Sound

Progression through Scientific Knowledge

Intent: Observe, Discover, Decide

A design for life!

Children have opportunities to develop a strong understanding of the world around them whilst acquiring specific skills and knowledge to help them to think scientifically, to gain an understanding of scientific processes and also an understanding of the uses and implications of Science, today and for the future. Scientific enquiry skills are embedded in each topic the children study and these topics are revisited and developed throughout their time at school. Topics, suchas Plants, are taught in Key Stage One and studied again in further detail throughout Key Stage Two. This model allows children to build upon their prior knowledge and increases their enthusiasm for the topics whilst embedding this procedural knowledge into the long-term memory.

This will be underpinned and progressive across Key Stage 1 and 2 through a curriculum that plans for:

Children developing and using a range of skills including observations, planning and investigations, as well as being encouraged to question the world aroundthem and become independent learners in exploring possible answers for their scientific based questions.

Specialist vocabulary for topics to be taught and built up, and effective questioning to communicate ideas is encouraged.

Concepts being reinforced by focusing on the key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientificquestions.

SCIENCE WILL BE TAUGHT IN SCIENCE DAY BLOCKS EACH HALF TERM/TERM LINKED IF APPROPRIATE TO THE THEMES AND SUPPORTED BY THE USE OF 'DISCOVERYSCIENCE' INVESTIGATIONS.

Teach the knowledge → Conduct the investigation → Reflect on your findings

Asking Questions

Asking questions that can be answered using a scientific enquiry.

Making Predictions

Using prior knowledge to suggest what will happen in an enquiry.

Setting Up Tests

Deciding on the method and equipment to use to carry out an enquiry.

Observing & Measuring

Using prior knowledge to suggest what will happen in an enquiry.

Recording Data

Using tables, drawings and other means to note observations and measurements.

Interpreting & Communicating Results

Using information from the data to say what you found out.

Evaluating

Reflecting from the success of the enquiry approach and identifying further questions for enquiry.

Working Scientifically Progression – Skills Grid

	EYFS	KS1	Lower KS2	Upper KS2
PLAN	choose the resourcesthey need for their chosen activities andsay when they do or don't need help	ask simple questions and recognising that they can be answeredin different ways	ask relevant questions and using different typesof scientific enquiries to answer them set up simple practical enquiries, comparativeand fair tests	plan different types ofscientific enquiries to answer questions, including recognising and controlling variables where necessary
DO	know about similaritiesand differences in relation to places, objects, materials and living things make observations ofanimals and plants explore a variety of materials, tools and techniques, experimenting with colour, design, texture,form and	observe closely, usingsimple equipment perform simple tests identify and classify	make systematic and careful observations and, where appropriate, take accurate measurements using standard units, use a range of equipment, including thermometers and data loggers	take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings whenappropriate
RECORD	represent their own ideas, thoughts and feelings through designand technology, art, music, dance, role play andstories	use their observationsand ideas to suggest answers to questions	gather, record, classify and present data in a variety of ways to help in answering questions record findings using simple scientific language, drawings, labelled diagrams, keys,bar charts, and tables	record data and results of increasing complexity using scientific diagrams andlabels, classification keys, tables, scatter graphs, bar and line graphs

REVIEW	talk about the features of their own immediateenvironment and how environments might vary from one another explain why some things occur and talkabout changes	use their observationsand ideas to suggest answers to questions	report on findings from enquiries, including oral and written explanations, displays orpresentations of results and conclusions use results to draw simple conclusions, make predictions for new values, suggest improvements and raisefurther questions identify differences, similarities or changesrelated to simple scientific ideas and processes use straightforward scientific evidence to answer questions or tosupport their findings	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 asdisplays and other presentations identify scientific evidence that has been used to supportor refute ideas or arguments

Year group	Autumn term focus	Spring term focus	Summer term focus Enquiry projects and core value champions
1	Animals (senses) and seasonal changes	Everyday Materials Seasonal changes	<u>Plants</u> CV champion – plant biologist, Angie Burnett <u>Animals including humans</u> CV champion – marine biologist, Dagwood Qureshi
2	Uses of everyday materials Animals including humans taught in PSHCE	Plants	<u>Living things and their habitats</u> CV champions – polar scientist, Prem Singh Gill and zoologist, Tanesha Allen. <u>Animals including humans (offspring and survival)</u>
3	Fossils and rocks Animals (PSHCE nutrition) including humans (skeleton)	Forces and magnets	<u>Plants and living things</u> CV champion – evolution biologist, Dr Kelsey Byers. <u>Light</u> CV – laser physicist, Professor Colin Webb.

4	Living things and their habitats Digestion and teeth	States of matter	Electricity CV champion – Thomas Edison Sound CV champion – Alexander Graham Bell
5	Properties and changes of materials	Living things and their habitats Animals including humans taught in PSHCE	Earth and space CV champion – space scientist, Dr Karen Aplin Mae Jemison Forces
6	Electricity and light	Living things and their habitats	Evolution and inheritance CV champion – evolutionary biologist, Telma G Laurentino Circulatory system

Year 1				
Plants	**Key Scientific Knowledge**		**Vocabulary**	**Investigations**
Pupils should be taught to: Identify and name a variety of common wild and gardenplants, including deciduous and evergreen trees; identify and describe the basic	**Key Learning** Growing locally, there will be a vast array of plants which all have specific names. These can be identified by looking at the key characteristics of the plant. Plants have common parts, but they vary between the different types of plants. Some trees keep their leaves all year while other trees drop their leaves during autumn and grow them again during spring.	**Prior Learning** • Plant seeds and care for growing plants. (Nursery – Plants) • Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants) • Begin to understand the need to respect and care for the natural environment and all living things. (Reception– Plants) • Explore the natural world around them. (Reception – Living things and their habitats) • Recognise some environments that are different to the one in which they live. (Reception – Living things and their habitats)	Seed Plant Deciduous Evergreen Flowering plant Tree Roots Stem Flower sPlant Are all leaves the same?	Are all leaves the same? What's in a bud?

the basic structure of a variety of common flowering plants, including trees.	**Common Misconceptions** Some children may think: · plants are flowering plants grown in pots with coloured petals and leaves and a stem · trees are not plants · all leaves are green · all stems are green · a trunk is not a stem · blossom is not a flower.	**Future Learning** • Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants) • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats) • Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. (Y3 - Plants) • Investigate the way in which water is transported within plants. (Y3 Plants)	How do leaves change?	

Animals and Plants	**Key Scientific Knowledge**		**Vocabulary**	**Investigations**
Animals, including humans Pupils should be taught to: Identify and name a varietyof common animals including fish,	**Key Learning** Animals vary in many ways having different structures e.g. wings, tails, ears etc. They also have different skin coverings e.g. scales, feathers, hair. These key features can be used to identify them. Animals eat certain things - some eat other animals, some eat plants, some eat both plants and animals. Humans have key parts in common, but these vary from person to person. Humans (and other animals) find out about the world using their senses. Humans have five senses – sight, touch, taste, hearing and smelling. These senses are linked to particular parts of the body.	**Prior Learning** • Use all their senses in hands-on exploration of natural materials. (Nursery - Humans) • Name and describe people who are familiar to them. (Reception - Humans)	Fish Amphibians Reptiles Birds Mammals	Can you leap like a frog? What is camouflage for? Why do we have two eyes? How does it move? What can worms

amphibians, reptiles, birds and mammals; identify and name a variety of common animals that are carnivores, herbivores and omnivores	**Common Misconceptions** Some children may think: • only four-legged mammals, such as pets, are animals • humans are not animals • insects are not animals • all 'bugs' or 'creepy crawlies', such as spiders, are part of the insect group • amphibians and reptiles are the same	**Future Learning** • 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. (Y2 - Living things and their habitats) • 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. (Y6 - Living things and their habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)		sense? Whose poo?

Everyday Materials	Key Scientific Knowledge		Vocabulary	Investigations
Pupils should be taught to: 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 variety of everyday materials; compare and group together a variety ofeveryday materials on the basis of their	**Key Learning** All objects are made of one or more materials. Some objects can be made from different materials e.g. plastic, metal or wooden spoons. Materials can be described by their properties e.g. shiny, stretchy, rough etc. Some materials e.g. plastic can be in different forms with very different properties.	**Prior Learning** • Use all their senses in hands-on exploration of natural materials. (Nursery - Materials, including changing materials) • Explore collections of materials with similar and/or different properties. (Nursery - Materials, including changing materials) • Talk about the differences between materials and changes they notice. (Nursery - Materials, including changing materials)	absorbent bendy brick elastic fabrics man-made metal natural opaque plastic rock rough shiny smooth stiff stretchy transparent waterproof wood	Can you be a superhero? How does it feel? What keeps us dry? What makes the loudest sound?

simple physical properties.	**Common Misconceptions** Some children may think: • only fabrics are materials • only building materials are materials • only writing materials are materials • the word 'rock' describes an object rather than a material • 'solid' is another word for hard	**Future Learning** • 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) • 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)		

Seasonal Changes	**Key Scientific Knowledge**		**Vocabulary**	**Investigations**
Pupils should be taught to: Observe changes across the four seasons; observe and describe weather associated with the seasons and how day length varies.	**Key Learning** In the UK, the day length is longest at mid-summer (about 16 hours) and gets shorter each day until mid-winter (about 8 hours) before getting longer again. The weather also changes with the seasons. In the UK, it is usually colder and rainier in winter, and hotter and drier in the summer. The change in weather causes many other changes. Some examples are: numbers of minibeasts found outside; seed and plant growth; leaves on trees; and type of clothes worn by people.	**Prior Learning** • Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants & Animals, excluding humans) • Explore the natural world around them. (Reception – Seasonal changes) • Describe what they see, hear and feel whilst outside. (Reception – Seasonal changes) • Understand the effect of changing seasons on the natural world around them. (Reception – Seasonal changes)	Weather Temperature Seasons Leaves Thunderstor mAutumn Spring Summer Winter Leave s Month	Autumn How do leaves change? Winter Do pinecones know it's raining? Summer Does it snow in the summer?

	Common Misconceptions Some children may think: • only fabrics are materials • only building materials are materials • only writing materials are materials • the word 'rock' describes an object rather than a material • 'solid' is another word for hard	**Future Learning** • 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) • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. (KS3)		

Year 2				
Plants	**Key Scientific Knowledge**		**Vocabulary**	**Investigations**
Pupils should be taught to: Pupils should be taught to: 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.	Plants may grow from either seeds or bulbs. These then germinate and grow into seedlings which then continue to grow into mature plants. These mature plants may have flowers which then develop into seeds, berries, fruits etc. Seeds and bulbs need to be planted outside at particular times of year and they will germinate and grow at different rates. Some plants are better suited to growing in full sun and some grow better in partial or full shade. Plants also need different amounts of water and space to grow well and stay healthy.	**Prior Learning** • Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants)	branches bulb common crop deciduous evergreen flower flowering fruit somethin ggarden herb leaf / leaves petal plant reproduce roots seed stem tree trunk vegetable vegetatio n weed wild	Can seeds grow anywhere? How does grass grow? How do plants grow in winter? What's on your wellies?
	Common Misconceptions Some children may think: • plants are not alive as they cannot be seen to move • seeds are not alive • all plants start out as seeds • seeds and bulbs need sunlight to germinate.	**Future Learning** • Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. (Y3 - Plants) • 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. (Y3 - Plants) • Investigate the way in which water is transported within plants. (Y3 - Plants) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)		

<table>
<tr><th>Animals including Humans</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

Pupils should be taught to:
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</td><td>Key Learning
Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be young, such as babies or kittens, that grow into adults. In other animals, such as chickens or insects, there may be eggs laid that hatch to young or other stages which then grow to adults. The young of some animals do not look like their parents e.g. tadpoles.
All animals, including humans, have the basic needs of feeding, drinking and breathing that must be satisfied in order to survive. To grow into healthy adults, they also need the right amounts and types of food and exercise. Good hygiene is also important in preventing infections and illnesses.</td><td>Prior Learning
• Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans)
• 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)</td><td rowspan="2">Offspring
Growth
Pupa
Baby
Toddler
Child
Teenager
Adult
Hygiene
Exercise
Diet</td><td rowspan="2">What is the life cycle of the ladybird?

Do insects have a favourite colour?

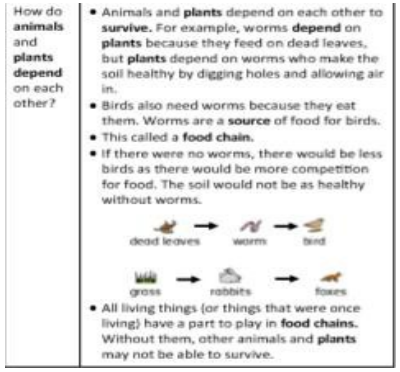
Do snails have noses?</td></tr>
<tr><td>Common Misconceptions

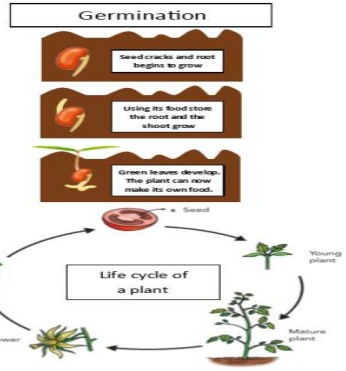
Some children may think:

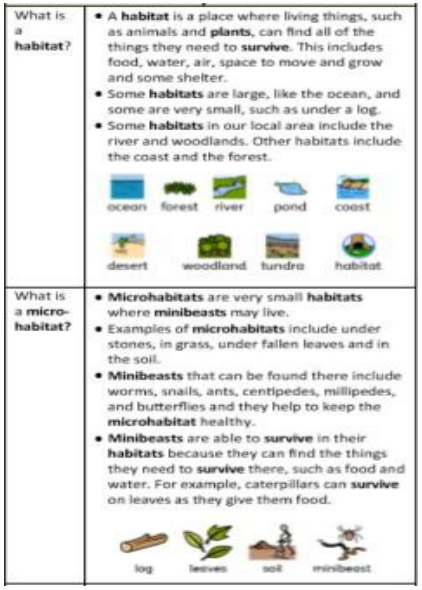
• an animal’s habitat is like its ‘home’
• all animals that live in the sea are fish
• respiration is breathing
• breathing is respiration</td><td>Future Learning
• Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. (Y3 - Animals, including humans)
• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats)
• Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)
• Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)</td></tr>
</table>

Living things and their habitats	Key Scientific Knowledge		Vocabulary	Investigations
Pupils should be taught to: Explore and compare the differences between things that are living, dead, and things that have never been alive; identify that most livingthings live in habitats to which they are suited and describe how different habitats provide for the basicneeds 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	**Key Learning** All objects are either living, dead or have never been alive. Living things are plants (including seeds) and animals. Dead things include dead animals and plants and parts of plants and animals that are no longer attached e.g. leaves and twigs, shells, fur, hair and feathers (This is a simplification, but appropriate for Year 2 children.) An object made of wood is classed as dead. Objects made of rock, metal and plastic have never been alive (again ignoring that plastics are made of fossil fuels). Animals and plants live in a habitat to which they are suited, which means that animals have suitable features that help them move and find food and plants have suitable features that help them to grow well. The habitat provides the basic needs of the animals and plants – shelter, food and water. Within a habitat there are different micro-habitats e.g. in a woodland – in the leaf litter, on the bark of trees, on the leaves. These micro-habitats have different conditions e.g. light or dark, damp or dry. These conditions affect which plants and animals live there. The plants and animals in a habitat depend on each other for food and shelter etc. The way that animals obtain their food from plants and other animals can be shown in a food chain	**Prior Learning** • Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) • Observe changes across the four seasons. (Y1 - Seasonal changes)	Living Seed Germinate Non living Habitat Survive Micro habitat Food chain Plants Animals Sources n Variety Life cycle Scattered	How many arms does an octopus have? Where do snails live? Where do worms like to live?

microhabitats; 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.	**Common Misconceptions** Some children may think: • an animal's habitat is like its 'home' • all animals that live in the sea are fish • respiration is breathing • breathing is respiration	**Future Learning** • Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats) • 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) • Recognise that environments can change and that this can sometimes pose dangers to living things. (Y4 - Living things and their habitats) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans)		







Uses of everyday Materials	Key Scientific Knowledge		Vocabulary	Investigations
Pupils should be taught to: Pupils should be taught to: 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, bending, twisting and stretching	**Key Learning** All objects are made of one or more materials that are chosen specifically because they have suitable properties for the task. For example, a water bottle is made of plastic because it is transparent allowing you to see the drink inside and waterproof so that it holds the water. When choosing what to make an object from, the properties needed are compared with the properties of the possible materials, identified through simple tests and classifying activities. A material can be suitable for different purposes and an object can be made of different materials. Objects made of some materials can be changed in shape by bending, stretching, squashing and twisting. For example, clay can be shaped by squashing, stretching, rolling, pressing etc. This can be a property of the material or depend on how the material has been processed e.g. thickness.	**Prior Learning** • Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials)	Materials Properties Wood Metal Plastic Glass Brick Rock Paper Cardboard Solid Changed Squashing Blinding twisting Stretching Suitable Unsuitable Purpose Hardness	**INFO NEEDED**
	Common Misconceptions Some children may think: • only fabrics are materials • only building materials are materials • only writing materials are materials • the word rock describes an object rather than a material • solid is another word for hard.	**Future Learning** • Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Y3 - Rocks) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets) • 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. (Y5 - Properties and changes of materials) • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood		

Year 3				
Animals including Humans	**Key Scientific Knowledge**		**Vocabulary**	**Investigations**
Pupils should be taught to: Pupils should be taught to: 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; identifythat humans and some other animals have skeletons and muscles for support, protection and movement.	**Key Learning** Animals, unlike plants which can make their own food, need to eat in order to get the nutrients they need. Food contains a range of different nutrients – carbohydrates (including sugars), protein, vitamins, minerals, fats, sugars, water – and fibre that are needed by the body to stay healthy. A piece of food will often provide a range of nutrients. Humans, and some other animals, have skeletons and muscles which help them move and provide protection and support.	**Prior Learning** • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals, including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 - Animals, including humans) • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)	Skeleton Muscle Tissue Bones Protect Movement	How do worms move? What are joints for?
	Common Misconceptions Some children may think: • certain whole food groups like fats are ‘bad’ for you • certain specific foods, like cheese are also ‘bad’ for you • diet and fruit drinks are ‘good’ for you • snakes are similar to worms, so they must also be invertebrates • invertebrates have no form of skeleton.	**Future Learning** • Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans) • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)		

<table>
<tr><th>Rocks</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

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 livedare trapped within rock; recognise that soils are made from rocks and organic matter.</td><td>Key Learning
Rock is a naturally occurring material. There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft. They have different sizes of grain or crystal. They may absorb water. Rocks can be different shapes and sizes (stones, pebbles, boulders). Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil.
Some rocks contain fossils. Fossils were formed millions of years ago. When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water.</td><td>Prior Learning
• Distinguish between an object and the material from which it is made. (Y1 - Everyday materials)
• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials)
• Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials)
• Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials)
• 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)</td><td rowspan="2">Erosion
Magma
Solidify
Dissolve</td><td rowspan="2">How do fossils form?

How do we identify different rock types?</td></tr>
<tr><td>Common Misconceptions

Some children may think:

• rocks are all hard in nature
• rock-like, man-made substances such as concrete or brick are rocks
• materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer ‘natural’
• certain found artefacts, like old bits of pottery or coins, are fossils
• a fossil is an actual piece of the extinct animal or plant
• soil and compost are the same thing.</td><td>Future Learning
• 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)
• The composition of the Earth. (KS3)
• The structure of the Earth. (KS3)
• The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. (KS3)</td></tr>
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<table>
<tr><th>Forces and Magnets</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:
Compare how things move on different surfaces; noticethat 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</td><td>Key Learning
A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes.
A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract.
For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts</td><td>Prior Learning
• Explore how things work. (Nursery - Forces)
• Explore and talk about different forces they can feel. (Nursery - Forces)
• Talk about the differences between materials and changes they notice. (Nursery - Forces)
• Explore the natural world around them. (Reception - Forces)
• Describe what they see, hear and feel whilst outside. (Reception - Forces)
• 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)</td><td rowspan="2">Magnet
Magnetism
Magnetic field
Magnetic Poles (North and South poles).
Lodestone, a rock that is naturally magnetic.</td><td rowspan="2">How mighty are magnets?

Why do magnets attract and repel?

Can you block magnetism ?</td></tr>
<tr><td>Common Misconceptions

Some children may think:

• rocks are all hard in nature
• rock-like, man-made substances such as concrete or brick are rocks
• materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer ‘natural’
• certain found artefacts, like old bits of pottery or coins, are fossils
• a fossil is an actual piece of the extinct animal or plant
• soil and compost are the same thing.</td><td>Future Learning
• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 - Forces)
• Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (Y5 - Forces)
• Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 - Forces)
• Magnetic fields by plotting with compass, representation by field lines. (KS3)
• Earth’s magnetism, compass and navigation. (KS3)</td></tr>
</table>

<table>
<tr><th>Light</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

Recognise that they need light in order to see things and that dark is the absenceof 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 froma light source is blocked by an opaque object; find patterns in the way that thesize of shadows change</td><td>Key Learning
We see objects because our eyes can sense light. Dark is the absence of light. We cannot see anything in complete darkness. Some objects, for example, the sun, light bulbs and candles are sources of light. Objects are easier to see if there is more light. Some surfaces reflect light. Objects are easier to see when there is less light if they are reflective. The light from the sun can damage our eyes and therefore we should not look directly at the sun and can protect our eyes by wearing sunglasses or sunhats in bright light. Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface and blocks some of the light. The size of the shadow depends on the position of the source, object and surface.</td><td>Prior Learning
Explore how things work. (Nursery - Light)
Talk about the differences in materials and changes they notice. (Nursery - Light)
Describe what they see, hear and feel whilst outside. (Reception - Light)
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)
Describe the simple physical properties of a variety of everyday materials. (Y1 - Materials)</td><td rowspan="2">Opaque
Source
Electric
Reflection
Transparent
Translucent</td><td rowspan="2">Why do shadows change?</td></tr>
<tr><td>Common Misconceptions

Some children may think:
we can still see even where there is an absence of any light
our eyes ‘get used to’ the dark
the moon and reflective surfaces are light sources
a transparent object is a light source
shadows contain details of the object, such as facial features on their own shadow
shadows result from objects giving off darkness.</td><td>Future Learning
Recognise that light appears to travel in straight lines. (Y6 - Light)
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. (Y6 - Light)
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. (Y6 - Light)
Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. (Y6 – Light)</td></tr>
</table>

<table>
<tr><th>Plants and Living Things</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

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 howthey vary from plant to plant; investigate the way inwhich water is transported within plants; explore the part that flowers play in thelife cycle of flowering plants, including pollination,seed formation and seed dispersal.</td><td>Key Learning
Many plants, but not all, have roots, stems/trunks, leaves and flowers/blossom. The roots absorb water and nutrients from the soil and anchor the plant in place. The stem transports water and nutrients/minerals around the plant and holds the leaves and flowers up in the air to enhance photosynthesis, pollination and seed dispersal. The leaves use sunlight and water to produce the plant’s food. Some plants produce flowers which enable the plant to reproduce. Pollen, which is produced by the male part of the flower, is transferred to the female part of other flowers (pollination). This forms seeds, sometimes contained in berries or fruits which are then dispersed in different ways. Different plants require different conditions for germination and growth.</td><td>Prior Learning
• Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants)
• Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants)</td><td rowspan="2">Petal
Pollen
Fertilisation
Dispersal
Nectar</td><td rowspan="2">Do plants have legs?

What are flowers for?

How do plants get water?</td></tr>
<tr><td>Common Misconceptions

Some children may think:

• plants eat food
• food comes from the soil via the roots
• flowers are merely decorative rather than a vital part of the life cycle in reproduction
• plants only need sunlight to keep them warm
• roots suck in water which is then sucked up the stem.</td><td>Future Learning
• Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)
• Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)</td></tr>
</table>

Year 4				
Living things & their habitats	**Key Scientific Knowledge**		**Vocabulary**	**Investigations**
Pupils should be taught to: Recognise that living thingscan be grouped in a variety of ways; explore and use classification keys to help group, identify andname 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.	**Key Learning** Living things can be grouped (classified) in different ways according to their features. Classification keys can be used to identify and name living things. Living things live in a habitat which provides an environment to which they are suited (Year 2 learning). These environments may change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the environment to change. This can be in a good way (i.e. positive human impact, such as setting up nature reserves) or in a bad way (i.e. negative human impact, such as littering). These environments also change with the seasons; different living things can be found in a habitat at different times of the year.	**Prior Learning** • Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Y1 - Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Y1 - Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 – Animals, including humans) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 - Living things and their habitats)	Gills Fins Scales Lungs Body Temperature Section Deciduous Coniferous (Evergreen) Algae	Are all sea creatures the same? Can animals sense danger?
	Common Misconceptions Some children may think: • the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain • there is always plenty of food for wild animals • animals are only land-living creatures • animals and plants can adapt to their habitats, however they change • all changes to habitats are negative	**Future Learning** • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats) • 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. (Y6 - Living things and their habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Y6 - Living things and their habitats)		

Living things & their habitats	Key Scientific Knowledge		Vocabulary	Investigations
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.	**Key Learning** Food enters the body through the mouth. Digestion starts when the teeth start to break the food down. Saliva is added and the tongue rolls the food into a ball. The food is swallowed and passes down the oesophagus to the stomach. Here the food is broken down further by being churned around and other chemicals are added. The food passes into the small intestine. Here nutrients are removed from the food and leave the digestive system to be used elsewhere in the body. The rest of the food then passes into the large intestine. Here the water is removed for use elsewhere in the body. What is left is then stored in the rectum until it leaves the body through the anus when you go to the toilet. Humans have four types of teeth: incisors for cutting; canines for tearing; and molars and premolars for grinding (chewing). **Common Misconceptions** • arrows in a food chains mean 'eats' • the death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain • there is always plenty of food for wild animals • your stomach is where your belly button is • food is digested only in the stomach • when you have a meal, your food goes down one tube and your drink down another • the food you eat becomes "poo" and the drink becomes "wee"	**Prior Learning** • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans) • Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans) • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) • 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. (Y3 - Animals, including humans) **Future learning** Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. (Y6 - Animals, including humans) • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans) • Describe the ways in which nutrients and water are transported within animals, including humans. (Y6 - Animals, including humans)	Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain	How does toothpaste protect teeth? How does the stomach work?

States of Matter	Key Scientific Knowledge		Vocabulary	Investigations
Pupils should be taught to: Compare and group materials together, according to whether theyare 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 watercycle and associate the rate of evaporation with temperature.	**Key Learning** A solid keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level, horizontal surface. A gas fills all available space; it has no fixed shape or volume. Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid. Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0^{o}C. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100^{o}C. Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. Condensation is the change back from a gas to a liquid caused by cooling. Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.	**Prior Learning** • Distinguish between an object and the material from which it is made. (Y1 - Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials) • Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - Everyday materials) • 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) • 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)	Solids Liquids Gases Temperature Celsius Boils Container Condense Vapour Water cycle	Is custard a liquid? Where does water go?

	Common Misconceptions Some children may think: • 'solid' is another word for hard or opaque • solids are hard and cannot break or change shape easily and are often in one piece • substances made of very small particles like sugar or sand cannot be solids • particles in liquids are further apart than in solids and they take up more space • when air is pumped into balloons, they become lighter • water in different forms – steam, water, ice – are all different substances • all liquids boil at the same temperature as water (100 degrees) • melting, as a change of state, is the same as dissolving • steam is visible water vapour (only the condensing water droplets can be seen) • clouds are made of water vapour or steam • the substance on windows etc. is condensation rather than water • the changing states of water (illustrated by the water cycle) are irreversible • evaporating or boiling water makes it vanish • evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.	**Future Learning** • 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. (Y5 - Properties and changes of materials) • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. (Y5 - Properties and changes of materials) • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. (Y5 - Properties and changes of materials) • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (Y5 - Properties and changes of materials) • Demonstrate that dissolving, mixing and changes of state are reversible changes. (Y5 - Properties and changes of materials) • 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. (Y5 - Properties and changes of materials)		

<table>
<tr><th>Electricity</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

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, basedon 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 Recognise some common conductors and insulators, and associatemetals with being good conductors.</td><td>Key Learning
Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off.
Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.</td><td>Prior Learning
• Explore how things work. (Nursery - Electricity)</td><td rowspan="2">Generator
Component
Circuit
Current
Connected
Bulb
Switch
Conductor
Insulator
Electricity</td><td rowspan="2">What conducts electricity?</td></tr>
<tr><td>Common Misconceptions

Some children may think:

• electricity flows to bulbs, not through them
• electricity flows out of both ends of a battery
• electricity works by simply coming out of one end of a battery into the component.</td><td>Future Learning
• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. (Y6 - Electricity)
• 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. (Y6 - Electricity)
• Use recognised symbols when representing a simple circuit in a diagram. (Y6 - Electricity)</td></tr>
</table>

<table>
<tr><th>Sound</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

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.</td><td>Key Learning
A sound produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound.
The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively.
Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.</td><td>Prior Learning
• Explore how things work. (Nursery - Sound)
• Describe what they see, hear and feel whilst outside. (Reception - Sound)
• 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)</td><td rowspan="2">vibration
sound waves
pitch
volume
larynx
sound barrier
Supersonic</td><td rowspan="2">Can we block sound?

How far can sound travel?

How can we change a sound?</td></tr>
<tr><td>Common Misconceptions

Some children may think:

• sound is only heard by the listener
• sound only travels in one direction from the source
• sound can’t travel through solids and liquids
• high sounds are load and low sounds are quiet.</td><td>Future Learning
• Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. (KS3)
• Frequencies of sound waves, measured in Hertz (Hz); echoes, reflection and absorption of sound. (KS3)
• Sound needs a medium to travel, the speed of sound in air, in water, in solids. (KS3)
• Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. (KS3)
• Auditory range of humans and animals. (KS3)
• Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. (KS3)
• Waves transferring information for conversion to electrical signals by</td></tr>
</table>

Year 5				
Living things & their habitats	**Key Scientific Knowledge**		**Vocabulary**	**Investigations**
Pupils should be taught to: 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.	**Key Learning** As part of their life cycle, plants and animals reproduce. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. Animals, including humans, have offspring which grow into adults. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis. Plants reproduce both sexually and asexually. Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction which involves only one parent. Gardeners may force plants to reproduce asexually by taking cuttings. Sexual reproduction occurs through pollination, usually involving wind or insects.	**Prior Learning** • Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)	Consumer Predator Prey Food chain Molar Premolar Canine Incisor Reproduce pollination Pollinator Reproduction Stamen Germinate	What is the life cycle of a meal worm? How do worms reproduce?

	Common Misconceptions Some children may think: • all plants start out as seeds • all plants have flowers • plants that grow from bulbs do not have seeds • only birds lay eggs.	**Future Learning** • Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive 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. (KS3) • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)		

<table>
<tr><th>Animals, including humans</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

describe the changes as humans develop to old age.</td><td>Key Learning
When babies are young, they grow rapidly. They are very dependent on their parents. As they develop, they learn many skills. At puberty, a child’s body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce. This needs to be taught alongside PSHE.</td><td>Prior Learning
• Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)</td><td rowspan="2">Develop
Age
Old age
Changes
Human
Growth
Development
Changes
Puberty
Gestation
Baby
Growth
Length
Mass</td><td rowspan="2">Do we slow down as we get older?</td></tr>
<tr><td>Common Misconceptions

Some children may think:

• a baby grows in a mother’s tummy
• a baby is “made”.</td><td>Future Learning
• Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive 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. (KS3)</td></tr>
</table>

Properties and changes of materials	Key Scientific Knowledge		Vocabulary	Investigations
Pupils should be taught to: Compare and group togethereveryday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets; 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 throughfiltering, sieving and evaporating; give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, includingmetals, wood	**Key Learning** Materials have different uses depending on their properties and state (liquid, solid, gas). Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment. Mixtures can be separated by filtering, sieving and evaporation. Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.	**Prior Learning** • 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) • 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) • 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. (Y3 - Forces and magnets) • Compare and group materials together, according to whether they are solids, liquids or gases. (Y4 - States of matter) • 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). (Y4 - States of matter) • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (Y4 - States of matter)	Conductor Dissolve Evaporation Filtering Flexible Gas Insulator Irreversible Liquid Magnetic Material Opaque Reversible Sieving Solid Soluble Thermal Transparent	Which materials conduct heat? Do all solids dissolve?

and plastic; demonstrate that dissolving, mixing and changes of state are reversible changes; 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 andthe action of acid on bicarbonate of soda.	**Common Misconceptions** Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed. Some children may think: • thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change.	**Future Learning** • Chemical reactions as the rearrangement of atoms. (KS3) • Representing chemical reactions using formulae and using equations. (KS3) • Combustion, thermal decomposition, oxidation and displacement reactions. (KS3) • Defining acids and alkalis in terms of neutralisation reactions. (KS3) • The pH scale for measuring acidity/ alkalinity; and indicators. (KS3)		

<table>
<tr><th>Earth & Space</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

Describe the movement ofthe Earth, and other planets, relative to the Sun in the solar system; describe the movement ofthe Moon relative to the Earth; describe the Sun, Earth and Moon as approximately spherical bodies; use the idea of theEarth’s rotation to explain day and night and the apparent movement of the sun across the sky.</td><td>Key Learning
The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes 365¼ days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky. The Moon orbits the Earth. It takes about 28 days to complete its orbit. The Sun, Earth and Moon are approximately spherical.</td><td>Prior Learning
• Explore the natural world around them. (Reception - Earth and space)
• Describe what they see, hear and feel whilst outside. (Reception - Earth and space)
• Observe changes across the four seasons. (Y1 - Seasonal changes)
• Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes)</td><td rowspan="2">Asteroid
Axis
Celestial
Day
Dwarf planet e.g. Pluto
Geocentric
Heliocentric
Moon
Night
Orbit
Planet
Rotation
Solar system
Star
Sun
Gravity
Air resistance</td><td rowspan="2">Can we track the sun?

How does the moon move?

How do we know that the earth is round?</td></tr>
<tr><td>Common Misconceptions
Some children may think:

• the Earth is flat
• the Sun is a planet
• the Sun rotates around the Earth
• the Sun moves across the sky during the day
• the Sun rises in the morning and sets in the evening
• the Moon appears only at night
• night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.</td><td>Future Learning
• Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). (KS3)
• Our Sun as a star, other stars in our galaxy, other galaxies. (KS3)
• The seasons and the Earth’s tilt, day length at different times of year, in different hemispheres. (KS3)
• The light year as a unit of astronomical distance. (KS3)</td></tr>
</table>

<table>
<tr><th>Forces</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

Explain that unsupported objects fall towards the Earth because of the forceof gravity acting between the Earth and the falling object; identify the effectsof 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</td><td>Key Learning
A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall.
Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object.
A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover.
Pulleys, levers and gears are all mechanisms, also known as simple machines.</td><td>Prior Learning
• Compare how things move on different surfaces. (Y3 - Forces and magnets)
• Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets)
• Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets)
• 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. (Y3 - Forces and magnets)
• Describe magnets as having two poles. (Y3 - Forces and magnets)
• Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets)</td><td rowspan="2">Air resistance
Balanced force
Force
Friction
Gears
Gravity
Levers
Mass Pull
Force
Pulleys
Push force
Unbalanced force
Water resistance</td><td rowspan="2">INFO NEEDED</td></tr>
<tr><td>Common Misconceptions
Some children may think:

• the heavier the object the faster it falls, because it has more gravity acting on it
• forces always act in pairs which are equal and opposite
• smooth surfaces have no friction
• objects always travel better on smooth surfaces
• a moving object has a force which is pushing it forwards and it stops when the pushing force wears out
• a non-moving object has no forces acting on it
• heavy objects sink and light objects float.</td><td>Future Learning
• Forces as pushes or pulls, arising from the interaction between two objects. (KS3)
• Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3)
• Moment as the turning effect of a force. (KS3)
• Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3)
• Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)</td></tr>
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<table>
<tr><td>Year 6</td><td colspan="2"></td><td></td><td></td></tr>
<tr><td>Living things & their habitats</td><td colspan="2">Key Scientific Knowledge</td><td>Vocabulary</td><td>Investigations</td></tr>
<tr><td rowspan="2">Pupils should be taught to:

Describe how living things are categorised into broad groups according to observable characteristics and based on similarities and differences including organisms, plants and animals. Give reasons for classifications.</td><td>Key Learning
Living things can be formally grouped according to characteristics. Plants and animals are two main groups but there are other livings things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms.
Plants can make their own food whereas animals cannot.
Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has common characteristics.
Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms.
Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants.</td><td>Prior Learning
• Recognise that living things can be grouped in a variety of ways. (Y4 - Living things and their habitats)
• 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)
• Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Y5 - Living things and their habitats)
• Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)</td><td rowspan="2">Amphibian
Annelid
Arachnid
Bird
Crustaceans
Habitat
Insect
Invertebrate
Mammal
Microorganis
mReptile
Vertebrate</td><td rowspan="2">Why are things classified?

How do animals stay warm?

Where do wild plants grow best?

How many worms are underground?</td></tr>
<tr><td>Common Misconceptions

Some children may think:

• all micro-organisms are harmful
• mushrooms are plants.</td><td>Future Learning

• Differences between species. (KS3)</td></tr>
</table>

Animals including humans	Key Scientific Knowledge		Vocabulary	Investigations
Pupils should be taught to: 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 waterare transported within animals, including humans.	**Key Learning** The heart pumps blood in the blood vessels around to the lungs. Oxygen goes into the blood and carbon dioxide is removed. The blood goes back to the heart and is then pumped around the body. Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed. As they are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system. Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well out heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel. Some conditions are caused by deficiencies in our diet e.g. lack of vitamins. This content is also included in PSHE.	**Prior Learning** • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans) • 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. (Y3 - Animals, including humans) • Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans) • Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)	Circulation Vessels Heart Veins Arteries Chamber Capillaries Atrium Waste products Nutrients Oxygen Carbon dioxide Ventricle Lungs	How does blood flow? What can your heart rate tell you? PE What's in blood?
	Common Misconceptions Some children may think: • your heart is on the left side of your chest • the heart makes blood • the blood travels in one loop from the heart to the lungs and around the body • when we exercise, our heart beats faster to work the muscles more • some blood in our bodies is blue and some blood is red • we just eat food for energy • all fat is bad for you • all dairy is good for you • protein is good for you, so you can eat as much as you want • foods only contain fat if you can see it • all drugs are bad for you.	**Future Learning** • The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases. (KS3) • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. (KS3) • The structure and functions of the gas exchange system in humans, including adaptations to function. (KS3) • The mechanism of breathing to move air in and out of the lungs. (KS3) • The impact of exercise, asthma and smoking on the human gas exchange system. (KS3)		

<table>
<tr><th>Light</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

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 thingsbecause 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.</td><td>Key Learning
Light appears to travel in straight lines, and we see objects when light from them goes into our eyes. The light may come directly from light sources, but for other objects some light must be reflected from the object into our eyes for the object to be seen. Objects that block light (are not fully transparent) will cause shadows. Because light travels in straight lines the shape of the shadow will be the same as the outline shape of the object.</td><td>Prior Learning
• Recognise that they need light in order to see things and that dark is the absence of light. (Y3 - Light)
• Notice that light is reflected from surfaces. (Y3 - Light)
• Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Y3 - Light)
• Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3 - Light)
• Find patterns in the way that the size of shadows change. (Y3 - Light)
• 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. (Y5 - Properties and changes of materials)</td><td rowspan="2">Light source
Periscope
Rainbow
Reflection
Refraction
Shadow
Spectrum</td><td rowspan="2">Is green really green?

What colour is a shadow?

What is a reflection?

How does light travel?</td></tr>
<tr><td>Common Misconceptions
Some children may think:

• We see objects because light travels from our eyes to the object.</td><td>Future Learning
• The similarities and differences between light waves and waves in matter. (KS3)
• Light waves travelling through a vacuum; speed of light. (KS3)
• The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. (KS3)
• Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. (KS3)
• Light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras. (KS3)
• Colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. (KS3)</td></tr>
</table>

<table>
<tr><th>Electricity (Morse Code)</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

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.</td><td>Key Learning
Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound. If you use a battery with a higher voltage, the same thing happens. Adding more bulbs to a circuit will make each bulb less bright. Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter. Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well.
You can use recognised circuit symbols to draw simple circuit diagrams.</td><td>Prior Learning
• Identify common appliances that run on electricity. (Y4 - Electricity)
• Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. (Y4 - Electricity)
• 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. (Y4 - Electricity)
• Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. (Y4 - Electricity)
• Recognise some common conductors and insulators, and associate metals with being good conductors. (Y4 - Electricity)</td><td rowspan="2">Battery
Bulb
Buzzer
Cell
Circuit
Current
Electricity
Filament
Motor
Switch
Voltage
Volt</td><td rowspan="2">Can you turn light down?

Can you send a coded message?</td></tr>
<tr><td>Common Misconceptions
Some children may think:

• larger-sized batteries make bulbs brighter
• a complete circuit uses up electricity
• components in a circuit that are closer to the battery get more electricity.</td><td>Future Learning
• Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. (KS3)
• Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. (KS3)
• Differences in resistance between conducting and insulating components (quantitative). (KS3)
• Static electricity. (KS3)</td></tr>
</table>

<table>
<tr><th>Evolution and Inheritance</th><th colspan="2">Key Scientific Knowledge</th><th>Vocabulary</th><th>Investigations</th></tr>
<tr><td rowspan="2">Pupils should be taught to:

Recognise that living thingshave 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.</td><td>Key Learning
All living things have offspring of the same kind, as features in the offspring are inherited from the parents. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other. Plants and animals have characteristics that make them suited (adapted) to their environment. If the environment changes rapidly, some variations of a species may not suit the new environment and will die. If the environment changes slowly, animals and plants with variations that are best suited survive in greater numbers to reproduce and pass their characteristics on to their young. Over time, these inherited characteristics become more dominant within the population. Over a very long period of time, these characteristics may be so different to how they were originally that a new species is created. This is evolution.
Fossils give us evidence of what lived on the Earth millions of year ago and provide evidence to support the theory of evolution. More recently, scientists such as Darwin and Wallace observed how living things adapt to different environments to become distinct varieties with their own characteristics.</td><td>Prior Learning
• 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)
• Notice that animals, including humans, have offspring which grow into adults. (Y2 - Animals, including humans)
• Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Y3 - Plants)
• 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)
• Describe the life process of reproduction in some plants and animals. (Living things and their habitats - Y5)</td><td rowspan="2">Adaptation
Body fossil
Breeding
Environment
Evolution
Fossil
Inherit
Migration
Offspring
Reproduction
Selective breeding
Trace fossil</td><td rowspan="2">Why do birds have different beaks?

How does inheritance work?</td></tr>
<tr><td>Common Misconceptions
Some children may think:
• adaptation occurs during an animal’s lifetime: giraffes’ necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life
• offspring most resemble their parents of the same sex, so that sons look like fathers
• all characteristics, including those that are due to actions during the parent’s life such as dyed hair or footballing skills, can be inherited
• cavemen and dinosaurs were alive at the same time.</td><td>Future Learning
• Heredity as the process by which genetic information is transmitted from one generation to the next. (KS3)
• A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. (KS3)
• The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. (KS3)
• 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. (KS3)</td></tr>
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