



## Whole School Science Long Term Plan 2022-2023

	Autumn Term			Spring Term			Summer Term		
Nursery	All about me	Different materials		Animals			Our body		Healthy foods
Reception	Our body	Baking Seasons		Animals			Plants		Floating/sinking Different materials
Year 1	Everyday materials	Seasonal Changes	Everyday materials	Animals including humans	Seasonal changes	Animals including humans	Plants	Seasonal changes	Plants
Year 2	Uses of everyday materials	Living things and their habitats		Animals including humans			Plants		
Year 3	Animals including humans	Rocks and minerals		Forces and magnets	Light		Plants		
Year 4	Animals including humans	Changing sound		Circuits and conductors	States of matter		Living things and their habitats		
Year 5	Properties and changes to materials			Forces	Living things and their habitat		Animals including Humans		Earth and Space
Year 6	Animals including Humans			Electricity	Evolution and inheritance		Light		Living things and their habitats

### The intent of our Science Curriculum at Christ Church CE Primary Academy

Christ Church CE Primary Academy we encourage children to be inquisitive learners. Our vision is to give children a Science curriculum, which enables them to explore and discover the world around them, confidently, so that they have a deeper understanding. Children are naturally curious learners. Providing a stimulating hands on Science curriculum ignites the children's curiosity and encourages them to become inquisitive learners. A practical, inquiry-based curriculum, empowers the children to lead their own learning by asking and answering their own questions through investigation, observation and research.

At Christ Church CE Primary Academy, scientific enquiry skills are embedded in each topic the children study and these topics are revisited and developed throughout their time at school. Topics, such as 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. All children are encouraged to develop and use a range of skills including observations, planning and investigations, as well as being encouraged to question the world around them and become independent learners in exploring possible answers for their

### The aims for implementation of our curriculum for science at Christ Church CE Primary Academy

To ensure that all pupils:

- Are given the opportunity to ask questions and plan investigations to find their own answers.
- Are encouraged to be independent thinkers and learners
- Natural curiosity is encouraged; they are excited and enthusiastic to engage in science lessons.
- Answer open-ended questions to spark their creative thinking and ideas.
- Gain confidence to solve problems through practical and hands on lessons
- Learn through first hand experiences of scientific phenomena through observation, investigation, exploration and discovery.
- To use a scientific approach to solve 'real-life' problems.
- To use science knowledge and skills to understand the world around them.

## Year 1

Each of the 5 types of scientific enquiry will be focused upon throughout the year:

Pattern seeking

Research

Fair testing

Identifying and classifying

Observation over time

### Working scientifically:

1. I know how to ask simple scientific questions and recognise that they can be answered in different ways.
2. I know how to use simple equipment to make observations.
3. I know how to use my observations and ideas to suggest answers to questions.
4. I know how to carry out simple tests.
5. I know how to identify and classify things. Use appropriate scientific language to communicate ideas.
6. I know how to explain to others what I have found out.
7. I know how to use simple data to answer questions.
8. I know how to gather and record data to help in answering questions.

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Children to group materials according to their properties. 5  What can make the best umbrella? 1, 6  Weather chart over the year. 2  Observe how the trees in our local area change over time. 8	What material will make good curtains? 4, 7  Weather chart over the year. 2	Children sort animals and group animals according to whether they are fish, amphibians, reptiles, birds and mammals. 5  Weather chart over the year. 2	Identify and name all the body parts. 5  Weather chart over the year. 2	Weather chart over the year. 2  What purpose do leaves serve? 3  Observe a plant growing from a seed. 3  Weather chart over the year. 2	Sort wild and garden plants. 5  Weather chart over the year. 2

**Pupils should be taught to:**

- Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.
- Identify and name a variety of common animals that are carnivores, herbivores and omnivores.
- Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets).
- Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.

**Sticky knowledge**

1. Some animals use other animals for food. Some animals eat plants and seeds for food. (Herbivore, Omnivore, Carnivore)
2. There are different types of animals based on where they live, what they eat and what they look like. These are reptiles, birds, fish, mammals, and amphibians.
3. Reptiles are air-breathing vertebrates covered in scales, bony plates, or a combination of both. They include crocodiles, alligators, snakes, lizards, turtles, and tortoises.
4. Birds are vertebrate animals that have feathers, wings, and beaks. Most birds are able to fly, but some (like ostriches and penguins) cannot fly even though they still have wings.
5. Fish are vertebrates (vertebrates have backbones) that live in water. They breathe using special organs called gills.
6. Mammals are warm-blooded vertebrates with hair or fur; females feed milk to their young, and most give birth to live young. Such as human, mouse, dog, cow.
7. Amphibians are cold-blooded vertebrates (vertebrates have backbones) that don't have scales. They live part of their lives in water and part on land. These are frog, toad, salamander and newt.
8. Name and label basic body parts (head, shoulders, knees, toes, eyes, ears, nose, mouth, elbow, neck, back)
9. Humans have key parts in common, but these vary from person to person.
10. Animals have senses to help them survive. The 5 senses are sight, smell, touch, taste, hear.
11. Animals have different skin coverings e.g. scales, feathers, hair

**Pupils will work scientifically by:**

- *Sort and group animals according to whether they are fish, amphibians, reptiles, birds and mammals.*
- *Identify and name all the parts of the body.*

**Key Questions:**

- What do animals eat?
- Do all animals eat the same food?
- Which of our senses is the most accurate at identifying food?
- Do all animals hunt?
- How are animals similar?
- How are animals different?
- How can we sort animals into groups?

**Key vocabulary**

Fish, reptiles, mammals, birds, amphibians, herbivore, omnivore, carnivore, leg, arm, elbow, head, ear, nose, back, neck, wings, beak.

**Key scientists**

Chris Packham (Animal Conservationist)

**Science careers**

Zoo keeper

Topic: Seasonal Changes		Year 1	
Pupils should be taught to: <ul style="list-style-type: none"><li>• Observe and describe weather associated with the seasons and how day length varies.</li><li>• Observe changes across the four seasons.</li><li>• Pupils should observe and talk about changes in the weather and the seasons.</li></ul>			
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>1. Weather can change.</li><li>2. There are many different types of weather: rain, sun, cloud, wind, snow, etc.</li><li>3. Days are longer and hotter in the summer.</li><li>4. Days are shorter and colder in the winter.</li><li>5. There are four seasons: Spring, summer, autumn, winter.</li><li>6. The weather and day length changes over the seasons.</li><li>7. In autumn, the weather begins to get colder. The leaves start to fall from the trees.</li><li>8. Evergreen trees keep their leaves all year round. Deciduous trees lose their leaves in autumn.</li></ol>		<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Observe how the trees in our local area change over the year.</li><li>➤ Weather chart over the year.</li><li>➤ What purpose do leaves serve?</li></ul>	
		<b>Key Questions:</b> <ul style="list-style-type: none"><li>• How does rainfall and temperature change over time?</li><li>• What do you notice about different leaves?</li><li>• What purpose to leaves serve for a tree?</li><li>• Why do you think leaves turn brown in autumn?</li><li>• What colours can we find outside? Does this change across the seasons?</li><li>• What effect does rain have on the environment?</li><li>• What would happen if there was too much rain?</li><li>• What would happen if there wasn't enough rain?</li></ul>	
<b>Key vocabulary</b> <p>Weather, sunny, rainy, windy, snowy, seasons, winter, summer, spring, autumn, sun, sunrise, sunset, day length.</p>			
<b>Key scientists</b> <p>Holly Green (Meteorologist)</p>		<b>Science careers</b> <p>TV weather forecaster</p>	

Topic: Everyday materials		Year 1
Pupils should be taught to: <ul style="list-style-type: none"><li>• Distinguish between an object and the material from which it is made.</li><li>• Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock.</li><li>• Describe the simple physical properties of a variety of materials.</li><li>• Compare and group together a variety of everyday materials on the basis of their simple physical properties</li></ul>		
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>1. All objects are made of one or more materials.</li><li>2. Some objects can be made from different materials e.g. plastic, metal or wooden spoons.</li><li>3. Paper, wood, plastic, glass, fabric, water, rock and metal are everyday materials.</li><li>4. An object is something that can be used e.g. door, chair, table. These are all objects.</li><li>5. A material is what an object is made from.</li><li>6. Plastic, glass, brick, paper, cardboard and metal are man-made materials</li><li>7. Wood, rock and stone are natural materials.</li><li>8. The properties of a material determine whether they are suitable for a purpose.</li><li>9. Glass is transparent and waterproof.</li><li>10. Metal is waterproof, and opaque.</li></ol>	<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Identify and group materials according to their properties.</li><li>➤ Investigate the best material to make curtains.</li></ul>	
	<b>Key Questions:</b> <ul style="list-style-type: none"><li>• Which materials absorb the most water?</li><li>• Which fabric would make the darkest curtain?</li><li>• Which material could be used to make a waterproof umbrella?</li><li>• How can you sort the materials?</li></ul>	
<b>Key vocabulary</b> <p>Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card, cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks, tears, rough, smooth, shiny, dull, transparent, opaque.</p>		
<b>Key scientists</b> <p>Charles Mackintosh (Waterproof coat)</p>	<b>Science careers</b> <p>Space suit designer</p>	

Topic: plants		Year 1	
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"><li>• Identify and describe the basic structure of a variety of common flowering plants, including trees.</li><li>• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.</li><li>• Pupils should use the local environment throughout the year to explore and answer questions about plants growing in their habitat.</li><li>• Where possible, they should observe the growth of flowers and vegetables that they have planted.</li><li>• They should become familiar with common names of flowers, examples of deciduous and evergreen trees, and plant structures (including leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem).</li></ul>			
<p><b>Sticky knowledge:</b></p> <p>1. Plants grow from seeds or bulbs.</p> <p>2. Different seeds and bulbs produce different plants and trees.</p> <p>3. There are three common types of tree, these are: cedar, horse chestnut and oak. They each have different leaves and some produce nuts and seeds for animals to eat.</p> <p>3. The main parts of a flower are: stem, root, petal, flower, leaf and fruit.</p> <p>5. Plants need sunlight, a space to live, water and oxygen to grow.</p> <p>6. Plants change over time. They begin as a seed or bulb, develop roots and a stem and grow into a plant or flower.</p> <p>5. Wild plants do not need help to grow. These grow by themselves. Some wild plants are: dandelion, daisy, buttercup, nettles, ivy, dog rose, clover, and brambles.</p> <p>6. Garden plants are what humans choose to grow in their garden. We helps these plants to grow. Some common garden plants are: fuchsia, pansy, sweet pea, sunflower, rose, iris, lavender.</p> <p>7. Some trees keep their leaves all year while other trees drop their leaves during autumn and grow them again during spring.</p>		<p><b>Pupils will work scientifically by:</b></p> <p>➤ Observe a plant growing from a seed.</p> <p>➤ Identify and group wild and garden plants.</p>	
		<p><b>Key questions:</b></p> <ul style="list-style-type: none"><li>• How do plants grow?</li><li>• What do plants need to grow?</li><li>• Do all plants need water?</li><li>• Are all plants green?</li><li>• Why do seeds look different?</li><li>• Can plants grow in the shade?</li><li>• What is a deciduous and evergreen tree?</li><li>• Can you label the parts of a plant?</li><li>• Where will we find plants in our school and local area?</li></ul>	
<p><b>Key vocabulary</b></p> <p>Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud Names of trees in the local area, Names of garden and wild flowering plants in the local area.</p>			
<p><b>Key scientists</b></p> <p>Beatrix Potter (Author &amp; Botanist)</p>		<p><b>Science careers</b></p> <p>Landscape gardener</p>	

## Year 2

Each of the 5 types of scientific enquiry will be focused upon throughout the year:

Pattern seeking

Research

Fair testing

Identifying and classifying

Observation over time

### Working scientifically:

1. I know how to ask simple scientific questions and recognise that they can be answered in different ways.
2. I know how to use simple equipment to make observations.
3. I know how to use my observations and ideas to suggest answers to questions.
4. I know how to carry out simple tests.
5. I know how to identify and classify things. Use appropriate scientific language to communicate ideas.
6. I know how to explain to others what I have found out.
7. I know how to use simple data to answer questions
8. I know how to gather and record data to help in answering questions.

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Research how John Dunlop's invention has impacted upon life today 6 8  Identify and classify different materials 2 3 4 5 6  Investigating how materials change shape 1 2 4 6 8	Identify and classify objects according to whether they are living, non-living and never lived things 1 2 3 7  Research why animals are suited to their habitats 1 3 6 7 8  Research, create and describe food chains 1 3 5 6 8	Describe life-cycles of different animals 1 2 3 5 6 8  Match animals to their young 1 2 3 5 6  Identify the effects of exercise 1 2 3 4 6 7 8	Observing how a bulbs and seeds grow 1 2 5 6 8  Investigate the best conditions for a plant to grow 1 2 3 4 6 7 8  Investigate if bigger seeds grow into bigger plants 1 2 3 4 5 6 7 8		



**Topic: everyday materials****Year 2**

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.
- Identify and discuss the uses of different everyday materials so that they become familiar with how some materials are used for more than one thing (metal can be used for coins, cans, cars and table legs; wood can be used for matches, floors, and telegraph poles) or different materials are used for the same thing (spoons can be made from plastic, wood, metal, but not normally from glass).
- Think about the properties of materials that make them suitable or unsuitable for particular purposes and they should be encouraged to think about unusual and creative uses for everyday materials.

**Sticky knowledge**

1. 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.
2. Glass can be used to make windows because it is transparent.
3. Rulers can be made from wood, plastic or rubber because these materials are smooth and can be cut straight.
4. Spoons are made from metal, because it is waterproof and can be cleaned easily. They can be made from plastic for children because plastic is light and it cannot hurt children's growing teeth. They can also be made from wood as they can be used for cooking as they don't get hot or melt.
3. 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.

**Pupils will work scientifically by:**

- Research how John Dunlop's invention has impacted upon life today
- Identify and classify different materials.
- Investigate how materials change shape.

**Key questions:**

- Which materials absorb the most water?
- What do the different properties mean?
- Which material would be the best to use for...?
- How can we change the shape of certain materials?

**Key vocabulary**

Hard, soft, stretchy, stiff, shiny, dull, rough, smooth, bendy, waterproof, absorbent, opaque, transparent, brick, paper, fabric, squashing, bending, twisting, stretching elastic, wood, glass, metal, plastic.

**Key scientists**

John McAdam (roads)

**Science careers**

Bridge engineer

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 living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other
- Identify and name a variety of plants and animals in their habitats, including 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.
- Raise and answer questions about the local environment that help them to identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example, plants serving as a source of food and shelter for animals.
- Compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in woodland, in the ocean, in the rainforest.

### **Sticky knowledge**

1. All objects are either living, dead or have never been alive.
2. Living things are plants (including seeds) and animals.
3. 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.
4. An object made of wood is classed as dead.
5. Objects made of rock, metal and plastic have never been alive.
6. Animals and plants live in a habitat to which they are suited. The habitat provides the basic needs of the animals and plants – shelter, food and water.
7. Animals including humans need 4 basic things for survival: air, food, Water and Shelter.
8. The five major habitats are – forests, grasslands, deserts, mountains and polar regions, and aquatic habitat.
9. Polar habitats are in the Arctic and Antarctic. They are very cold, windy and have a lot of snow and ice.
10. Grassland habitats do not have many trees and is full of tall grass. They do not get as much rain as forests but are not as dry as deserts.
11. Desert habitats do not get much rain and are very dry. They can be hot during the day and cold during the night.
12. Forest / woodlands habitats have mostly trees. They can be hot like rainforests or cold like in Europe.
13. Coastal habitats could be shallow seawater, beaches, rock pools, sand dunes and cliffs.
14. Marine habitats could be oceans and seas where the water is salty. Over 70% of the Earth's surface is covered by saltwater.
15. All animals are part of a food chain.

### ***Pupils will work scientifically by:***

- Identify and classify objects according to whether they are living, non-living and never lived things
- Research how the habitat of the Arctic compares with the habitat of the rainforest.

### ***Key questions:***

- What does living mean?
- What does non-living mean?
- What does never lived mean?
- What is a habitat?
- Why is this animal suited to this habitat?
- What is a food chain?
- What is a carnivore, herbivore, and omnivore?
- What is a predator and prey?

### ***Key vocabulary***

Living, dead, habitat, micro-habitat, energy, food chain, predator, prey, woodland, pond, desert, ocean, sea, carnivore, omnivore, herbivore, reproduce.

<b><i>Key scientists</i></b> Liz Bonnin (Conservationist)	<b><i>Science careers</i></b> Ecologist
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Topic: plants		Year 2
Pupils should be taught to:		
<ul style="list-style-type: none"><li>• Observe and describe how bulbs and seeds mature to plants.</li><li>• Find out how and describe how plants need water, light and a suitable temperature to grow and stay healthy.</li><li>• Use the local environment throughout the year to observe how plants grow.</li><li>• Know the requirements of plants for germination, growth and survival, as well as the processes of reproduction and growth in plants.</li><li>• Note: seeds and bulbs need water to grow but most do not need light; seeds and bulbs have a store of food inside them.</li></ul>		
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>1. Plants may grow from either seeds or bulbs.</li><li>2. These then germinate and grow into seedlings which then continue to grow into mature plants.</li><li>3. These mature plants may have flowers which then develop into seeds, berries, fruits etc.</li><li>4. Seeds and bulbs need to be planted outside at particular times of year and they will germinate and grow at different rates.</li><li>5. Some plants are better suited to growing in full sun and some grow better in partial or full shade.</li><li>6. Plants also need different amounts of water and space to grow well and stay healthy.</li><li>7. Some food we eat is grown from a seed or a bulb that grows into a plant.</li><li>8. Not all mature plants can be eaten, some are just flowering plants.</li><li>9. The food we eat comes from the root, seed, stem or leaves of a mature plant.</li><li>10. Mature plants make their own seeds ready for the next stage of their life cycle. We don't always have to plant new seeds for them to grow.</li><li>11. Seeds and bulbs need water to grow but most do not need light; seeds and bulbs have a store of food inside them.</li><li>12. Plants are living things because they need food, and they grow and reproduce.</li></ol>		<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Observe how a bulbs and seeds grow.</li><li>➤ Investigate the best conditions for a plant to grow.</li><li>➤ Investigate if bigger seeds grow into bigger plants.</li></ul> <b>Key questions:</b> <ul style="list-style-type: none"><li>• Do all plants produce flowers and seeds?</li><li>• Do plants flower all year round?</li><li>• What happens to a plant after it has produced seeds?</li><li>• What has happened to your bean?</li><li>• What has happened to the plant kept in the...?</li><li>• What does a plant need to grow healthily?</li></ul>
<b>Key vocabulary</b> <p>Seeds, bulbs, water, light, temperature, growth, roots, stem, flower, leaf, soil, nutrients.</p>		
<b>Key scientists</b> <p>Alan Titchmarsh (Botanist &amp; Gardener)</p>		<b>Science careers</b> <p>Horticulturalist</p>

Topic: animals including humans		Year 2	
Pupils should be taught to:			
<ul style="list-style-type: none"><li>• Notice that animals, including humans, have offspring which grow into adults.</li><li>• Find out about and describe the basic needs of animals, including humans, for survival (water, food and air).</li><li>• Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.</li><li>• Know the basic needs of animals for survival, as well as the importance of exercise and nutrition for humans.</li></ul>			
<b>Sticky knowledge</b> <ul style="list-style-type: none"><li>1. All living things reproduce and have offspring.</li><li>2. Animals, including humans, have offspring which grow into adults.</li><li>3. Some animals such as humans give birth to live young. Their offspring normally look like them when they are born.</li><li>4. 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.</li><li>5. The young of some animals do not look like their parents e.g. tadpoles.</li><li>6. All animals, including humans, have the basic needs of feeding, drinking and breathing that must be satisfied in order to survive.</li><li>7. To grow into healthy adults, they also need the right amounts and types of food and exercise.</li><li>8. Good hygiene is also important in preventing infections and illnesses.</li><li>9. All young animals change at different stages as they grow into adults.</li><li>10. To grow into a healthy adult, we must eat the right types of food in the right amount and exercise.</li></ul>		<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Describe life-cycles of different animals</li><li>➤ Identify which offspring belongs to which animal.</li><li>➤ Identify the effects of exercise.</li></ul>	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>• How many stages are in the life-cycle?</li><li>• What stage will be next in the life-cycle?</li><li>• What is this animals young called?</li><li>• What will happen if we exercise?</li><li>• What do living things need to survive?</li></ul>	
<b>Key vocabulary</b> Survival, water, air, food, adult, baby, offspring, kitten, calf, puppy, exercise, hygiene, sleep, healthy, life-cycle, stage.			
<b>Key scientist</b> Joe Wicks (Personal Trainer)		<b>Science careers</b> Personal trainer	

### Year 3

Each of the 5 types of scientific enquiry will be focused upon throughout the year:

Pattern seeking

Research

Fair testing

Identifying and classifying

Observation over time

#### 1. Working scientifically:

2. I know how to ask relevant Scientific questions and use different scientific enquiries to answer them.
3. I know how to use observations and knowledge to answer scientific questions.
4. I know how to set up a test to compare two things.
5. I know how to set up a fair test and explain why it is fair.
6. I know how to make careful and accurate observations, including the use of standard units.
7. I know how to use equipment, including thermometers and data loggers to make measurements.
8. I know how to gather, record, classify and present data in different ways to answer scientific questions.
9. I know how to use diagrams, keys, bar charts and tables; using scientific language.
10. I know how to use findings of a report in different ways, including oral and written explanations, presentations.
11. I know how to draw conclusions and suggest improvements.
12. I know how to make a prediction with a reason.
13. I know how to identify differences, similarities and changes related to an enquiry.

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Identify how the skeleton of different animals compare. 12	Use identification keys to find out the name of each rock. 8  Investigate which rock is the strongest. 4  Research where are most fossils are found. 2	Sort magnetic and non-magnetic materials. 3  Investigate if the size and shape of a magnet affects how strong it is. 10  Investigate how magnetic poles work. 9	Identify and sort reflective materials. 3  Investigate how to change the size of a shadow. 10	Investigate if plants need soil to grow. 4, 8  What happens to celery when it is left in a glass of coloured water. 11	

Topic: animals including humans		Year 3
Pupils should be taught to: <ul style="list-style-type: none"><li>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.</li><li>Identify that humans and some other animals have skeletons and muscles for support, protection and movement.</li><li>Learn about the importance of nutrition and should be introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions.</li></ul>		
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>Animals, unlike plants which can make their own food, need to eat in order to get the nutrients they need.</li><li>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.</li><li>A piece of food will often provide a range of nutrients.</li><li>Different animals are adapted to eat different foods.</li><li>Humans, and some other animals, have skeletons and muscles.</li><li>Skeletons do three important jobs: protect organs inside the body; allow movement; support the body and stop it from falling on the floor.</li><li>Skeletal muscles work in pairs to move the bones they are attached to by taking turns to contract (get shorter) and relax (get longer)..</li></ol>	<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Research food chains.</li><li>➤ Identify and classifying different types of animals vertebrates, invertebrates- exoskeleton</li></ul>	
	<b>Key questions:</b> <ul style="list-style-type: none"><li>Why do we need a skeleton?</li><li>What types of skeleton are there?</li><li>Are all skeletons the same?</li><li>How do we move?</li><li>Why do we need joints?</li><li>Why do muscles get tired?</li></ul>	
<b>Key vocabulary</b> Movement, muscles, bones, skull, nutrition, skeletons, exoskeleton, invertebrate.		
<b>Key scientists</b> Marie Curie (Radiation / X-Rays)	<b>Science careers</b> Radiographer	

Topic: rocks and minerals		Year 3
Pupils should be taught to:		
<ul style="list-style-type: none"><li>Describe in simple terms how fossils are formed when things that have lived are trapped within rock.</li><li>Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.</li><li>Recognise that soils are made from rocks and organic matter.</li></ul>		
<b>Sticky knowledge</b> 1. Rock is a naturally occurring material. 2. There are three different rock types: Igneous, Sedimentary, metamorphic. 3. There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. 4. Rocks can be hard or soft. 5. They have different sizes of grain or crystal. 6. They may absorb water. 7. Rocks can be different shapes and sizes (stones, pebbles, boulders). 8. A fossil is the preserved remains or traces of a dead organism. 9. 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. 10. Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). 11. The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil.	<b>Pupils will work scientifically by:</b> ➤ Use identification keys to find out the name of each rock. ➤ Investigate which rock is the strongest. ➤ Research where are most fossils are found.	
	<b>Key questions:</b> How are rocks formed? Which rock would make the best ? What is soil made up from? How are fossils formed? What types of fossils are there?	
<b>Key vocabulary</b> Crust, decay, fossil, geologist, igneous Rock, impermeable, inner core, mantle, metamorphic rock, microbe, mine, permeable, rock, sedimentary rock, soil, microbes and water.		
<b>Key scientists</b> Mary Anning	<b>Science careers</b> Palaeontologist	



Topic: magnets and forces		Year 3	
Pupils should be taught to:			
<ul style="list-style-type: none"><li>• Notice that some forces need contact between two objects, but magnetic forces can act at a distance.</li><li>• Compare how things move on different surfaces.</li><li>• Observe how magnets attract or repel each other and attract some materials and not others.</li><li>• 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.</li><li>• Predict whether two magnets will attract or repel each other, depending on which poles are facing.</li><li>• Describe magnets as having two poles.</li></ul>			
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>1. A force is a push or a pull.</li><li>2. Magnets exert attractive and repulsive forces on each other.</li><li>3. A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic.</li><li>4. Magnets exert non-contact forces, which work through some materials.</li><li>5. Magnet forces are affected by magnet strength, object mass, distance from object and object material.</li><li>6. The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole.</li><li>7. 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.</li><li>8. 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.</li></ol>		<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Sort magnetic and non-magnetic materials</li><li>➤ Investigate if the size and shape of a magnet affects how strong it is.</li><li>➤ Investigate how magnetic poles work.</li></ul>	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>• Which materials are magnetic?</li><li>• How far away does a magnet have to be before it attracts a magnetic material?</li><li>• How is the magnetic attraction of repulsion force affected by putting materials between the magnets?</li><li>• Are bigger magnets stronger?</li></ul>	
<b>Key vocabulary</b> <p>Magnetic, force, contact, attract, repel, friction, poles, push, pull</p>			
<b>Key scientists</b> <p>Andre Marie Ampere (Founder of Electro-Magnetism)</p>		<b>Science careers</b> <p>Scrap metal recyclers</p>	

**Topic: lights and shadows****Year 3**

Pupils should be taught to:

- Recognise that shadows are formed when the light from a light source is blocked by a solid object.
- 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.
- Explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves.
- Think about why it is important to protect their eyes from bright lights.
- Look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change.

**Sticky knowledge**

1. We see objects because our eyes can sense light.
2. Dark is the absence of light. We cannot see anything in complete darkness.
3. Some objects, for example, the sun, light bulbs and candles are sources of light.
4. Objects are easier to see if there is more light.
5. Some surfaces reflect light.
6. Objects are easier to see when there is less light if they are reflective.
7. 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. Light travels in straight lines.
8. 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.
9. The size of the shadow depends on the position of the source, object and surface.

***Pupils will work scientifically by:***

- Identify and sort reflective materials.
- Investigate how to change the size of a shadow.

***Key questions:***

- Can you see without light?
- How can we change the size of a shadow?
- Is the sun dangerous?
- How do mirrors work?

***Key vocabulary***

Light source, sun, reflect, mirror, reflection, shadow, block, absence of light, opaque, translucent, transparent

***Key scientist***

James Clerk Maxwell (Visible and Invisible Waves of Light)

***Science careers***

Solar panel installer

Topic: plants		Year 3	
Pupils should be taught to:			
<ul style="list-style-type: none"><li>• 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.</li><li>• Identifying differences, similarities or changes related to simple scientific ideas and processes.</li><li>• Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers.</li><li>• Investigate the way in which water is transported within plants.</li><li>• Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</li></ul>			
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>1. Many plants, but not all, have roots, stems/trunks, leaves and flowers/blossom.</li><li>2. The roots absorb water and nutrients from the soil and anchor the plant in place.</li><li>3. 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.</li><li>4. The leaves use sunlight and water to produce the plant’s food.</li><li>5. Some plants produce flowers which enable the plant to reproduce.</li><li>6. Pollen, which is produced by the male part of the flower, is transferred to the female part of other flowers (pollination).</li><li>7. This forms seeds, sometimes contained in berries or fruits.</li><li>8. Seeds can be dispersed by wind, animals, water and explosion.</li><li>9. Different plants require different conditions for germination and growth.</li></ol>		<b>Pupils will work scientifically by:</b> ➤ Investigate if plants need soil to grow. ➤ Investigate what happens to celery when it is left in a glass of coloured water.	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>• What do plants need to survive?</li><li>• How is water transported?</li><li>• What job do the roots have?</li><li>• What animals are pollinators?</li><li>• How does seed dispersal happen?</li><li>• What is pollination?</li></ul>	
<b>Key vocabulary</b> Seed dispersal, pollination, pollinators, nutrients, xylem			
<b>Key scientists</b> Jan Ingenhousz (Photosynthesis)		<b>Science careers</b> Apiculturist	

## Year 4

Each of the 5 types of scientific enquiry will be focused upon throughout the year:

Pattern seeking

Research

Fair testing

Identifying and classifying

Observation over time

### Working scientifically:

I know how to ask relevant Scientific questions and use different scientific enquiries to answer them.

I know how to use observations and knowledge to answer scientific questions.

I know how to set up a test to compare two things.

I know how to set up a fair test and explain why it is fair.

I know how to make careful and accurate observations, including the use of standard units.

I know how to use equipment, including thermometers and data loggers to make measurements.

I know how to gather, record, classify and present data in different ways to answer scientific questions.

I know how to use diagrams, keys, bar charts and tables; using scientific language.

I know how to use findings of a report in different ways, including oral and written explanations, presentations.

I know how to draw conclusions and suggest improvements.

I know how to make a prediction with a reason.

I know how to identify differences, similarities and changes related to an enquiry.

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Investigate the effects of different liquids on egg shells. 2  Identify and group teeth based on their use. 1	Investigate how the volume of a drum changes the further away from it you move 5, 6 7  Investigate if there is there a pattern between how loud it is in school and the time of the day 5,6,7	Investigate which metal is the best conductor of electricity. 8  Identify and classify electrical devices based on where the electricity comes from. 8	Identify and classify liquids, solids and gases. 12  Investigate what temperature is the best to melt chocolate. 11, 3, 4, 10	➤ Use of classification keys to group, identify and name a variety of living things. 1, 8  ➤ Research why people cut down the rainforest and what effects this has.	Research endangered animals 9  Identify and classify using a classification key 8

Topic: animals including humans		Year 4
Pupils should be taught to: <ul style="list-style-type: none"><li>Describe the simple functions of the basic parts of the digestive system in humans.</li><li>Identify the different types of teeth in humans and their simple functions.</li><li>Construct and interpret a variety of food chains, identifying producers, predators and prey.</li><li>Learn the main body parts associated with the digestive system, for example: mouth, tongue, teeth, oesophagus, stomach, and small and large intestine, and explore questions that help them to understand their special functions.</li></ul>		
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>Food enters the body through the mouth.</li><li>Digestion starts when the teeth start to break the food down.</li><li>Saliva is added and the tongue rolls the food into a ball.</li><li>The food is swallowed and passes down the oesophagus to the stomach.</li><li>Here the food is broken down further by being churned around and other chemicals are added.</li><li>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.</li><li>The rest of the food then passes into the large intestine. Here the water is removed for use elsewhere in the body.</li><li>What is left is then stored in the rectum until it leaves the body through the anus when you go to the toilet.</li><li>Animals have teeth to help them eat.</li><li>Humans have four types of teeth: incisors for cutting; canines for tearing; and molars and premolars for grinding (chewing).</li><li>Producers get their energy from the sun.</li><li>A food chain includes a producer and consumers.</li></ol>	<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Investigate the effects of different liquids on egg shells.</li><li>➤ Identify and group teeth based on their use.</li></ul>	
	<b>Key questions:</b> <ul style="list-style-type: none"><li>Why do we need teeth?</li><li>Why is it important to look after our teeth?</li><li>Where does our food go after we swallow it?</li><li>Why do different animals have different teeth?</li><li>What types of teeth do we have?</li><li>Do all animals have teeth?</li></ul>	
<b>Key vocabulary</b> <p>Food chain, predator, prey, producer, secondary consumer, tertiary, consumer, mouth, teeth, tongue, stomach, small and large intestine, Molars, incisors, canines, premolars, carnivore, herbivore, teeth, dentist</p>		
<b>Key scientists</b> <p>Ivan Pavlov (Digestive System Mechanisms)</p>	<b>Science careers</b> <p>Food science technician</p>	

Topic: living things and their habitats		Year 4	
Pupils should be taught to: <ul style="list-style-type: none"><li>• Recognise that living things can be grouped in a variety of ways.</li><li>• Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.</li><li>• Recognise that environments can change and that this can sometimes pose dangers to living things.</li><li>• Identify how the habitat changes throughout the year.</li></ul>			
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>1. Living things can be grouped (classified) in different ways according to their features.</li><li>2. Classification keys can be used to identify and name living things.</li><li>3. Living things live in a habitat which provides an environment to which they are suited.</li><li>4. These environments may change naturally e.g. through flooding, fire, earthquakes etc.</li><li>5. 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).</li><li>6. These environments also change with the seasons; different living things can be found in a habitat at different times of the year.</li></ol>		<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Use of classification keys to group, identify and name a variety of living things.</li><li>➤ Research why people cut down the rainforest and what effects this has.</li></ul>	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>• What features must something have in order to be alive?</li><li>• What is a vertebrate and what is an invertebrate?</li><li>• What animals are vertebrates?</li><li>• What animals are invertebrates?</li><li>• What is a classification key?</li><li>• How can animals be grouped?</li><li>• What dangerous affect animal’s habitats?</li><li>• How do changes in the environment affect animal’s habitats?</li><li>• What does it mean if an animal is endangered or extinct?</li></ul>	
<b>Key vocabulary</b> Environment, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, deforestation, classification.			
<b>Key scientists</b> Jaques Cousteau (Marine Biologist)		<b>Science careers</b> Marine biologist	

Topic: circuits and conductors		Year 4
Pupils should be taught to:		
<ul style="list-style-type: none"><li>• Recognise some common conductors and insulators, and associate metals with being good conductors.</li><li>• Identify common appliances that run on electricity.</li><li>• Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.</li><li>• 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.</li></ul>		
<b>Sticky knowledge</b> 1. Many household devices and appliances run on electricity. 2. Some plug in to the mains and others run on batteries. 3. An electrical circuit consists of a cell or battery connected to a component using wires 4. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. 5. A switch can be added to the circuit to turn the component on and off. 6. Metals are good conductors so they can be used as wires in a circuit. 7. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity. 8. Electricity and electrical appliances can be dangerous.	<b>Pupils will work scientifically by:</b> ➤ Investigate which metal is the best conductor of electricity. ➤ Identify and classify electrical devices based on where the electricity comes from.	
	<b>Key questions:</b> <ul style="list-style-type: none"><li>• When do I use electricity?</li><li>• What appliances use batteries?</li><li>• What appliances use mains power?</li><li>• What materials conduct electricity?</li><li>• How does a light bulb light up?</li></ul>	
<b>Key vocabulary</b> Electrical appliance, non-electrical appliance, electricity, power Source, electricity, batteries, mains/plugs, electrical appliance/device., circuits, battery, positive and negative. <i>bulb or cell, wires Crocodile clips, series, parallel, negative, positive, conductor, insulator, safety, plug socket, power</i>		
<b>Key scientists</b> Thomas Edison (First Working Lightbulb)	<b>Science Careers</b> Electrician	

Topic: states of matter		Year 4	
Pupils should be taught to:			
<ul style="list-style-type: none"><li>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).</li><li>Compare and group materials together, according to whether they are solids, liquids or gases.</li><li>Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.</li><li>Explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container).</li></ul>			
<b>Sticky knowledge</b> 1. A solid keeps its shape and has a fixed volume. 2. 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. 3. A gas fills all available space; it has no fixed shape or volume. 4. Melting is a state change from solid to liquid. 5. Freezing is a state change from liquid to solid. 6. The freezing point of water is 0oC. 7. 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. 8. Water boils when it is heated to 100oC. 9. 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. 10. Evaporation happens more quickly if the temperature is higher. 11. 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.		<b>Pupils will work scientifically by:</b> ➤ Identify and classify liquids, solids and gases. ➤ Investigate which material is best for keeping the hot chocolate warm.	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>What happens to water when it is put in the freezer?</li><li>What happens to chocolate when it is heated up?</li><li>What happens to the puddles after it rains?</li><li>What is the best temperature to melt chocolate?</li></ul>	
		<b>Key vocabulary</b> Matter, solid, liquid, gas, melting, cooling, heating, evaporation, condensation, collections, precipitation, changing state.	
<b>Key scientist</b> Bernard Palissy (water cycle)		<b>Science Careers</b> Climate scientist	



**Topic: changing sounds****Year 4**

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.
- Explore and identify the way sound is made through vibration in a range of different musical instruments from around the world; and find out how the pitch and volume of sounds can be changed in a variety of ways.

**Sticky knowledge**

1. A sound produces vibrations which travel through a medium from the source to our ears.
2. Sound travels in all directions.
3. Different mediums such as solids, liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter).
4. The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound.
5. 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.
6. A sound insulator is a material which blocks sound effectively.
7. 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.
8. Changing the shape and size of an object changes the sound it produces.

**Pupils will work scientifically by:**

- Investigate how the volume of a drum changes the further away from it you move.
- Investigate if there is there a pattern between how loud it is in school and the time of the day.

**Key questions:**

- How do you change the volume of a sound?
- Can you change the pitch of a sound?
- Does the length of an instrument affect the pitch?

**Key vocabulary**

Sound, hearing, eardrum, volume, pitch, quiet, loud, sound waves.

**Key scientists**

Alexander Graham Bell (Invented the Telephone)

**Science careers**

Musician

## Year 5

Each of the 5 types of scientific enquiry will be focused upon throughout the year:

Pattern seeking

Research

Fair testing

Identifying and classifying

Observation over time

### Working scientifically:

1. I know how to plan different types of scientific enquiry.
2. I know how to control variables in an experiment.
3. I know how to measure accurately and precisely using a range of equipment.
4. I know how to record data and results using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
5. I know how to use the outcome of test results to make predictions and set up further comparative and fair tests
6. I know how to report findings from enquiries in a range of ways
7. I know how to explain a conclusion from an enquiry.
8. I know how to explain causal relationships in an enquiry
9. I know how to explain degree of trust in results, identify and evaluate scientific evidence (their own and others).

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<p>Classify materials according to their properties; hardness, solubility, transparency, electrical conductivity and response to magnets. 1, 7,</p> <p>What is the best temperature to dissolve sugar the quickest? 8, 1, 2, 7, 5</p> <p>Observe how a nail in salt water changes over time. 6</p>		<p>Moon diary, observe and identify all the phases in the cycle of the Moon. 6</p> <p>Investigate the shape and size of the sun, Earth and moon. 6, 8</p> <p>Investigate if there is a pattern between the size of a planet and the time it takes to travel around the Sun. 6,8</p>	<p>Identify and name the forces acting on an object in various situations. 1, 2, 3, 4,</p> <p>Investigate if all objects fall through water in the same way. 1,2,</p> <p>Investigate how the surface area of parachute affect the time it takes to fall. 4 (scatter graph)</p>	<p>Research the changes experienced in puberty and old age. 7, 6</p> <p>Identify all the stages in the human life cycle. 6</p> <p>Investigate if there is a relationship between a mammal's size and its gestation period. 4,8,9 (research, trustworthy sources etc.)</p>	<p>Research the differences between the lifecycle of an insect and a mammal. 6, 7</p> <p>Research what are microplastics and why are they harming the planet. 6, 7</p> <p>Grow and observe a new plant from cuttings. 2</p>

**Topic: properties and changes to materials****Year 5**

Pupils should be taught to:

- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.
- 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.
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.
- 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 and the action of acid on bicarbonate of soda.
- Build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4.
- Explore reversible changes, including evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.
- Explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda.

**Sticky knowledge**

1. Materials have different uses depending on their properties and state (liquid, solid, gas).
2. Properties include hardness, transparency, electrical and thermal conductivity and attraction to magnets.
3. Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.
4. Mixtures can be separated by filtering, sieving and evaporation.
5. Some changes to materials such as dissolving, mixing and changes of state are reversible.
6. 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.

**Pupils will work scientifically by:**

- Classify materials according to their properties; hardness, solubility, transparency, electrical conductivity and response to magnets.
- What is the best temperature to dissolve sugar the quickest?
- Observe how a nail in salt water changes over time.

**Key questions:**

- How can materials be grouped according to their properties?
- How can we separate mixtures?
- Can you reverse the changes?
- Which materials dissolve in a liquid?

**Key vocabulary**

Evaporating, filtering, sieving, melting, dissolving, reversible, irreversible, properties, hardness, solubility, transparency, conductivity (electrical and thermal), magnets, burning, rusting.

**Key scientists**

Anders Celsius (Celsius Temperature Scale)

**Science careers**

Chemist

Topic: living things and their habitats		Year 5	
Pupils should be taught to:			
<ul style="list-style-type: none"><li>Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.</li><li>Describe the life process of reproduction in some plants and animals.</li><li>Observe life-cycle changes in a variety of living things, for example, plants in the vegetable garden or flower border, and animals in the local environment.</li><li>Find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals.</li></ul>			
<b>Sticky knowledge</b> 1. As part of their life cycle, plants and animals reproduce. 2. Most animals reproduce sexually. This involves two parents where the sperm from the male fertilises the female egg. 3. Animals, including humans, have offspring which grow into adults. 4. In humans and some animals, these offspring will be born live, such as babies or kittens, and then grow into adults. 5. In other animals, such as chickens or snakes, there may be eggs laid that hatch to young which then grow to adults. 6. Some young undergo a further change before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis. 7. Plants reproduce both sexually and asexually. 8. Bulbs, tubers, runners and plantlets are examples of asexual plant reproduction which involves only one parent. 9. Gardeners may force plants to reproduce asexually by taking cuttings. 10. Sexual reproduction occurs through pollination, usually involving wind or insects. 11. Different types of organisms have different lifecycles.		<b>Pupils will work scientifically by:</b> ➤ Research the differences between the lifecycle of an insect and a mammal. ➤ Research what are microplastics and why are they harming the planet. ➤ Grow and observe a new plant from cuttings.	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>What are the life cycles of a mammal, amphibian, insect and bird? How are these similar and different?</li><li>How do animals and plants reproduce?</li><li>From your observations, what happens in the life cycle of a sunflower and caterpillar/butterfly?</li><li>Can we grow a new plant from cuttings?</li><li>What are sexual and asexual reproduction?</li></ul>	
<b>Key vocabulary</b> Sexual, asexual, reproduction, life cycle, mammal, amphibian, insect			
<b>Key scientists</b> David Attenborough (Naturalist and Nature Documentary Broadcaster)		<b>Science careers</b> Naturalist	

Topic: animals including humans		Year 5
Pupils should be taught to: <ul style="list-style-type: none"><li>Describe the changes as humans develop to old age.</li><li>Draw a timeline to indicate stages in the growth and development of humans.</li><li>Learn about the changes experienced in puberty.</li></ul>		
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>When babies are young, they grow rapidly. They are very dependent on their parents.</li><li>As they develop, they learn many skills.</li><li>At puberty, a child’s body changes and develops primary and secondary sexual characteristics. This enables the adult to reproduce.</li><li>Different animals mature at different rates and live to different ages.</li><li>Puberty is something we all go through, a process which prepares our bodies for being adults, and reproduction.</li><li>Hormones control these changes, which can be physical and/or emotional.</li></ol>	<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Research the changes experienced in puberty and old age.</li><li>➤ Identify all the stages in the human life cycle.</li><li>➤ Investigate if there is a relationship between a mammal’s size and its gestation period.</li></ul>	
	<b>Key question</b> <ul style="list-style-type: none"><li>What changes do humans face as they develop into old age?</li><li>How do humans develop, grow and change from birth to old age?</li><li>How do humans change during puberty?</li></ul>	
<b>Key vocabulary</b> <p>Foetus, embryo, womb, gestation, baby, toddler, teenager, elderly, growth, development, puberty</p>		
<b>Key scientists</b> <p>Dr Steve Jones (Geneticist)</p>	<b>Science careers</b> <p>Lab technician</p>	

Topic: forces		Year 5	
<ul style="list-style-type: none"><li>• Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</li><li>• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.</li><li>• Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.</li><li>• Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.</li></ul>			
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>1. A force causes an object to start moving, stop moving, speed up, slow down or change direction.</li><li>2. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall.</li><li>3. 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.</li><li>4. Friction is a force against motion caused by two surfaces rubbing against each other.</li><li>5. Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move.</li><li>6. A mechanism is a device that allows a small force to be increased to a larger force.</li><li>7. Pulleys, levers and gears are all mechanisms, also known as simple machines.</li></ol>		<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Identify and name the forces acting on an object in various situations.</li><li>➤ Investigate if all objects fall through water in the same way. 1,2,</li><li>➤ Investigate how the surface area of parachute affect the time it takes to fall.</li></ul>	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>• Can you label and name all the forces acting on the objects in each of these situations?</li><li>• What is gravity?</li><li>• What is friction?</li><li>• What are levers, pulleys and gears. How do they effect forces?</li><li>• Do all objects fall through water in the same way? (Water resistance)</li><li>• How does surface area of parachute affect the time it takes to fall? (Air resistance)</li></ul>	
<b>Key vocabulary</b> Air resistance, water resistance, friction, gravity, newton, gears, pulleys			
<b>Key scientists</b> Isaac Newton (Gravitation)		<b>Science careers</b> Aerodynamics engineer	

Topic: earth and space		Year 5	
Pupils should be taught to:			
<ul style="list-style-type: none"><li>Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.</li><li>Describe the movement of the Moon relative to the Earth.</li><li>Describe the Sun, Earth and Moon as approximately spherical bodies.</li><li>Use the idea of the Earth’s rotation to explain day and night and the apparent movement of the sun across the sky.</li></ul>			
<b>Sticky knowledge</b> 1. The Sun is a star. It is at the centre of our solar system. 2. There are 8 planets. These travel around the Sun in fixed orbits. 3. Earth takes 365¼ days to complete its orbit around the Sun. 4. The Earth rotates (spins) on its axis every 24 hours. 5. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). 6. As the Earth rotates, the Sun appears to move across the sky. 7. The Moon orbits the Earth. It takes about 28 days to complete its orbit. 8. The Sun, Earth and Moon are approximately spherical. 9. Stars, planets and moons have so much mass they attract other things, including each other due to a force called gravity. 10. Gravity works over distance. 11. Objects with larger masses exert bigger gravitational forces. 12. Stars produce vast amounts of heat and light. 13. All other objects are lumps of rock, metal or ice and can be seen because they reflect the light of stars.		<b>Pupils will work scientifically by:</b> ➤ Moon diary, observe and identify all the phases in the cycle of the Moon. ➤ Investigate the shape and size of the sun, Earth and moon. ➤ Investigate if there is a pattern between the size of a planet and the time it takes to travel around the Sun.	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>Is there a pattern between the size of a planet and the time it takes to travel around the Sun?</li><li>Can you observe and identify all the phases in the cycle of the Moon?</li><li>How do planets move in the solar system?</li><li>How does the sun move across the sky?</li><li>How does the Earth move? How does this create day and night?</li></ul>	
<b>Key vocabulary</b> Earth, sun, moon, axis, rotation, day, night, phases of the moon, star, constellation			
<b>Key scientists</b> Helen Sharman (First British astronaut)		<b>Science careers</b> Astronaut	

## Year 6

Each of the 5 types of scientific enquiry will be focused upon throughout the year:

Pattern seeking

Research

Fair testing

Identifying and classifying

Observation over time

### Working scientifically:

1. I know how to plan different types of scientific enquiry.
2. I know how to control variables in an experiment.
3. I know how to measure accurately and precisely using a range of equipment.
4. I know how to record data and results using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
5. I know how to use the outcome of test results to make predictions and set up further comparative and fair tests
6. I know how to report findings from enquiries in a range of ways
7. I know how to explain a conclusion from an enquiry.
8. I know how to explain causal relationships in an enquiry
9. I know how to explain degree of trust in results, identify and evaluate scientific evidence (their own and others).

Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
<p>Identify the different blood vessels and their functions.</p> <p>Identify the parts of the human circulatory system and explain their functions.</p> <p>Identify and explain how the heart works,</p> <p>Investigate how exercise affects our heart, pulse and health.</p> <p>Research the impact of diet, exercise, drugs and lifestyle on body function.</p> <p>Research the dangers of smoking.</p>	<p>Research the importance of the major discoveries in electricity.</p> <p>Identify and draw scientific circuit symbols and a complete circuit for different purposes.</p> <p>Investigate the effects of differing voltages in a circuit.</p>	<p>Identify what is inherited and what is acquired.</p> <p>Research what adaptation is.</p> <p>Research what happened when Charles Darwin visited the Galapagos Islands.</p>	<p>Identify how light travels in straight lines from light sources to our eyes, and from light sources to objects and then to our eyes.</p> <p>Demonstrate how mirrors reflect light, and how they can help us see objects.</p> <p>Investigate how a prism changes a ray of light to show the spectrum.</p> <p>Proving why shadows have the same shape as the object that casts them.</p>	<p>Classify animals based on its characteristics.</p> <p>Investigate helpful and harmful microorganisms.</p> <p>Identify the characteristics of different types of microorganisms.</p> <p>Classifying organisms found in my local habitat and to explain the classification of organisms found in my local habitat.</p>	
1 2 4 5 7 9	2 3	8 6	7 9	2 3 4	



Topic: animals including humans		Year 6	
Pupils should be taught to:			
<ul style="list-style-type: none"><li>Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood.</li><li>Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.</li><li>Describe the ways in which nutrients and water are transported within animals, including humans.</li></ul>			
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>The heart pumps blood in the blood vessels around to the lungs.</li><li>Oxygen goes into the blood and carbon dioxide is removed.</li><li>The blood carrying oxygen goes back to the heart and is then pumped around the body to various organs and tissues.</li><li>Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed.</li><li>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.</li><li>The heart has 4 chambers (left and right atrium and the left and right ventricle).</li><li>There are three types of blood vessels (capillaries, veins and arteries).</li><li>It takes about 20 seconds for the blood to be pumped all around the body.</li><li>Diet, exercise, drugs and lifestyle have an impact on the way our bodies function.</li><li>Exercise can improve the health of a person by removing fatty deposits from the body.</li><li>Fatty rich foods can clog arteries and veins, preventing blood from delivering what is needed.</li></ol>		<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Identify which organs of the body make up the circulatory system, and where they are found.</li><li>➤ Investigate which type of exercise has the greatest effect on our heart rate.</li><li>➤ Research the impact of diet, exercise, drugs and lifestyle on body function.</li></ul>	
		<b>Key questions:</b> <ul style="list-style-type: none"><li>Why do we need oxygen?</li><li>How do we breathe?</li><li>Do all living things need oxygen?</li><li>How does the size of a person’s lungs affect their lung capacity?</li><li>Why do we have blood?</li><li>How does our heart work?</li><li>How does exercise effect our pulse rate?</li><li>Is the air you breathe out, the same as that you breathe in?</li></ul>	
<b>Key vocabulary</b> arteries, capillaries, veins, lungs, blood vessels, heart, body, mouth, oxygenated, deoxygenated. atrium, ventricle, chambers, oxygenated and deoxygenated blood, pulse, exercise, increase, decrease, drugs, medicines and prescriptions.			
<b>Key scientists</b> Sir Richard Doll (Linking Smoking and Health Problems)		<b>Science careers</b> Cardiologist	

Topic: living things and their habitats		Year 6
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>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.</li> <li>Give reasons for classifying plants and animals based on specific characteristics.</li> <li>Build on their learning about grouping living things in year 4 by looking at the classification system in more detail.</li> <li>Be introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. Through direct observations where possible, they should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals).</li> <li>Discuss reasons why living things are placed in one group and not another.</li> </ul>		
<p><b>Sticky knowledge</b></p> <ol style="list-style-type: none"> <li>Plants and animals are two main groups but there are other living things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, toadstools and mushrooms.</li> <li>Microorganisms are very tiny living things. They are so small that they are not visible to the naked eye, so a microscope is needed to see them.</li> <li>Microorganisms can be found all around us. They can live on and in our bodies, in the air, in water and on the objects around us. They can be found in almost every habitat on Earth.</li> <li>Plants can make their own food whereas animals cannot.</li> <li>Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates).</li> <li>Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals.</li> <li>Each group has common characteristics.</li> <li>Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms.</li> <li>Vertebrate animals can be either warm or cold-blooded. A cold-blooded animal cannot maintain a constant body temperature. The temperature of their body is determined by the outside surroundings.</li> <li>Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants.</li> </ol>		<p><b>Pupils will work scientifically by:</b></p> <ul style="list-style-type: none"> <li>Use classification keys for vertebrate/ invertebrates or microorganisms.</li> <li>Research what different types of microorganisms do and are they always harmful.</li> </ul>
<p><b>Key vocabulary</b></p> <p>Classify, Carl Linnaeus, Linnaean, classification, domain, kingdom, phylum, class, genus, species, microorganism, fungus, bacteria, virus, microscopic, cell, DNA, organism, species, vertebrates, invertebrates, mammals, birds, amphibians, reptiles, fish, insects, arachnids, molluscs, crustaceans, annelids, plants, flowering, non-flowering.</p>		<p><b>Key questions:</b></p> <ul style="list-style-type: none"> <li>Why do we need to classify living things?</li> <li>How do we classify?</li> <li>What are the difficulties with classification? (penguins, whales, platypus)</li> <li>How do animals change over time?</li> <li>Why does variation exist?</li> <li>What are microorganisms?</li> <li>How can we prevent the spread of disease?</li> </ul>
<p><b>Key scientists</b></p> <p>Carl Linnaeus (Identifying, Naming and Classifying Organisms)</p>		<p><b>Science careers</b></p> <p>Animal technician</p>

Topic: evolution and inheritance		Year 6
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>• Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.</li> <li>• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.</li> <li>• Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</li> <li>• Build on what they learned about fossils in the topic on rocks in year 3, pupils should find out more about how living things on earth have changed over time.</li> <li>• They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, Labradors are crossed with poodles.             <ul style="list-style-type: none"> <li>• They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox.</li> </ul> </li> </ul>		
<p><b>Sticky knowledge</b></p> <ol style="list-style-type: none"> <li>1. All living things have offspring of the same kind, as features in the offspring are inherited from the parents.</li> <li>2. Inheritance is when characteristics are passed on from generation to the next.</li> <li>3. Due to sexual reproduction, the offspring are not identical to their parents and vary from each other.</li> <li>4. Plants and animals have characteristics that make them suited (adapted) to their environment.</li> <li>5. If the environment changes rapidly, some variations of a species may not suit the new environment and will die.</li> <li>6. 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.</li> <li>7. Fossils give us evidence of what lived on the Earth millions of year ago and provide evidence to support the theory of evolution.</li> </ol>		<p><b>Pupils will work scientifically by:</b></p> <ul style="list-style-type: none"> <li>➤ Identify what characteristics are inherited and what is acquired.</li> <li>➤ Research what happened when Charles Darwin visited the Galapagos Islands.</li> <li>➤ Investigate if there is a pattern between the size and shape of a birds beak and the food it will eat.</li> </ul> <p><b>Key questions:</b></p> <ul style="list-style-type: none"> <li>• Why are we all different?</li> <li>• What is variation, and why is it important?</li> <li>• What is evolution?</li> <li>• What evidence is there for evolution?</li> <li>• How does evolution happen?</li> <li>• What reasons do animals become extinct?</li> <li>• How did Darwin come up with the theory?</li> <li>• Why was his theory not initially accepted?</li> </ul>
<p><b>Key vocabulary</b></p> <p>Inheritance, animals, plants, humans, parent, offspring, characteristics, variation, adaptation, environment, habitat, DNA, genes, adaptive traits, mutation, accidental, evolution, selective breeding, environment, inherited traits, genetic, genes, modification.</p>		
<p><b>Key scientists</b></p> <p>Jane Goodall (Chimpanzees)</p>		<p><b>Science careers</b></p> <p>Evolutionary biologist</p>

Topic: electricity		Year 6
Pupils should be taught to:		
<ul style="list-style-type: none"><li>• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.</li><li>• 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.</li><li>• Use recognised symbols when representing a simple circuit in a diagram.</li><li>• Build on their work in year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors.</li><li>• Learn how to represent a simple circuit in a diagram using recognised symbols.</li></ul>		
<b>Sticky knowledge</b> <ol style="list-style-type: none"><li>1. Electricity is created by generators which can be powered by gas, coal, oil, wind or solar.</li><li>2. The electrical energy can be converted into other types of energy such as light, heat, movement or sound.</li><li>3. Electricity is dangerous, so be careful when using electrical appliances.</li><li>4. Electricity will only travel around a circuit that is complete. That means it has no gaps.</li><li>5. Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound.</li><li>6. If you use a battery with a higher voltage, the same thing happens.</li><li>7. 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.</li><li>7. 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.</li><li>8. You can use recognised circuit symbols to draw simple circuit diagrams.</li></ol>	<b>Pupils will work scientifically by:</b> <ul style="list-style-type: none"><li>➤ Research how our understanding of electricity has changed over time.</li><li>➤ Investigate the effects of differing voltages in a circuit.</li></ul>	
	<b>Key questions</b> <ul style="list-style-type: none"><li>• What is electricity?</li><li>• How does the voltage of a battery affect how much current is pushed?</li><li>• How does the length of time I leave the current flowing for affect the brightness of the bulb?</li><li>• How does number of bulbs affect the brightness of a bulb?</li><li>• Are all types of wires as good as conducting electricity?</li><li>• Why are wires insulated in plastic? Does type of material make a difference?</li><li>• Does length of wire make a difference?</li></ul>	
<b>Key vocabulary</b> <p>Electricity, Thomas Edison, Nikola Tesla, Alessandro Volta, Michael Faraday, alternating current, direct current, battery, cell, bulb, battery, cell, wires, switch, motor, buzzer, diagram, brightness, loudness, increase, decrease, voltage, circuit, investigation, fair test, comparative test, practical enquiry, wire and length.</p>		
<b>Key scientists</b> <p>Alessandro Volta (Electrical Battery)</p>	<b>Science careers</b> <p>Electrical engineer</p>	

Topic: light Year 6	
<p>Pupils should be taught to:</p> <ul style="list-style-type: none"> <li>• Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</li> <li>• Recognise that light appears to travel in straight lines.</li> <li>• 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.</li> <li>• 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.</li> <li>• Build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows.</li> <li>• Talk about what happens and make predictions.</li> </ul>	
<p><b>Sticky knowledge</b></p> <ol style="list-style-type: none"> <li>1. Light travels in a straight line.</li> <li>2. When you place a torch on a table in a dark room, the beam travels in a straight line.</li> <li>3. We see objects when light from them goes into our eyes.</li> <li>4. Reflection is when light bounces off a surface - this changes the direction in which the light travels.</li> <li>5. Because light travels in straight lines, when there is an opaque object blocking the light, a shadow is formed.</li> <li>6. The size of a shadow changes as the light source moves.</li> </ol>	<p><b>Pupils will work scientifically by:</b></p> <ul style="list-style-type: none"> <li>➤ Identify how light travels in straight lines from light sources to our eyes, and from light sources to objects and then to our eyes.</li> <li>➤ Demonstrate how mirrors reflect light, and how they can help us see objects.</li> <li>➤ Investigate how a prism changes a ray of light to show the spectrum. Proving why shadows have the same shape as the object that casts them.</li> </ul>
	<p><b>Key questions:</b></p> <ul style="list-style-type: none"> <li>• How does the size of an object affect the size of a shadow?</li> <li>• How does the distance between the light and the object change the size of a shadow?</li> <li>• How does the distance between the object and the size of the screen affect the size of a shadow?</li> <li>• How does the amount of aluminium foil crumpled affect how much light is scattered?</li> <li>• What happens to light when it is shone through water? How is this affected by putting glitter, salt or talc in the water?</li> <li>• How does a periscope/microscope/telescope work?</li> </ul>
<p><b>Key vocabulary</b></p> <p>Light, source, travel, straight line, waves, ray, beam, wave, energy, vacuum. reflection, angle, incidence, normal, periscope. refraction, bend, lens, transparent, spectrum, wavelength, colour, prism, visible, reflect, absorb. shadow, light, source, opaque, size, distance, change, cast.</p>	
<p><b>Key scientists</b></p> <p>Percy Shaw (The Cats Eye)</p>	<p><b>Science careers</b></p> <p>Optometric</p>