Science programmes of study:

key stages 1 and 2 National Curriculum in England

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.

Scientific knowledge and conceptual understanding

The programmes of study describe a sequence of knowledge and concepts. While it is important that pupils make progress, it is also vitally important that they develop secure understanding of each key block of knowledge and concepts in order to progress to the next stage. Insecure, superficial understanding will not allow genuine progression: pupils may struggle at key points of transition (such as between primary and secondary school), build up serious misconceptions, and/or have significant difficulties in understanding higher-order content. Pupils should be able to describe associated processes and key characteristics in common language, but they should also be familiar with, and use, technical terminology accurately and precisely. They should build up an extended specialist vocabulary. They should also apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data. The social and economic implications of science are important but, generally, they are taught most appropriately within the wider Science 145 school curriculum: teachers will wish to use different contexts to maximise their pupils' engagement with and motivation to study science.

The nature, processes and methods of science

'Working scientifically' specifies the understanding of the nature, processes and methods of science for each year group. It should not be taught as a separate strand. The notes and guidance give examples of how 'working scientifically' might be embedded within the content of biology, chemistry and physics, focusing on the key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions. These types of scientific enquiry should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. Pupils should seek answers to questions through collecting, analysing and presenting data. 'Working scientifically' will be developed further at key stages 3 and 4, once pupils have built up sufficient understanding of science to engage meaningfully in more sophisticated discussion of experimental design and control.

Spoken language

The national curriculum for science reflects the importance of spoken language in pupils' development across the whole curriculum – cognitively, socially and linguistically. The quality and variety of language that pupils hear and speak are key factors in developing their scientific vocabulary and articulating scientific concepts clearly and precisely. They must be assisted in making their thinking clear, both to themselves and others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.

Progression of skills

Plants						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
Can talk about some of the things they have observed such as plants. Make observations of plants. Looks closely at similarities, differences, patterns and change.	Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. Identify and describe the basic structure of a variety of common flowering plants, including trees.	Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant Investigate the way in which water is transported within plants Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal			
Outdoor learning						
Explore the outdoor area Explore the lifecycle of a plant Plant beans	Plant beans. Look at God's creations, make a list of creations we can see and how to look after them. I can study and plot simple area of my school environment. Recording different plants around our school grounds. Modelling a trees structure.	Seasonal change – natural resource walk. Seasonal change – Plants Plant seeds/bulbs. Plant growth experiments.	I can identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers. Find plants/flowers and looking at the constituent parts together. Can they make a diagram/model of a flower and roots using natural resources? Give them laminated labels.			

	Using tape measures to measure the lengths of branches. Story telling with outdoors props. Create characters from natural objects. Pattern using natural objects. Make music from natural objects.		Requirements for plant growth: I can explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) Discuss – ask the question – what do plants need to grow? Discuss our prior learning and what we already know. Why would plants need these things? Set up bags and elastic bags around leaves on trees to 'see' trees breathing – explain that what they are seeing is Layers of a rainforest. Forest floor, understory layer, canopy layer and emergent layer. What is the climate like in each layer? What kind of animals do we see in each layer? Chn then to look at the provided pictures and go to make their own natural art rainforest layers diagram. Paper mache worlds. Decorate worlds in groups. Use atlas and globe to help decorate the world. Decorate by painting it blue and then green land masses – use the globe to			

			support. Importantly – put the equator, tropic of cancer, tropic of capricorn			
Animals including humans						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
Can talk about some of the things they have observed such as animals. Make observations of animals. Looks closely at similarities, differences, patterns and change.	Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. Identify and name a variety of common animals that are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	Notice that animals, including humans, have offspring which grow into adults. Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	describe the simple functions of the basic parts of the digestive system in humans identify the different types of teeth in humans and their simple functions construct and interpret a variety of food chains, identifying producers, predators and prey	describe the changes as humans develop to old age. know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic demonstrate that dissolving, mixing and changes of state are reversible changes explain that some changes result in the	identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies Function describe the ways in which nutrients and water are transported within animals, including humans.

					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.	
Outdoor learning						
Explore the outdoor area Explore our senses	Mini beast hunt. Carnivore, omnivore and herbivore game. Bird feeders. Look at God's creations, make a list of creations we can see and how to look after them.	Animal lifecycles and survival. Building homes for badgers	Skeletons and muscles – resources to print Healthy Diet, Food and Nutrition – Food miles game. Heart rate measurements.	Construct food chains Identifying producers, predators and prey – food chain game. Recognising the energy being transferred throughout the chain. Make a digestive system out of natural materials and label. Create a mouth and label the different teeth.	Experiment based upon dissolving and evaporating liquids	I can describe the ways in which nutrients and water are transported within animals, including humans. - Build a Tree. - plant adaptations for collecting and storing water. Compare with human blood system. Use natural objects to make a model of the circulatory system/heart.
Use of everyday materials/properties and changes of materials						
Reception	Y1	Y2	Y3	Y4	Y5	Y6
Know about similarities in relation to materials. Know about differences in relation to materials.	Distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Describe the simple physical properties of a	Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. Find out how the shapes of solid objects made from some materials can be changed by squashing,			compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets	

	variety of everyday materials. Compare and group together a variety of everyday materials on the basis of their simple physical properties.	bending, twisting and stretching.				
Outdoor learning						
	Use simple equipment to gather and record data. Birds nests. Badger homes. Campfire safety. Sensory exploration.	How to become an environmental Superhero. Litter survey of grounds. How to use natural environments as a prompt for storytelling Make a wind-powered car			WW2 explore use of materials for differing products. E.g. helmet, blankets, etc.	
Seasonal changes						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
	Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies.					
Outdoor learning						
	Identify the four seasons.					
Living things and their habitats						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**

Shows care and concern for living things and the environment. Developing an understanding of growth, decay and changes. Know about similarities in relation to living things. Know about differences in relation to living things. Looks closely at similarities, differences, patterns and change.		Explore and compare the differences between things that are living, dead, and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including micro-habitats. Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.		recognise that living things can be grouped in a variety of ways explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment recognise that environments can change and that this can sometimes pose dangers to living things	describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird describe the life process of reproduction in some plants and animals	describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals give reasons for classifying plants and animals based on specific characteristics.
Outdoor learning						
Make animal shelters		Children to sort things that are living, dead and never been alive. Children to find things in outdoor learning environment to sort. Minibeast hunts Making food chains using natural materials.		Name and classify plants and trees around the school field. Discuss and recognise the risks in the area e.g. litter. Grouping and classifying animals, creating habitats		

				according to their characteristics.		
Rocks						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
Exploring fossils			Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties Describe in simple terms how fossils are formed when things that have lived are trapped within rock Recognise that soils are made from rocks and organic matter.			
Outdoor learning						
			Soils and soil erosion – plastic bottles to make soil separation viewer Soil soup – check the black book from last year (Chrissie) Chn need to know make up of soil first – layers, constituent parts, scientific terminology.			
Light						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
			Recognise that they need light in order to see things and that dark is the absence of light			recognise that light appears to travel in straight lines use the idea that light travels in straight lines

			Notice that light is reflected from surfaces Recognise that light from the sun can be dangerous and that there are ways to protect their eyes Recognise that shadows are formed when the light from a light source is blocked by an opaque object Find patterns in the way that the size of shadows change.			to explain that objects are seen because they give out or reflect light into the eye explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
Outdoor learning						
			Shadows – create a short shadow and a long shadow, mark out our own shadows in flour Light sources and reflectors – natural light reflectors, opaque/transparent/translucent Sunlight is dangerous for our eyes – use different coloured flowers under ultraviolet light pics and what they look like in real life			make wind chimes with crystals – how light moves through them Nocturnal animals – Echo-location, Bat & Moth Game, Mole Run.
Forces and Magnets						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
			Compare how things move on different surfaces		explain that unsupported objects fall towards the	

			Notice that some forces need contact between two objects, but magnetic forces can act at a distance Observe how magnets attract or repel each other and attract some materials and not others Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials Describe magnets as having two poles Predict whether two magnets will attract or repel each other, depending on which poles are facing		Earth because of the force of gravity acting between the Earth and the falling object identify the effects of air resistance, water resistance and friction, that act between moving surfaces recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	
Outdoor learning						
			Friction: Make a game using the pencil chopsticks – then test it using stick chopsticks (chn make a little circuit game. Chn practise their games and improve them – can they make a course or a board made of natural resources to play it on? Can they try other		Experiment based upon gravity and air resistance – paper experiment	

			people's games or suggest improvements? Make and use compasses – list of resources			
States of Matter						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
Exploring and introducing changing states.				compare and group materials together, according to whether they are solids, liquids or gases observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature		
Outdoor learning						
				Heating and cooling materials and recognising how the substances change		
Sound						
Reception	Y1	Y2	Y3	Y4	Y5	Y6
				identify how sounds are made, associating some of them with something vibrating recognise that vibrations from sounds travel		

				through a medium to the ear find patterns between the pitch of a sound and features of the object that produced it find patterns between the volume of a sound and the strength of the vibrations that produced it recognise that sounds get fainter as the distance from the sound source increases		
Outdoor learning						
				Using 'We Are Going on a Bear Hunt' – create the tune using natural resources. Create a musical instrument using natural resources Create a harmonica, finding patterns between the pitch of sound Create a shaker using natural resources		
Electricity						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
				identify common appliances that run on electricity construct a simple series electrical circuit, identifying and naming its basic parts, including		associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit

				cells, wires, bulbs, switches and buzzers identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit recognise some common conductors and insulators, and associate metals with being good conductors		compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches use recognised symbols when representing a simple circuit in a diagram.
Outdoor learning						
				Create a water wheel, recognising different energy		Children create circuit diagrams out of natural materials using recognised symbols to label.
Earth and Space						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
Introduce planet names Introduce moon					describe the movement of the Earth, and other planets, relative to the Sun in the solar system describe the movement of the Moon relative to the Earth	

					describe the Sun, Earth and Moon as approximately spherical bodies use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	
Outdoor learning						
Evolution and inheritance						
Reception	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
						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 identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.of the same kind, but normally offspring vary and are not identical to their parents

Outdoor learning						
						Make fossils Recognise fossils provide information about living things from long ago