pressure	States of matter, solid, liquid, gas, evaporation, condensation, particle, temperature, freezing, heating	Hardness, transparency, conductivity, electrical, thermal, solubility, solution, dissolve, filter, evaporate, sieve, reversible, irreversible	
<b>Light and sound</b>						
Rainbow, torch, shadow, light, sound, loud, quiet	Ear, nose, eye, see, smell, taste		Light source, mirror, reflect, reflective, reflection, shadow, transparent, opaque, translucent	Vibration, wave, volume, pitch, tone, insulation		Reflection, refraction, spectrum, rainbow
<b>Earth in space / Seasonal change</b>						
Earth, moon, space, star, winter, summer, spring, autumn, rain, clouds, sunshine, snow	Season, spring, summer, autumn, winter, month, year, day, night, sun, moon, light, dark				Earth, sun, moon, solar system, axis of rotation, day, night, phases of the moon, star, constellation	
<b>Forces</b>						
		Squashing, bending, twisting, stretching	Force, contact, magnetic, attract, repel, poles		Air resistance, water resistance, friction, gravity, lever, gear, pulley, Newtons	
<b>Electricity</b>						
Battery, switch				Appliance, battery, power, main power, circuit, series, cell, battery, wire, bulb, switch, break in circuit, conductor, insulator		Circuit – series, parallel Voltage, volts, amps