

Progression of Knowledge in: Science

National Curriculum Aims:
The national curriculum for science aims to ensure that all pupils: develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Key stage 1:
Please refer to Science Programmes of study: key stages 1 and 2

Key stage 2:
Please refer to Science Programmes of study: key stages 1 and 2

https://assets.publishing.service.gov.uk/media/5a806ebd40f0b62305b8b1fa/PRIMARY_national_curriculum_-_Science.pdf

Year Groups	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Units	1. Which material would be the most suitable to fix a broken umbrella? Materials 2. What is the best material to absorb water? Materials 3. Can I name the parts of the body? Animals including Humans 4. How can we look after the trees and plants in our playground? Plants 5. How can we look after the animals in our playground? Animals 6. Crest Award- chosen investigations linking to Year 1 units- revisit key knowledge	1. How can the shapes of solid objects be changed? Materials 2. How do bulbs grow? Plants (Bulbs) 3. What is a habitat and how does it support the animals and plants that live there? Living things and their habitats 4. How can I make my seeds grow? Plants 5. How can I keep my body healthy? Animals including humans 6. How can I keep my body healthy? Animals including humans	1. How can we classify rocks? Materials-Rocks 2. How can I make objects move using magnets? Materials-Forces and magnets 3. What would happen if I didn't have a skeleton? Animals including humans 4. What are the functions of the parts of a flower? Plants 5. How are shadows formed? Light 6. Crest Award-chosen investigations linking to Year 3 units- revisit key knowledge	1. How are solids, liquids and gases different? Materials-States of matter 2. What effect does temperature have on solids? Materials 3. How does my body digest food? Animals including humans 4. How do you construct a simple series electrical circuit? Electricity 5. How can we group living things? Living things and their habitats 6. How are sounds made? Sound	1. Which material would make the best container for food storage? Materials 2. What are reversible and irreversible changes? Materials 3. What do we know about our solar system? Earth and space 4. How do forces affect how things move? Forces 5. How do living things reproduce? Living things and their habitats (Life cycles and reproduction) 6. How do humans change as they develop to old age? Animals including humans (human changes and puberty)	1. How does light travel? Light 2. How can I make a burglar alarm? Electricity 3. What is the human circulatory system? 4. How do we classify living things? Living things and their habitats 5. How have living things changed over time? Evolution and inheritance 6. How have living things changed over time? Evolution and inheritance
PLANTS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Substantive knowledge	Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees (Olive, cherry and silver Birch trees, rosemary, and lavender along with other plants growing in the edible playground) Identify and describe the basic structure of a variety of common flowering plants, including trees (including leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem)	Observe and describe how seeds and bulbs grow into mature plants (daffodils, tulips and cress) 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			

Disciplinary Knowledge	Working scientifically skills:	Working scientifically skills:	Working scientifically skills:			
	Observing closely, using magnifying glasses, and comparing and contrasting familiar plants.	Observing and recording, with some accuracy, the growth of a variety of plants as they change over time from seed or bulb,	Comparing the effect of different factors on plant growth,			
	Describing how they were able to identify and group them.	Observing similar plants at different stages of growth;	Discovering how seeds are formed by observing the different stages of plant life cycles over a period of time;			
	Drawing diagrams showing the parts of different plants including trees.	Setting up a comparative test to show that plants need light and water to stay healthy.	Looking for patterns in the structure of fruits that relate to how the seeds are dispersed.			
	Keeping records of how plants have changed over time, for example, the leaves falling off trees and buds opening; and compare and contrast what they have found out about different plants.	Using their observations and ideas to suggest answers to questions Gathering and recording data to help in answering questions.	Observing how water is transported in plants, for example, by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers.			

MATERIALS						
Substantive knowledge	Distinguish between an object and the material from which it is made	Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper, cotton fabric and cardboard for particular uses			Compare and group together everyday materials (rock, wood, plastic items, metal, paper, card, fabrics, glass objects, ceramic items) on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets	
	Identify and name a variety of everyday materials- wood, plastic, glass, metal, water, and rock	Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching test wood, metal, plastic, rock, paper, cotton fabric and cardboard			Know that some materials will dissolve (vinegar, lemon juice , coffee, salt, sugar) in liquid to form a solution, and describe how to recover a substance from a solutionTest sand, chalk, sugar, salt, indigestion tablets, coffee, lemon juice	
	Describe the simple physical properties of a variety of everyday materials-waterproof, absorbent, soft, hard, rough, smooth, flexible, rigid				Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating-Use mixtures of icing sugar and coconut; sand and paper clips; and muesli.	
	Compare and group together a variety of everyday materials on the basis of their simple physical properties-wood, plastic, glass, metal, and rock				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-investigate butter, chocolate, water	
					Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda-investigate burning, rusting and chemical reactions.	

Disciplinary Knowledge	Working scientifically skills: Ask simple questions and recognise that they can be answered in different ways. Observe closely, using simple equipment. Perform simple tests. Identify and classify. Use observations and ideas to suggest answers to questions. Gather and record data to help answer questions.	Working scientifically skills: To observe things using simple equipment. Identify and classify. Perform simple tests. Use observations and ideas to suggest answers to questions. Gather and record data to help in answering questions			Working scientifically skills: Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. Record data and results of increasing complexity using scientific diagrams and labels, and line graphs. Use test results to make predictions to set up further comparative and fair tests. Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and presentations.	
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ROCKS

Substantive knowledge			Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties-identify igneous rocks (basalt, granite, pumice) sedimentary rocks (shale, limestone) and metamorphic rocks (slate, marble) 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.			
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Disciplinary Knowledge			Working scientifically skills: Observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time; using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. Pupils research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. Pupils explore different soils and identify similarities and differences between them and investigate what happens when rocks are rubbed together or what changes occur when they are in water. They raise and answer questions about the way soils are formed.			
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FORCES AND MAGNETS

Substantive knowledge			Compare how things move on different surfaces 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 (paper, tin foil, fabric, thin wood, water in a beaker) 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.		Explain that unsupported objects fall towards the 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.	
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Disciplinary Knowledge			Working scientifically skills: 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. Predict whether 2 magnets will attract or repel each other, depending on which poles are facing. Comparing how different things move and grouping them; raising questions and carrying out tests to find out how far things move on different surfaces, and gathering and recording data to find answers to their questions; Exploring the strengths of different magnets and finding a fair way to compare them; sorting materials into those that are magnetic and those that are not; Looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another; Identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets.		Working scientifically skills: Designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective. Explore resistance in water by making and testing boats of different shapes. Design and make products that use levers, pulleys, gears and/or springs and explore their effects	
ANIMALS INCLUDING HUMANS						
Substantive knowledge	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense-ears, eyes, fingers, nose, tongue. Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals lion, rabbit, squirrel, horse, fox, hedgehog, lizard, snake, clownfish, salmon, eel, frog, newt, toad, cow, robin, pigeon, seagull Identify and name a variety of common animals that are carnivores (lion, dog,cat), herbivores (rabbit, squirrel, horse) omnivores (human, fox, hedgehog)	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 -incisors, canines, premolars and molars Construct and interpret a variety of food chains, identifying producers, predators and prey.	Describe the changes as humans develop to old age. Puberty, timeline of a human	
Disciplinary Knowledge	Working scientifically skills: Using their senses to compare different textures, sounds and smells. Ask simple questions and recognise that they can be answered in different ways. Observe closely, using simple equipment. Perform simple tests. Identify and classify. Use observations and ideas to suggest answers to questions. Gather and record data to help answer questions. Using their observations to compare and contrast animals at first hand or through videos and photographs, Describing how they identify and group them	Working scientifically skills: Using their observations to compare and contrast animals at first hand or through videos and photographs, Describing how they identify and group them Grouping animals according to what they eat Observing closely, using simple equipment Identifying and classifying Using their observations and ideas to suggest answers to question Observing, through video or first-hand observation and measurement, how different animals, including humans, grow; asking questions about what things animals need for survival and what humans need to stay healthy; asking simple questions and recognising that they can be answered in different ways	Working scientifically skills: Identifying and grouping animals with and without skeletons and observing and comparing their movement. Exploring ideas about what would happen if humans did not have skeletons. Comparing and contrasting the diets of different animals (including their pets) and deciding ways of grouping them according to what they eat. Researching different food groups and how they keep us healthy, and design meals based on what they find out.	Working scientifically skills: Comparing the teeth of carnivores and herbivores and suggesting reasons for differences; Finding out what damages teeth and how to look after them. Drawing and discussing their ideas about the digestive system and compare them to models or images.	Working scientifically skills: Pupils should draw a timeline to indicate stages in the growth and development of humans. Pupils should learn about the changes experienced in puberty. Pupils should work scientifically by researching the gestation periods of other animals and comparing them with humans; by finding out and recording the length and mass of a baby as it grows.	

	Grouping animals according to what they eat.	Suggesting ways to find answers to their questions.				
LIVING THINGS AND THEIR HABITATS						
Substantive knowledge		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, (on the seashore, woodland, in the ocean, rainforest and arctic habitats) including micro-habitats (under stones, logs or leaves) describe how animals obtain their food from plants and other animals, using the idea of a simple food chain,(that includes a human) 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- dog/human, frog/toad, moth/butterfly, robin/blackbird. Describe the life process of reproduction in some plants and animals. Lilies	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 Give reasons for classifying plants and animals based on specific characteristics.
Disciplinary Knowledge		Working scientifically skills: Ask simple questions and recognise that they can be answered in different ways Observe closely, using simple equipment Sorting and classifying livings things Use observations and ideas to suggest answers to questions. Gather and record data to help answer questions.		Working scientifically skills: Using and making simple guides or keys to explore and identify local plants and animals; Making a guide to local living things; Raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched.	Working scientifically skills: Observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in Australia) Asking pertinent questions and suggesting reasons for similarities and differences. Trying to grow new plants from different parts of the parent plant- seeds, stem and root cuttings, tubers, bulbs. Observing changes in an animal over a period of time (hatching and rearing chicks-(Reception during science week) Comparing how different animals reproduce and grow.	Working scientifically skills: Using classification systems and keys to identify some animals and plants in the immediate environment. Research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system
LIGHT						

Substantive knowledge			Recognise that they need light in order to see things and that dark is the absence of light 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.			Recognise that light appears to travel in straight lines use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye 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.
Working scientifically skills (Disciplinary knowledge)			Working scientifically skills: Looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes. Asking relevant questions and using different types of scientific enquiries to answer them. Setting up simple practical enquiries, comparative and fair tests.			Working scientifically skills: Designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works. Investigating the relationship between light sources, objects and shadows by using shadow puppets. Extending their experience 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) Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
ELECTRICITY						
Substantive knowledge				Identify common appliances that run on electricity Construct a simple series electrical circuit, identifying and naming its basic parts, including 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		Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit 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
Working scientifically skills (Disciplinary knowledge)				Working scientifically skills: Observing patterns, for example, that bulbs get brighter if more cells are added, Understanding that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit		Working scientifically skills: Systematically identifying the effect of changing one component at a time in a circuit; Designing and making a set of traffic lights, a burglar alarm or some other useful circuit
SOUND						

Substantive knowledge				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.		
Working scientifically skills (Disciplinary knowledge)				Working scientifically skills: Finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. Make earmuffs from a variety of different materials to investigate which provides the best insulation against sound. Make and play their own instruments by using what they have found out about pitch and volume. (Music lesson) Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, Setting up simple practical enquiries, comparative and fair tests		
STATES OF MATTER						
Substantive knowledge				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.		
Working scientifically skills (Disciplinary knowledge)				Working scientifically skills: Grouping and classifying a variety of different materials Exploring the effect of temperature on substances research the temperature at which materials change state Observe and record evaporation over a period of time		
EARTH AND SPACE						

Substantive knowledge					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.	
Working scientifically skills (Disciplinary knowledge)					Working scientifically skills: Comparing the time of day at different places on the Earth through internet links and direct communication Creating simple models of the solar system Constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day Finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks.	
EVOLUTION AND INHERITANCE						
Substantive knowledge						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.
Working scientifically skills (Disciplinary knowledge)						Working scientifically skills: Observing and raising questions about animals and how they are adapted to their environment; Comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels. Analyse the advantages and disadvantages of specific adaptations, such as being on 2 feet rather than 4, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers.
SEASONAL CHANGES						
Substantive knowledge	Observe changes across the four seasons Observe and describe weather associated with the seasons and how day length varies.					
Working scientifically skills (Disciplinary knowledge)	Working scientifically skills: Making tables and charts about the weather Making displays of what happens in the world around them, including day length, as the seasons change.					

