Science Curriculum

Thompson Primary School

Aims of Science at Thompson Primary School

At Thompson Primary School, we recognise the importance of Science in every aspect of daily life. The Scientific area of learning is concerned with increasing pupils' knowledge and understanding of our world, and with developing skills associated with Science as a process of enquiry. We aim to develop a natural curiosity, respect for organisms and the environment around us as well as opportunities for hands-on investigation and critical evaluation. Critical thinking skills are key to scientific enquiry and we always encourage children to ask questions of themselves and the world around them in order to make sense of what they are learning.

Our curriculum aims to integrate Science in a cross curricular way, through the Learning Challenge Curriculum, across Key Stage 1 and Key Stage 2, therefore there may not be discreet Science lessons being taught each week. Rather the objectives, skills and knowledge will be covered, where appropriate, in conjunction with other related subjects. Where this is not possible lessons will be taught in a discreet way in order to ensure a full breadth of coverage across the academic year. In Early years, Science is taught through the children learning about the world around them through play and structured support where needed.

Our Science teaching offers opportunities for children to:

- develop scientific knowledge and conceptual understanding;
- develop understanding the world they live in through various types of scientific enquiry that help them to answer scientific questions about the world around them;
- be equipped with the scientific knowledge required to understand the uses and implications of Science, today and for the future;
- develop the essential scientific enquiry skills to deepen their scientific knowledge;
- use a range of methods to communicate information;
- develop a respect for the materials and equipment they handle with regard to their own, and other children's safety;
- develop an enthusiasm and enjoyment of scientific learning and discovery.

The National Curriculum will provide a structure and skill development for the science curriculum being taught throughout the school, with clear progression of skills and knowledge through the year groups, as evidenced through our progression of skills documents. There is a clear expectation of what children should know upon leaving each year group along with a clear expectation of how these knowledge and skills will be built on in subsequent year groups when topics are re-visited.

Regular retrieval practice is encouraged to ensure that once skills and knowledge have been taught, they are used regularly in order to avoid them being forgotten. This retrieval practice may take the form of quizzes or mini assessments depending on what the teacher feels is most appropriate for their class. Questioning is also used regularly to test understanding in all science lessons.

Curriculum Map

Cycle A

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Wrens (R)	Seasons (Autumn)	Seasons (Winter)	N/A	Growing and planting Seasons (Spring)	Life cycles and habitats	N/A
Robins (1/2)	N/A	N/A	N/A	Living things and their habitats Seasons	N/A	Materials
Skylarks (3/4)	Plants	States of Matter	Animals including humans - the digestive system	N/A	Sound and forces	N/A
Barn Owls (5/6)	Earth and Space	N/A	N/A	Light and Electricity	N/A	N/A

Cycle B

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Wrens (R)	Seasons (Autumn)	Seasons (Winter)	N/A	Growing and planting Seasons (Spring)	Life cycles and habitats	N/A
Robins (1/2)	N/A	N/A	Plants	N/A	Animals including humans	N/A
Skylarks (3/4)	N/A	N/A	Living things and their habitats	Electricity Light and shadow	N/A	Rocks and soils
Barn Owls (5/6)	Changing materials	N/A	Evolution and inheritance	N/A	Living things and their habitats	Animals including humans - the circulatory system and reproduction

Early Years Curriculum

The EYFS framework is structured across seven areas of learning rather than subject areas. Below is a table highlighting how skills taught in Reception feed into the National Curriculum subjects.

The statements from the Early Years Foundation Stage Profile Handbook 2022 are prerequisite skills within the National Curriculum. The table below outlines the most relevant statements taken from the Early Learning Goals in the Profile which link to the teaching of Science in KS1 and KS2. The most relevant statements for Science are taken from the following area of learning:

Understanding the world - ELG The Natural World
Children at the expected level of development will:

- Explore the natural world around them, making observations and drawing pictures of animals and plants;
- Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class;
- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter

Early Years Curriculum	**When is it taught?**
Explore the natural world around them, making observations and drawing pictures of animals and plants	**Term 1 - animals that hibernate, all about me: facial features, body parts, the five senses** **Term 2 - describing places in our local area** **Term 5 - life on the farm (animals and plants), life cycles, plants and seeds** **Term 6 - animals and plants in the local area, protecting our local environment**
Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class	**Term 2 - look at environment in India when discussing Diwali - compare to UK** **Term 3 - look at environment in China when discussing Chinese New Year - compare to UK**
Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter	**Term 1 - Seasons (Autumn)** **Term 2 - light and shadow** **Term 3 - Seasons (Winter), changing states (water to ice and snow)** **Term 4 - Seasons (Spring), growing and planting, forces, air transport, water transport, land transport** **Term 6 - Seasons (Summer)**

Key Stage 1

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read and spell scientific vocabulary at a level consistent with their increasing word-reading and spelling knowledge at key stage 1.

National Curriculum	When is it taught?	Why?
Working scientifically During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: ● Asking simple questions and recognising that they can be answered in different ways. ● Observing closely, using simple equipment. ● Performing simple tests. ● Identifying and classifying . ● Using their observations and ideas to suggest answers to questions. ● Gathering and recording data to help in answering questions.	**Throughout the key stage 1 curriculum, linking in to the knowledge content and giving the children a clear context for applying the skills they will be learning.**	**The working scientifically skills are the threads that pull together the whole of the science curriculum. These skills will be taught through each programme of study and built upon as children move through their time in key stage 1, preparing them for further in depth study and development of these skills in key stage 2.**
Plants (Year 1) Pupils should be taught to: ● identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. ● Identify and describe the basic structure of a variety of common flowering plants, including trees. **Plants (Year 2)** 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.	**Cycle B Term 3**	**This is in the National Curriculum as a year 1 and year 2 topic. We have combined this area of study with a topic on Biomes in Geography as it will allow the children to think about plants in context and give them a real-life application for what they have learnt.**
Animals including humans (Year 1) Pupils should be taught to: ● Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals.	**Cycle B Term 5**	**This is in the National Curriculum as a year 1 and year 2 topic. We have combined the year 1 and 2 objectives to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across**

● 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. **Animals including humans (Year 2)** 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.		**our two yearly cycles. The knowledge and skills developed in this topic will be revisited at various points across key stage 1 and also in key stage 2, to ensure the information can be recalled accurately.**
Everyday materials (Year 1) 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 of everyday materials on the basis of their simple physical properties. **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.	**Cycle A Term 6**	**This is in the National Curriculum as a year 1 and year 2 topic. We have combined the year 1 and 2 objectives to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. The knowledge and skills developed in this topic will be revisited at various points across key stage 1 and also in key stage 2, to ensure the information can be recalled accurately.**
Seasonal changes Pupils should be taught to: ● Observe changes across the four seasons. ● Observe and describe weather associated with the seasons and how day length varies.	**Cycle A Term 4**	**This is in the National Curriculum as a year 1 and year 2 topic. We have combined this with the topic 'living things and their habitats' so that children can link their learning on seasons to a different context.**
Living things and their habitats 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.	**Cycle A Term 4**	**This is in the National Curriculum as a year 1 and year 2 topic. We have combined this with the topic 'seasons' so that the children can link their learning on living things and their habitats to a different context.**

Key Stage 2

The principal focus of science teaching in key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

'Working and thinking scientifically' is described separately at the beginning of the programme of study but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read, spell and pronounce scientific vocabulary accurately.

National Curriculum	When is it taught?	Why?
Working Scientifically (Years 3 and 4) During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: ● Asking relevant questions and using different types of scientific enquiries to answer them. ● Setting up simple practical enquiries, comparative and fair tests. ● Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. ● Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions. ● Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. ● Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. ● Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. ● Identifying differences, similarities or changes related to simple scientific ideas and processes. ● Using straightforward scientific evidence to answer questions or to support their findings.	**Throughout the key stage 2 curriculum, building on the skills learnt in key stage 1, linking in to the knowledge content and giving the children a clear context for applying the skills they will be learning.**	**The working scientifically skills are the threads that pull together the whole of the science curriculum. These skills will be taught through each programme of study and build upon skills learnt in key stage 1. As children move through their time in key stage 2 they will continue to build on these skills even further, preparing them for further in depth study and development of these skills in key stage 3.**
Plants Pupils should be taught to: ● Identify and describe the functions of different parts of flowering plants:	**Cycle A Term 1 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined this topic with the geography topic on South America and the rainforest to allow for deepening of knowledge**

roots, stem/trunk, leaves and flowers. ● Explore the requirements of plants for life and growth (air, light, water, nutrients from soil and room to grow) and how they vary from plant to plant. ● Investigate the way in which water is transported within plants. ● Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.		**and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a real life context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Animals including humans (Year 3) Pupils should be taught to: ● Identify that animals, including humans, need the right types and amounts of nutrition, and that they cannot make their own food; they get nutrition from what they eat. ● Identify that humans and some other animals have skeletons and muscles for support, protection and movement. **Animals including humans (Year 4)** Pupils should be taught to: ● 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.	**Cycle A Term 3 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined the year 3 and 4 objectives to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Rocks 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 lived are trapped within rock. ● Recognise that soils are made from rocks and organic matter.	**Cycle B Term 6 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined this topic with the geography topic on natural disasters to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a real life context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Light Pupils should be taught to: ● 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.	**Cycle B Term 4 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined this topic with the science topic on electricity to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a different context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Forces and magnets ● Compare how things move on different surfaces. ● Notice that some forces need contact between two objects, but magnetic forces can act at a distance. ● Observe how magnets attract or repel each other and attract some materials and not others. ● Compare and group together a variety of everyday materials 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	**Cycle A Term 5 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined this topic with the science topic on sound to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**

attract or repel each other, depending on which poles are facing.		
Living things and their habitats Pupils should be taught to: ● Recognise that living things can be grouped in a variety of ways. ● Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. ● Recognise that environments can change and that this can sometimes pose dangers to living things.	**Cycle B Term 3 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined this topic with the geography topic on North America to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a real-life context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
States of matter Pupils should be taught to: ● Compare and group materials together, according to whether they are solids, liquids or gases. ● Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius. ● Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	**Cycle A Term 2 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined this topic with the geography topic on rivers and the water cycle to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a different context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Sounds 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.	**Cycle A Term 5 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined this topic with the science topic on forces and magnetism to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Electricity 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, based on whether or not the lamp is part of a complete loop with a battery. ● Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. ● Recognise some common conductors and insulators, and associate metals with being good conductors.	**Cycle B Term 4 (Year 3/4)**	**This is in the National Curriculum as a year 3 and year 4 topic. We have combined this topic with the science topic on light to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a different context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Working Scientifically (Years 5 and 6) During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: ● Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. ● Taking measurements, using a range of	**Throughout the key stage 2 curriculum, building on the skills learnt in key stage 1, linking in to the knowledge content and giving the children a clear context for applying the skills they will be learning.**	**The working scientifically skills are the threads that pull together the whole of the science curriculum. These skills will be taught through each programme of study and build upon skills learnt in key stage 1. As children move through their time in key stage 2 they will continue to build on these skills even further, preparing them for further in depth study and development of these skills in key stage 3.**

scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. ● Recording data and results of increasing complexity, using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. ● Using test results to make predictions to set up further comparative and fair tests. ● Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations. ● Identifying scientific evidence that has been used to support or refute ideas or arguments.		
Living things and their habitats (Year 5) 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. **Living things and their habitats (Year 6)** Pupils should be taught to: ● Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including miro-organisms, plants and animals. ● Give reasons for classifying plants and animals based on specific characteristics.	**Cycle B Term 4 (Year 5/6)**	**This is in the National Curriculum as a year 5 and year 6 topic. We have combined this topic with the geography topic on map skills and a local area study to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a real-life context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Animals including humans (Year 5) Pupils should be taught to: ● Describe the changes as humans develop to old age. **Animals including humans (Year 6)** 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 water are transported within animals, including humans.	**Cycle B Term 6 (Year 5/6)**	**This is in the National Curriculum as a year 5 and year 6 topic. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Properties and changes of materials Pupils should be taught to: ● Compare and group together everyday materials based on 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 through filtering, sieving and evaporating. ● Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.	**Cycle B Term 1 (Year 5/6)**	**This is in the National Curriculum as a year 5 and year 6 topic. We have combined this topic with the science topic on forces, to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**

● 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.		
Earth and Space Pupils should be taught to: ● Describe the movement of the Earth and other planets relative to the sun in the solar system. ● Describe the movement of the moon relative to the Earth. ● Describe the sun, Earth and moon as approximately spherical bodies. ● Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	**Cycle A Term 4 (Year 5/6)**	**This is in the National Curriculum as a year 5 and year 6 topic. We have combined this topic with the history topic on space travel to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a real-life context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Forces Pupils should be taught to: ● Explain that unsupported objects fall towards Earth because of the force of gravity acting between Earth and the falling object. ● Identify the effects of air resistance, water resistance and friction that act between moving surfaces. ● Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.	**Cycle B Term 1 (Year 5/6)**	**This is in the National Curriculum as a year 5 and year 6 topic. We have combined this topic with the science topic on properties and changes to materials to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Evolution and inheritance Pupils should be taught to: ● Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. ● Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. ● Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	**Cycle B Term 3 (Year 5/6)**	**This is in the National Curriculum as a year 5 and year 6 topic. We have combined this topic with the geography topic on South America and the Galapagos to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a real-life context and make links to the work of Charles Darwin. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately.**
Light 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 things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. ● Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.	**Cycle A Term 5 (Year 5 and 6)**	**This is in the National Curriculum as a year 5 and year 6 topic. We have combined this topic with the science topic on electricity to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects across our two yearly cycles. It will also allow the children to apply their learning to a different context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately. We took this approach with the topics of electricity and light in years 3 and 4, so by doing this in year 5 and 6 it ensures consistency.**
Electricity Pupils should be taught to: ● Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells in the	**Cycle A Term 5 (Year 5 and 6)**	**This is in the National Curriculum as a year 5 and year 6 topic. We have combined this topic with the science topic on light to allow for deepening of knowledge and to ensure full coverage of the National Curriculum requirements for all subjects**

circuit. ● Compare and give reasons for the 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.		**across our two yearly cycles. It will also allow the children to apply their learning to a different context. The knowledge and skills developed in this topic will be revisited at various points across key stage 2, to ensure the information can be recalled accurately. We took this approach with the topics of electricity and light in years 3 and 4, so by doing this in year 5 and 6 it ensures consistency.**

Strand Development - Skills for Working Scientifically

	Threads				
	Asking questions	**Making observations**	**Planning and carrying out tests**	**Gathering and recording data**	**Analysing results**
EYFS	Ask simple questions about a topic being studied.	Be able to explain what they can see.	With adult support, conduct simple tests to investigate a question.	With adult support, make a record of what they have seen when carrying out a simple test.	With adult support, try to explain what has happened using simple scientific vocabulary.
Year 1/2	Ask simple questions and understand they can be answered in different ways	Describe and start to explain observations using simple equipment.	Conduct simple tests, for example, setting up comparative tests to show that plants need water and light.	Collect data relevant to the answering of questions, for example, seeing how the shapes of some materials can be changed.	Identify and classify results. Answer enquiry questions using data and ideas, for example, to help decide how the properties of certain materials make them suitable for certain applications.
Year 3/4	Generate clear questions about a topic and make suggestions about how these can be answered. Use evidence to suggest further relevant investigations, e.g. making own instruments, using ideas about pitch and volume.	Make accurate observations, recording them carefully and attempting to explain what they are seeing.	With support, develop relevant, testable questions, e.g. what happens to shadows when the light source moves. Plan enquiry, such as comparative or fair test, e.g. comparing the effect of different factors on plant growth. Pupils can set up a comparative test.	With prompting, draw and label diagrams, e.g. to show how water travels in a plant. Use various ways to record, group and display evidence, e.g. grouping and classifying various materials. Indicate findings from an enquiry that could be reported, e.g. answering questions about how rocks are formed. Use various equipment, as instructed, e.g. using a hand lens to examine rocks. Use standard measurements when taking measurements, e.g. measuring distances between a light source and an object.	Write a conclusion based on evidence, e.g. exploring the strengths of different magnets or the effect on brightness of bulbs if more cells are added. Recognise patterns that relate to scientific ideas, e.g. finding out which materials make better earmuffs. Use evidence to produce a simple conclusion, e.g. the effect of temperature on various substances.
Year 5/6	Ask clear questions about a topic, making links between scientific concepts already known and what needs to be found out. Identify clear variables.	Record observations in a variety of ways, choosing the method most appropriate for the study taking place. Make links between observations and scientific concepts in order to explain what is being observed.	Answer questions using evidence gathered from different types of scientific enquiry, e.g. comparing life cycles of different plants using change over time, surveys and secondary research. Identify and manage variables, e.g. when exploring falling paper cones.	Following discussion of alternatives, select appropriate equipment, e.g. using a shadow stick and measuring length and angle of shadow. Can start to use labelled diagrams to show more complex outcomes, e.g. comparing the time of day at different places on the earth. Can use a line graph to record basic data.	Write a conclusion using evidence and identifying causal links, e.g. In the design of a periscope. Display and present key findings from enquiries orally and in writing, e.g. deciding how well classifications fit unfamiliar animals/plants. Identify how an idea is supported or refuted by evidence, e.g. Selective breeding to produce animals or plants with desirable characteristics.

Year 1 and Year 2 - Knowledge to be taught

Plants - linked with geography topic: Biomes				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. Identify and describe the basic structure of a variety of common flowering plants. Identify and name the roots, trunk, branches and leaves of trees. Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and warmth to grow and stay healthy.	Building on prior learning: **In EYFS Children should:** Make observations of plants. Know some names of plants, trees and flowers. May be able to name and describe different plants, trees and flowers. Show some care for their world around them. Links to future learning: **In Year 3/4 Children will:** Identify and describe the functions of different parts of the flowering plant: roots/stem/trunk/leaves/flowers. Explore the part flowers play in a flowering plants life cycle, including: pollination, seed formation/dispersal Explain the requirements of plants for life and growth (air, light, water, nutrients from soil, room to grow) and how they vary between plants. Know the way in which water is transported between plants.	The study of plants is part of the discipline of biology - the study of living organisms. Know the names of the following common plants - daisy, white clover, poppy, nettle, ivy, bramble and locate some in the local environment (also dandelion and grass). Know the names of the following common trees - oak, elm, maple, silver birch, sycamore, horse chestnut, crack willow). Know how to identify them from their leaves, fruit and shape Know the term deciduous - a tree that sheds its leaves annually - this means every year the tree loses its leaves. The leaves of deciduous trees are often large and thin. Know the term Evergreen - a tree that has green leaves all year. These leaves are usually, waxy, thick, narrow and small. Know that oak, birch and sycamore are deciduous. Know that holly and pine are evergreen. Know the names of the basic parts of a plant and their function - leaves, flower, stem, roots, petals Know how to draw a diagram showing the parts of a plant. Know that roots support the plant in the ground and absorb water and nutrients needed for growth. Know that the stem holds the flower and leaves up to the sunlight and carries water and nutrients to the leaves. Know that leaves are made to catch sunlight and change the sun's energy into energy for the plant to use to grow. They are the only living things that can do this. Know that the flower is where seeds are made. Know that bees and insects help this process by carrying pollen from one flower to another. This is called pollination. Know that plants grow from seeds or bulbs. Identify pictures of seeds and bulbs. Know that seeds are sown and bulbs are planted. Know that when a seed germinates it starts to grow. This process is called germination. As a plant grows it becomes a seedling before becoming an adult plant. Know that a shoot is a new part of a plant that grows Know that seeds and bulbs have a store of food inside them Know that nutrients are substances that help plants and animals to grow. Know the names and function of parts of a tree - roots, trunk, branches, leaves. Know that a tree trunk is a type of stem. Know that flowers on a tree are often called blossom. Know that fruit often grows on trees including - apples, oranges, cherries, lemons, bananas, mangoes, pears and plums. Know that the fleshy part of the fruit generally protects the seeds within. Recognise examples of seeds and pips found in apples, oranges, peaches and cherries. Know that seeds are buried in the ground (or planted) and grow into new plants. Know that bulbs are short stems with leaves built up around it. They are planted in the	Make a fruit and vegetable based picnic for parents	The Wonder of Trees - Nicola Davies and Lorna Scobie Everything you need for a treehouse - Carter Higgins and Emily Hughes I love this Tree - Anna Claybourne The Tree Lady - H. Joseph Hoskins It Starts with a Seed - Laura Knowles Eddie's Garden and how to make things grow - Sarah Garland

		ground and new plants can grow. Know that onions are an example of a bulb that we can eat. Know that roses are England's national flower, that thistles are Scotland's national flower, daffodils are Wales' national flower and shamrocks are Northern Ireland's national flower. Know how to use the term species to describe different plants. **Key Vocabulary** leaves, trunk, branch, root, seed, bulb, flower, stem, wild, garden, deciduous, evergreen, observe, grow, compare, record, temperature, predict, measure, diagram, germinate, warmth, sunlight **Working Scientifically** Know how to observe a hyacinth bulb growing in a transparent glass vase, using a magnifying glass. Know how to record observations about the roots and stem growing. Carry out a demonstration with changed variables. Know that variables are the elements of an experiment that can be changed. Know how to conduct an experiment to demonstrate the effects of water and light on plant growth. (Note this task is not used to learn the effects of water and light but to prove what they have already been taught is true) 1. Seed A should have water and access to light (this is called the Control) 2. Seed B should have access to light but no water. 3. Seed C should have no water and access to light. 4. Seed D should have no water and no light. Pupils use what they know about what plants need to grow to predict what will happen for each container. Know that the experiment must have other variables the same e.g. temperature. Know that they must check the size of the plants regularly and over a long period of time. Know that scientists record results accurately to compare different conditions. Know how to use a ruler to measure height of a plant in cm. Know how to describe the health of the plant through careful observation of colouring and stem strength. **Key questions** How do Plants grow? What do Plants need to grow? Do all plants need water? Are all plants green? Why do seeds look different? Can plants grow as big in the shade? What is the biggest/smallest/smelliest (etc) tree/flower/plant on the planet? Do cress produce seeds, how could we find out? Do all plants produce flowers and seeds? What is the difference between freshly cut and planted flowers? Do plants flower all year round? What are flowers for? What happens to a plant after it has produced seeds?		

		Key Scientists: Agnes Arber (Botanist); Alan Titchmarsh (Botanist & Gardener)		

Animals including humans				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
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. Know that animals, including humans, have offspring which grow into adults. Know the basic stages in a life cycle for animals, including humans. Find out 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.	Building on prior learning: Be able to identify different parts of their body. Have some understanding of healthy food and the need for variety in their diets. Be able to show care and concern for living things. Know the effects exercise has on their bodies. Have some understanding of growth and change. Can talk about things they have observed including animals Links to future learning: In year 3/4 the children will identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat. Know how nutrients, water and oxygen are transported within animals and humans. Know about the importance of a nutritious, balanced diet. Identify that humans and some other animals have skeletons and muscles for support, protection and movement.	The study of animals, including humans is part of the discipline of biology - the study of living organisms. Pupils will know that animals are grouped together in 'families' based on shared properties. They will name the groups fish, amphibians, reptiles, birds and mammals. Know that fish, amphibians, reptiles, birds and mammals are similar in that they have internal skeletons and organs; these are known as vertebrates, which means they are animals that have a backbone. Understand the difference between a pet and a wild animal. There are many different animals with different characteristics. Animals have senses to help individuals survive. When animals sense things they are able to respond. Animals need food to survive. Animals need a variety of food to help them grow, repair their bodies, be active and stay healthy. Animals move in order to survive. Different animals move in different ways to help them survive. Exercise keeps animal's bodies in good condition and increases survival chances. All animals eventually die. Animals reproduce when they reach maturity. Animals grow until maturity and then don't grow any larger. Know the features of a fish - gills, scales, fins, water dwelling, Know the features of mammals - hair or fur, babies drink mother's milk, live on land or water Know the features of amphibians - live on land or water when adults, soft skin, lay eggs in water, live in water when young Know the features of reptiles - dry scaly skin, lay eggs on land, Know the features of birds - wings, feathers, beak/bill, hatch from eggs, most can fly but some can't (e.g., ostrich, penguin, kiwi) **Lifecycles** Know that animals grow and change over their lifetime. Know that animals grow in a womb, and are born or hatch. Know that some animals hatch from eggs and some have live young. Know that some animals need milk and care from their mothers (including lambs, calves, piglets, goat kids) and some fend for themselves (including ducks and geese). Know the life cycle of a human using the following language - Stage, Baby, Toddler, Child, Teenager, Adult, Elderly. Know the life cycle of a butterfly - egg, caterpillar, pupa, butterfly (know that the term metamorphosis describes the change from a caterpillar to butterfly. Frogs also demonstrate metamorphosis when	Create a moving animal/human with a guide to how to keep it alive	The Tadpole's Promise - Jeanne Willis Poo in the Zoo - Steve Smallman First Animal Encyclopaedia - DK Me and My Amazing Body - Joan Sweeney Amazing Animal Babies - Chris Packham The Pigeon Needs A Bath - Mo Willems The Busy Body Book - Lizzy Rockwell Once There Were Giants - Martin Waddell

		changing from tadpole to adult frog). Know that caterpillars moult to remove their old layer of skin. Know that a butterfly pupa is often known as a cocoon or chrysalis. Know the life cycle of a chicken - egg, chick, chicken Know the life cycle of a frog - frogspawn, tadpole, frog. Know that frogs have four legs - two front legs and two back legs. (address the misconception that frogs have arms) **Health** Know that animals and humans need water, food and air to survive (relate to looking after pets). Know that humans need exercise to stay fit and healthy. Know the following terms - muscles, flexible, strength, circulation to describe the effects of exercise on the body and the benefits to health and wellbeing. Know that the heart pumps blood around the body through the veins and that lungs are used for breathing. The heart and lungs are called organs. Know that when we breathe in we take oxygen from the air. Know why we need a heart and why we need lungs. **Diet** Know that a balanced diet consists of the five food groups below. Know examples from each and the health benefit of each food group ● Carbohydrates give us energy (e.g. bread, pasta, rice) ● Protein helps the body to grow and repair itself (e.g. meat, fish, eggs) ● Dairy products keep bones and teeth healthy (e.g. milk, yoghurt, cheese) ● Fruit and Vegetables keep your digestive system healthy. (e.g. apple, orange, pear, strawberry, melon) ● Fats and Sugars give us energy but should not be eaten too often (e.g. butter, cooking oil, cream, chocolate, sweets, jam, cakes, biscuits) Know that we need to drink water to be hydrated and stay healthy. Know that water is good to drink as it does not contain calories and is not harmful to teeth. Know that calories are 'a measure of the amount of energy in food'. **Unhealthy food and drink** Know that sugary soft drinks can damage teeth and contain sugar which can be harmful to the body if eaten in large quantities. Know that a germ is 'a very small living thing that causes disease'. Know that they are only visible through a microscope. Know the following basic hygiene rules to prevent the spread of germs ● Wash hands regularly especially before eating and after using the toilet ● Cover your mouth when sneezing or coughing ● Have a bath or shower regularly ● Wash your hair at least twice a week ● Wear clean clothes ● Brush teeth twice a day **Parts of the human body** Know that we have five senses - smell, taste, touch, sight, hearing Know that the following body parts are linked to the senses		

		Know why we need the following body parts - ears, mouth, eyes, nose, tongue. Know that the brain controls the body and is where you think and remember things. Know the location of the brain. Know the rhyme 'Heads, Shoulders Knees and Toes' **Working Scientifically** Sorting animals into the correct classification Know that objects can be identified or sorted into groups based on their observable properties Know that we can write down numbers and words or draw pictures to record what we find Know that herbivorous animals eat plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants Know that a cat is an example of a carnivore; that a rabbit is an example of a herbivore; know that many humans are examples of omnivores (though not vegetarians) **Key vocabulary** Amphibians, birds, fish, mammals, reptiles, carnivores, herbivore, omnivore, sight, hearing, touch, taste, smell, head, neck, ear, mouth, shoulder, hand, fingers, leg, foot, thumb, eye, nose, knee, toes, teeth, elbow, living, dead, never alive, habitats, micro-habitats, food, food chain, leaf litter, shelter, sea shore, woodland, ocean, rainforest, conditions, desert, damp, shade. **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? Why are animals different colours and patterns? How long do should my pets live for? Do all animals grow and live the same way? Do bigger animals live longer? Why are we all different heights? How and why do we grow and change? **Key scientists** Chris Packham (Animal Conservationist); Steve Irwin (Crocodile Hunter); Robert Winston (Human Scientist); Joe Wicks (Personal Trainer)		

Seasons linked with the science topic: living things and their habitats				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies.	Building on prior learning: **In Early Years children should:** Develop an understanding of change. Observe and explain why certain things may occur (e.g leaves falling off trees, weather changes). Look closely at similarities, differences, patterns and change. Comment and question about the place they live or the natural world. Links to future learning: **In Year 3 children will:** 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 a solid object. Find patterns in the way that the sizes of shadows change.	Weather can change. There are lots of different types of weather: Rain, Sun, Cloud, Wind, Snow, etc. Days are longer and hotter in the summer. Days are shorter and colder in the winter. Know that there are four seasons: Spring, Summer, Autumn, Winter. Know how the environment changes in each season. Autumn - Leaves change colour and fall from deciduous trees, harvest time, some birds migrate (e.g. swallows) Winter - Some animals including hedgehogs and tortoises hibernate throughout Winter (identify these animals) water freezes to ice. Many plants stop growing. Spring - Flowers begin to grow, associated with rebirth and growth, some baby animals are born (e.g. lambing season), Summer - Flowers and trees are in bloom. (Time-lapse video of seasons - https://vimeo.com/2639782 Know that the length of daylight varies with Winter having the shortest daylight hours and Summer having the longest. Know that in the UK the longest day is June 21st (the Summer Solstice) and the shortest day is December 21st (the Winter Solstice). Know that there is equal daylight and night time at the Spring Equinox (around March 20th) and the Autumn Equinox (around 22nd September). Know that the Earth orbits the Sun with one orbit constituting a year of 365/366 days (Note: The Sun and the Earth are capitalised when being discussed in an astronomical context.) Know the weather patterns associated with each season - Autumn - Temperatures start to drop from Summer, overcast Winter - Coldest time of year, snow, frosty in the morning, sleet, blizzard, hail Spring - Temperatures start to warm up Summer - Hottest time of the year, sunshine, generally dry weather but may be thunderstorms Know the differences between types of precipitation - hail, rain, snow, sleet. **Working Scientifically** Know how to gather information on wind speed, rainfall and temperature at each season. Know that a thermometer is used to measure temperature. Know how to read a thermometer to find out the temperature outside. Know that we measure temperature in degrees Celsius which is abbreviated to oC. Know that when the temperature falls below 0oC then water turns to ice. Know that looking directly at the sun is not safe even when wearing sunglasses. Know that the temperature on earth is affected by the sun.	Sculpture exhibition based on living things	Pond Circle - Stefano Vitale Lots: the diversity of life on Earth - Nicola Davies The Woods - Rob Hodgson Weather and the Seasons - DK Why Do Leaves Fall From Trees? Little Scientists Big Questions Poems About Seasons - Chosen by Brian Moses

		Know how to understand a weather forecast. Know that a forecast is a prediction about future weather. **<u>Key vocabulary</u>** Seasons, spring, summer, autumn, winter, windy, sunny, overcast, snow, rain, temperature. **<u>Key questions</u>** Why do more frequent days of rain saturate the ground? How long does it take for the ground to dry after it has been raining? Does more rain take longer to dry? Do countries with higher temperatures have less rain? How does rainfall and temperature change over time in our school grounds? Which leaf is the strongest/best shade cover/best at directing water? What do you notice about different leaves? What purpose do leaves serve for a tree? Why do you think leaves turn brown in Winter? What colours can we find outside? Does this change across the seasons? What effect does rain have on the environment? What would happen if there was too much rain? What would happen if there wasn't enough rain? **<u>Key scientists</u>** Dr Steve Lyons (Extreme Weather); Holly Green (Meteorologist)		

Living things and their habitats - linked with science topic: seasons

National Curriculum Links	Context	Key knowledge and vocabulary	End of topic outcome	Key texts that link to the topic
Explore and compare the difference between things that are living, dead and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including micro habitats. Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain and identify & name different **sources of food.**	Building on prior learning: **In EYFS children will:** Comment and question about the place they live or the natural world. Show care and concern for living things and the environment. Can talk about things they have observed such as plants and animals. Notice features of objects in their environment. Comment and ask questions about their familiar world. Links to future learning: **In Year 3/4 children will:** Recognise that living things can be grouped in a variety of ways. Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. Know and label the features of a river. Recognise that environments can change and that this can sometimes pose danger to living things.	The study of animals, including humans is part of the discipline of biology - the study of living organisms. To know which items, including those made from a variety of materials, fit into each category and place them in a table under the headings living (tree, person, animal, fish, grass) dead (paper, bunch of flowers, cotton shirt, wooden table), and things that have never been alive (plastic chair, pen, window, stone, metal). Understand that a flame is not alive and that a deciduous tree is not dead in Winter. Know that living things move, grow, consume nutrients and reproduce; that dead things used to do these things but no longer do; and that things that never lived have never done these things. Know the acronym MRS NERG (Movement, Respiratory, Sensitivity, Nutrition, Excretion, Reproduction and Growth) to teach about how to organise objects into each category. Know the following: M Movement – All living things move, even plants. R Respiration – Getting energy from food. S Sensitivity – Detecting changes in the surroundings. G Growth – All living things grow. R Reproduction – Making more living things E Excretion – Getting rid of waste. N Nutrition – Taking in and using food. Know that a species of animal or plant that is extinct no longer has any living members in the world. e.g. dinosaurs, dodo. Know that all creatures need air, food, shelter and water to survive 1. Sea/underwater - A fish breathes through gills, has fins to swim, swim bladders for buoyancy, eat water insects and other sea creatures (shrimp) 2. Woodland - A fox/badger, breathes through lungs, has fur for warmth, lives in a den underground, eats creatures found in the habitat (frogs, worms, berries, mice) 3. Birds - breathe through lungs, have wings to fly to warmer places (migrate) or out of danger, eat worms and slugs found on the ground Know that animals and plants survive in a habitat because of each other and that different plants and animals live in different places because of their needs. Link to food chains for how they depend on each other to survive. Know the terms omnivore, carnivore and herbivore to describe the eating habits of animals in the food chain. Know that the arrows on a food chain show the direction that the energy travels.	Sculpture exhibition based on living things	Pond Circle - Stefano Vitale Lots: the diversity of life on Earth - Nicola Davies The Woods - Rob Hodgson

		Recognise and name these larger habitats - ocean, tropical rainforest, desert, woodland, tundra and polar ice. Know the names of plants in these habitats such as cactus, tumbleweed (desert), orchid, coffee plant (rainforest) dandelion, moss, clover, grass, shrub, conifer (woodland/grassland). Know that there is variation between living things. Know the names of the following minibeasts - caterpillar, spider, woodlouse, beetle, worm, slug, water boatman, pond skater and observe where they live. Know that an insect has 6 legs. Know that a spider has 8 legs and is an arachnid. Know that a worm and a slug are not insects. Understand the term microhabitat (a small habitat specific to minibeasts within larger habitats) **Working Scientifically** Use questions to sort different animals based on their characteristics and habitat. Use the word key to describe the system of sorting. A woodland has many microhabitats - under a log or rock, a leaf pile or under a bush. Know that a pond is a microhabitat. Pupils should look at some habitats and microhabitats in the local area and record their findings. Use the terms Solar Energy, Producer, Consumer, Prey, Predator to describe a food chain and use the terminology to organise and create food chains. **Key vocabulary** Living, dead, never alive, habitats, micro-habitats, food, food chain, leaf litter, shelter, sea shore, woodland, ocean, rainforest, conditions, desert, damp, shade **Key questions** How do animals eat? Do all animals eat the same thing? Which animals hunt, and which animals are hunted? What animals live in our school environment? How are animals and plants 'adapted' to live in their habitats Why do animals and plants like to live in different places? How do seasons affect our animals and plants? Which animals hibernate and why? Why do snails hibernate, but slugs don't? How do habitats change over our school year? **Key scientists** Terry Nutkins (TV Presenter); Liz Bonnin (Conservationist)		

Materials				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials, including wood, metal, plastic, glass, water and rock. Describe the simple physical properties of a variety of everyday materials. Compare and group together a variety of everyday materials on the basis of their simple properties. 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 shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	Building on prior learning: **In Early Years children should:** Be able to ask questions about the place they live. Talk about why things happen and how things work. Discuss the things they have observed such as natural and found objects. Manipulates materials to achieve a planned effect. Links to future learning: **In Year 3/4 children will:** Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soil is made from rocks and organic matter.	There are many different materials that have different describable and measurable properties. Materials that have similar properties are grouped into metals, rocks, fabrics, wood, plastic and ceramics (including glass). The properties of a material determine whether they are suitable for a purpose. Materials can be changed by physical force (twisting, bending, squashing and stretching). The study of materials is part of the discipline of Chemistry - the identification of the properties that a substance is made from. Know that matter (stuff) is made from tiny building blocks. This comes in three forms - solids, liquids and gases. Solids include glass, plastic and stone. Liquids include water, blood, milk. Gas includes air that we breathe. Know that many materials are solid and have different properties. Water is a liquid and is different because it can change its shape. Know that some materials are natural and others are man-made. Natural materials come from materials found in nature and man-made materials are those which humans make. Natural materials: iron, gold, silver, silk, cotton, leather, wood, water and rock. (know that iron, gold, silver are collectively known as metals) Man-made materials: plastic, glass (know that glass is heated sand), brick, paper, concrete, rubber and some metals like steel. Identify different items and name what material or materials they are made from. e.g. Canoe: wood or plastic. Car: metal and rubber tyres. Know that John Dunlop was the inventor of the inflatable (pneumatic) tyre in 1887 (link to be made to study of History of Vehicles). Know that he was born in Scotland. He watched his son riding a bicycle over cobbles with solid tyres and noticed how uncomfortable the bike was to ride. John Dunlop was a vet and he used rubber sheets to protect his tables when performing surgery on animals. He used these rubber sheets to make an airtight tube which he stitched together by hand. He then attached this to the bike wheel and wrapped canvas material around it and sealed it with liquid rubber. He then pumped the tube with air and invented the first inflatable (or pneumatic) tyre. The air meant that the bumps in the road did not shake the bike as much as solid wheels and it was much more comfortable to ride. These tyres are now used all over the world on all sorts of vehicles including cars, planes and bikes. The first tyre invented by John Dunlop is now in the Museum of Scotland for people to look at. Know that a museum is a building. Know that forces are part of the study of Physics. Use properties to compare what different materials would be used for and why. Know that a chair can be made of wood because wood is strong and rigid. Plastic would also be good for a chair because it is strong, flexible and smooth. Glass is a good material for a window because it is transparent and rigid. Fabric would be a good material for a jumper because it is flexible, soft and strong. Know why some materials are not appropriate e.g. Why is glass not appropriate for a chair? Why is wood not appropriate for a window? Know how to use a Venn diagram to sort a set of materials (e.g., one circle labelled 'flexible' and the other circle labelled 'opaque')	Design and make a chair for Baby Bear using the strongest material	Materials - Anna Claybourne Let's Build a House - Mick Manning and Brita Granstrom The Slimy Book - Babette Cole The Three Billy Goats Fluff - Rachel Mortimer Three Little Pigs - A Favourite Story in Rhythm and Rhyme

		Know that resistance is 'a force which slows down a moving object'. Know that when objects move across a surface there is friction when they rub against each other and that sometimes this friction is larger or smaller. To know that the smoother the surface of the material, the less resistance it has and will travel further. Know that the rougher the surface, the more resistance it has and the less it will travel. Know that materials can change shape when properties are flexible and soft but they can't change shape when the properties are rigid, hard and stiff. **Key vocabulary** Hard, soft, stretchy, stiff, shiny, dull, rough, smooth, bendy/not bendy, waterproof/not waterproof, absorbent, opaque, rubber, cars, rock, paper, cardboard, wood, metal, plastic, glass, brick, twisting, squashing, bending, matches, cans, spoons. **Working Scientifically** Test a range of materials and identify which properties they have. Group materials based on similar properties. Make predictions and test how an item moves on different surfaces - sandpaper, carpet, paper, plastic and bubble wrap. Make predictions and test items made from different materials against 4 forces - squashing, bending, twisting and stretching. Know that applying forces to objects can change their shape. Record the results to see which can be changed or not by each force. **Key questions** **Buildings** Which rocks are the least crumbly? Which materials absorb the most water? Which type of brick would be the easiest to drag to make a pyramid? Which material would be the strongest to use as a floor tile? **Toys & Nice things** Which fabric would make the softest blanket? The baby has spilt her drink, which material would absorb the drink the best? We want to make a really slippery slide, which liquid would be best to use? Which chocolate will melt the fastest on a warm plate (a model of a warm hand) Which wrapping papers are strong enough to wrap and send a present? **Clothing & Materials** Which material could be used to make a waterproof hat for the teacher when she is on the playground at playtime? Which plastic would be flexible enough to make a belt? Which material could I wrap my ice egg / snowman in to stop it melting, or would it make it melt quicker? What could I wrap a chicken egg in to keep it warm when it is waiting to hatch?		

		What could you paint on the runaway gingerbread man that would allow him to swim the river and get away from the fox and not turn to mush? **<u>Key scientists</u>** William Addis (Toothbrush Inventor); Charles Mackintosh (Waterproof coat); John MacAdam (roads)		

Year 3 and Year 4 - Knowledge to be taught

Plants - linked to geography topic South America and the rainforest				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Identify and describe the functions of different parts of the flowering plant: roots, stem/trunk/leaves and flowers. Explore the part flowers play in a flowering plants life cycle, including: pollination, seed formation and seed dispersal. Explain the requirements of plants for life and growth (air, light, water, nutrients from soil, room to grow) and how they vary between plants. Know the way in which water is transported between plants.	Building on prior learning: **In Year 1/2 Children should:** Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and warmth to grow and stay healthy. Links to future learning: **In Year 5/6 Children will:** Recognise that living things have changed over time and that fossils provide information about living things. 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 can lead to evolution.	The study of plants is part of the discipline of biology - the study of living organisms. Living things move, grow, consume nutrients and reproduce; that dead things used to do these things, but no longer do; and that things that never lived have never done these things. The process of pollination, seed formation and dispersal. Know that different parts of plants have one or more functions (jobs). Evergreen trees maintain their leaves throughout the year and that deciduous trees shed their leaves in autumn (revision from Year 1 unit) Know the following parts of a plant/tree (revision from Y2 unit) roots, stem, trunk, leaves and flower. Know that flowering plants are any plant that produces a flower head or fruit. Know the function of each part of a plant (revision from Year 2). Roots keep the plant secured within the ground and also collect water and nutrients from the soil. The stem keeps the plant upright and transports water to the leaves and flower head. The leaves collect energy from the sun to make into food. Plants are producers, as they make their food. What Seeds and Plants need to grow (revision from Y2) Know that seeds need the following to germinate - Water, Oxygen, Warmth Know that plants need the following to grow and be healthy (revision from Year 2) - Water, Air, Warmth, Light, Nutrients **Pollination, Seed formation and seed dispersal** The flower is used to form seeds and attract animals for pollination. Insects such as bees travel from flower-to-flower drinking nectar for energy. Know that nectar is a sweet liquid produced by flowers, which bees and other insects collect. They collect pollen from one flower which sticks to their bodies. The grains of pollen from one plant stick to another plant and this begins the process of seed making. This is called pollination. (Know that some people are allergic to pollen and this is known as hayfever which causes the nose and eyes to run). After pollination over a number of days seeds begin to form in the flower head. When the seeds are developed, they are scattered away from the parent plant through a process called seed dispersal. Know the importance of brightly coloured petals and flower heads as these colours can be seen by insects as 'advertisements' for food. Know the four methods of seed dispersal: wind dispersal, water dispersal, animal dispersal and explosion. Study photographs or real-life examples of the following seeds - sycamore, dandelion, coconut, blackberry, cherry, burdock, poppy, laburnum. Identify a cactus, tulip and venus fly trap in photographs Know how a cactus plant is different from a tulip. Cactuses have thicker stems as they live in arid (dry) conditions whereas tulip's grow in damp conditions where access to water is much easier. Cactus plants do not rely on insects for reproduction, whereas tulips have bright leaves to attract insects. Compare	Presentation to convince a chosen group not to destroy the rainforest	Ten Seeds - Ruth Brown A Seed Is Sleepy - Diana Hutts Aston We are the Gardeners - Joanna Gaines

		with a venus fly trap, which gets most of its nutrition from insects above the ground, instead of nutrients in the soil like the cactus and tulip. Know the life cycle of a plant as follows - Germination > Growth > Pollination > Seed Formation > Seed Dispersal > Germination… **Key vocabulary** air, light, water, nutrients, soil, support, anchor, reproduction, pollination, dispersal, transportation, flower, energy, growth, seedling, carbon dioxide, oxygen, sugar, material, photosynthesis, chlorophyll **Working Scientifically** Know that water travels through the stem of the plant. Use celery and coloured water to demonstrate the early stages of transpiration (water travelling through the plant). Celery plants are mostly stems (as this is what we eat.) Set up the celery 72 hours prior to the session. Trim the root off the pieces, and place in dyed water. Red food colouring works better. Leave to allow the plant to soak up the dye. Cut open the celery and show a cross section of the plant. Draw the cross section of the celery. Know that a cross section is what you see if you cut through an object. **Key questions** How do plants reproduce? How do insects know which flowers to pollinate? Why do flowers smell? What do seeds do? Can a plant live without its leaves? Do grass/trees make flowers? What conditions are perfect for a seed to grow? How does the space between seeds affect how well they grow? Does seed size match plant size? Do plants take in water through their roots? How does water move through the plant? How do plants make their food? How does light affect plant growth? **Key scientists** Jan Ingenhousz (Photosynthesis); Joseph Banks (Botanist)		

Animals including humans

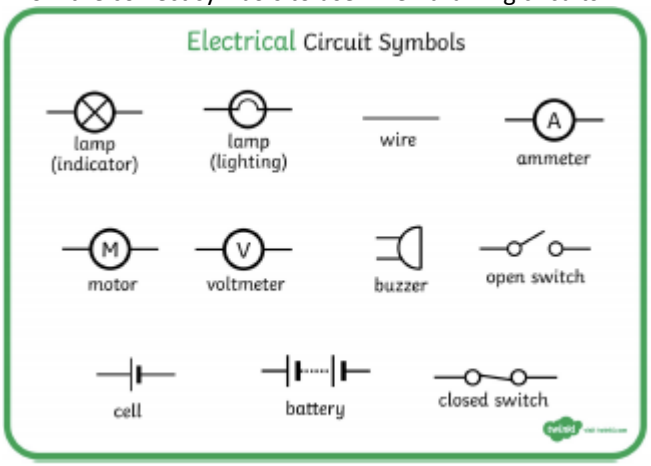
National Curriculum Links	Context	Key knowledge and vocabulary	End of topic outcome	Key texts that link to the topic
Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat. Know how nutrients, water and oxygen are transported within animals and humans. Know about the importance of a nutritious, balanced diet. Identify that humans and some other animals have skeletons and muscles for support, protection and movement. Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions. Construct and interpret a variety of food chains, identifying producers, predators and prey.	Building on prior learning: **In Year 1/2 children should:** Know that animals, including humans, have offspring which grow into adults. Know the basic stages in a life cycle for animals, including humans. Find out 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. Links to future learning: **In Year 5/6 children will:** Know the life cycle of different living things, e.g. Mammal, amphibian, insect, bird. Know the differences between different life cycles. Know the process of reproduction in plants. Know the process of reproduction in animals.	The study of animals, including humans regarding nutrition, skeletons and muscles is part of the discipline of biology - the study of living organisms. Animals, including humans, need food, water and air to survive. The arrows on a food chain show the direction that the energy travels. Know that all animals are consumers (they eat food but cannot create it themselves) and rely on a balanced diet to maintain their health. Consumers eat plants and some also eat other consumers. Know that plants are the only organisms that can make food for themselves using the sun's energy. The food that animals eat gives them nutrients for body health and maintenance. Know that nutrients are substances that help plants and animals to grow. Know that different food types provide different benefits for humans. Fruit and vegetables provide fibre, vitamins and minerals to keep body parts working properly and maintain health. Know that fibre consists of the parts of plants or seeds that your body cannot digest. Fibre is useful because it makes food pass quickly through your body. Know that vitamins are substances that you need in order to remain healthy which are found in foods. Know that vitamins are known by letters and know the following information about vitamins: Meat, fish and eggs provide protein, which is needed for healthy muscle development and maintenance. Milk, cheese and yoghurt provide calcium, necessary for good bone and tooth development. Know that fibre/vitamin rich food should be 50% of each meal, protein around 30% and calcium around 20%. Know that high fat and sugary food does not provide any nutritional value, and can be harmful to health. Know for example, that a lack of vitamin D leads to a disease called Rickets. Know that tooth decay is caused by an excess of sugar. Know that excess fat from fatty foods such as butter and cheese - and created in the body from excess calories - builds up in the body and can cause obesity. NB: some food groups are difficult to afford for some families so sensitivity is required when teaching this area. Know what a human skeleton looks like. Name key parts: skull/cranium, rib cage, spine, pelvis, collar bone, spine, vertebra, patella/knee cap, cartilage Know that mammals have skeletons and that a human is a type of mammal. Know that birds, fish, amphibians and reptiles also have skeletons, and that skeletons are designed to keep bodies the correct shape and help movement, as well as offer protection. Bird bones are hollow, making them lighter, enabling birds to fly.	Create a healthy meal and invite parents in to test it	Animalium Bone by Bone - Sara Levine Good Enough to Eat - Lizzy Rockwell Who Eats What? - Patricia Lauber See Inside Your Body - Colin King and Katie Daynes Wolves - Emily Gravett Poo - Nicola Davies What if you had animal teeth? - Scholastic

Vitamin	Food	Main Role
A	Milk, Cheese, butter	Healthy vision and skin
C	Orange, Lemon, tomatoes	Prevent infection
D	Milk, Cheese, Fish	Helps bone development

		Know that humans have muscles. Know the name and location of the following skeletal muscles in the body - abdominal, pectoral, bicep, tricep, hamstrings, calves. Know that the heart is a special type of muscle called cardiac muscle. Know that muscles are attached to the bones, and are responsible for movement. Know that when muscles contract and relax, that this is what causes movement. Know that joints occur where two bones meet and are able to move together e.g. knee, elbow Know that sitting up straight is good for your posture. **Digestive System** Know that digestion is the breaking down of food mechanically in the mouth before chemically in the stomach. Know that the mouth, tongue, teeth, oesophagus (sometimes spelled esophagus) , stomach, small and large intestine make up the human digestive system. Know where each part is within the human body. Know the function of each part - 1. Mouth: food enters the digestive system and is mixed with saliva to make it softer 2. Tongue: moves food around to be broken down. 3. Teeth: break down the food so it can travel through the esophagus. 4. Oesophagus: moves food from the mouth to the stomach. 5. Stomach: uses chemicals to break down the food into small parts before passing on to the small intestine. 6. Small intestine: digested food here is passed into the bloodstream where it can be taken to the body parts that require it. 7. Large intestine: any food leftover is unwanted, and is passed along the large intestine to the rectum. Know that, without digestion, we could not absorb nutrients from food into our bodies and use them. Know that, in humans, the small intestine is about 6 metres long and the large intestine is about 1.5 metres long. **Teeth** Know that there are different teeth for different purposes. Incisors: the front teeth help bite off chunks of food to be broken down. Canines: pointed teeth designed to rip and tear meat and fish. (Premolars and) Molars: flatter, thicker teeth at the back of the mouth designed to crush and grind food. Know that you get two sets of teeth during your lifetime - the first set is often called the milk or baby teeth. Know that a child has 20 teeth and an adult has 32. Know that adults have wisdom teeth which grow at the end of each row of teeth. Know that it is important to look after teeth by brushing at least twice a day for two minutes at a time. It is important to use toothpaste which contains flouride as this protects teeth from tooth decay. Know that you can also use mouthwash and dental floss to help look after your teeth. Image removed **Food Chains**		

		Know that plants are producers, and create their own food through a process called photosynthesis (which they will find out about in secondary school) Know that all animals are consumers, they eat food (either plants or other animals) rather than produce their own (as plants are able to) Know that prey are animals that are consumed by other animals and predators are animals that consume other animals. Understand that some animals can be both predator and prey (e.g. a baboon eats grasshoppers but is eaten by a leopard) Know the following food chains: Plant Roots (producer) -> Zebra (prey) -> Lion (predator) Green shoots (producer) -> antelope (prey) -> crocodile (predator) Grass (producer) -> grasshopper (prey) -> Baboon (predator + prey) -> Leopard (predator). Grass (producer) -> cow (prey) -> human (predator). **<u>Key vocabulary</u>** Nutrients, nutrition, carbohydrates, protein, fats, vitamins, minerals, water, fibre, skeleton, bones, joints, endoskeleton, exoskeleton, hydrostatic skeleton, vertebrates, invertebrates, muscles, contract, relax, herbivore, Carnivore, Digestive system, tongue, mouth, teeth, oesophagus, stomach, gallbladder, small intestine, pancreas, large intestine, liver, tooth, canine, incisor, molar, premolar, producer, consumer **<u>Working Scientifically</u>** Compare human skeletons with the skeletons of fish (tuna and shark), birds (owl and pigeon) and other mammals (blue whale, tiger, kangaroo) Compare the teeth of humans with carnivores and herbivores. Know that carnivores eat only meat. Their teeth have more canines as they will rip and tear food more. e.g. Lion's teeth. Know that herbivores eat only plant life. Their teeth have more molars as they grind and break down vegetation more. e.g Zebra's teeth. Know that humans are omnivores and have a more balanced diet of plants and animals. **<u>Key questions</u>** Why do we need a skeleton? What types of skeleton are there? Are all skeletons the same? Can something survive without a skeleton? What happens if we break a bone? How do we move? What different types of food are there? Why do we need a variety of different foods? Do all organisms eat the same things? **<u>Key scientists</u>**		

		Ivan Pavlov (Digestive System Mechanisms); Joseph Lister (Discovered Antiseptics); Adelle Davis (20th Century Nutritionist); Marie Curie (Radiation / X-Rays)		

Electricity - linked to the science topic: light and shadow				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Identify common appliances that run on electricity. Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. Recognise that a switch opens and closes the circuit and associate this with whether or not a lamp lights in a simple series circuit. Recognise some common conductors and insulators, and associate metals with being good conductors. Know the difference between a conductor and an insulator; giving examples of each. Safety when using electricity.	Building on prior learning: **In Early Years children:** May have some understanding that objects need electricity to work. May understand that a switch will turn something on or off. Links to future learning: **In Year 5/6 children will:** 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.	The study of electricity is part of the discipline of physics - the study of the processes that shape our world and how we use it. Know that electricity is dangerous, and know how to be safe using it. Know how electricity travels through a circuit, and the various components that create a circuit (battery, cell, open and closed switches, buzzer, lamp, motor, wire and voltmeter). Note: all batteries are cells, but not all cells are batteries. A cell is a power source, a battery is a power source that uses chemical reactions to generate power. Know the correct symbols to use when drawing circuits.  Know appliances that run on electricity in school and at home and those that do not. Identify the hazards that might be faced in the home. 1. Overloaded plug extension sockets, 2. Exposed wires, 3. Damaged sockets, 4. Wires left along the carpet for people to trip over, 5. Electrical appliances and wires near water, 6. Placing metal into electrical appliances or open sockets, Know how to prevent these hazards and know not to touch anything they feel is unsafe. Know how to create simple circuits using a battery, a bulb and a switch. Know that an open switch will not complete the circuit and that a closed switch will complete the circuit. Know that electricity must be able to flow around the circuit for components to work Know the difference between mains electricity and battery powered electricity. Know that the word current describes the flow of electricity in a circuit	Create a shadow puppet show for another class/group of children	Charging About - Jacqui Bailey and Matthew Lilly Electricity for Kids - Facts, Photos and Fun How Does A Lighthouse Work? - Roman Beliaev The Dark - Lemony Snickett Light Is All Around us - Wendy Pfeffer You Are Light - Aaron Becker

		Know that Thomas Edison invented the incandescent electric light bulb in 1879 in New Jersey, USA. (Video Know that Thomas Edison was born in 1847 and died in 1931. He lived in the state of New Jersey in The United States of America (USA). He is known as one of the greatest inventors in history. He invented the light bulb, the phonograph (which could record and play sound) and an early video camera called the Kinetograph. The films were then watched on a Kinetoscope which he also invented. Know that static electricity can be created by rubbing a balloon on material or through brushing hair. Know that conductors allow electricity to pass through them and that insulators prevent the passage of electricity. Know that metals such as copper, iron and steel make good conductors. Know that wood, plastic, paper and rubber are insulators. **Key vocabulary** Electricity, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, component **Working Scientifically** Identify materials that are conductors and insulators (children should know which materials are insulators and conductors prior to the investigation. The purpose of the demonstration is to prove what they know - not to discover for themselves). Plan an investigation to check the conductive properties of materials, with pupils predicting that metals will allow a circuit to be complete, but that other materials will not. Test the predictions and record in a table. **Key questions** What would life be like without electricity? What sorts of things use/need electricity? What electricity do I use? In which ways can we 'get' electricity? (mains/plugs/batteries/wireless) How do we make electricity? How do batteries work? How quickly can batteries run out? Does this make a difference depending on the number of components? How does the number of batteries added to the circuit affect a device? What materials can carry electricity? (conductors/insulators) **Key scientists** Thomas Edison (First Working Lightbulb); Joseph Swan (Incadesecant Light Bulb)		

Forces and magnetism linked with the science topic: Sound				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Compare how things move on different surfaces. Know how a simple pulley works and use making lifting an object simpler Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Observe how magnets attract and 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 with attract or repel each other, depending on which poles are facing.	Building on prior learning: **In EYFS children may:** Have an awareness of how to make things stop and start, using simple pushes and pulls. Know about floating and sinking. Links to future learning: **In Year 5/6 children will:** Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives. Identify the effects of air resistance, water resistance and friction, which act between moving surfaces. Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. Describe the movement of the Earth, and other planets, relative to the Sun in the solar system Describe the movement of the Moon relative to the Earth Describe the Sun, Earth and Moon as approximately spherical bodies. Describe the idea of the Earth's rotation to explain day and night.	The study of forces and magnetism is part of the discipline of physics - the study of the processes that shape our world and how we use it. Know that a force can be thought of as a push or a pull. Know that there are three types of contact force: impact forces (when two surfaces collide), frictional forces (when two surfaces are already in contact) and strain forces (when an elastic material is stretched or squashed). **Friction** Know that the texture of a surface will affect how another object moves along that surface. Know that smooth surfaces allow things to move quickly but rougher surfaces create a pull that keeps the object stuck there longer. Know that the term motion means 'moving from one place to another' Know that the force between two surfaces rubbing together is called friction. Know that a balanced force is when two forces are equal and there is no motion. Know that to accelerate means to get faster. Know that to decelerate means to slow down. Know that there are also non-contact forces that can act between objects without them touching and that magnetism is an example of a non-contact force. **Magnetism** Know that a magnet is a piece of iron or other material which attracts some metals towards it Know that a magnet has two poles - North and South Know that the word attract means one object pulling another object towards it Know that repel means one object pushing another object away from it Know that magnets have a magnetic field around them and that this is the area around a magnet where the magnetic forces work Understand that magnetic forces can work at a distance and do not need to have contact. Know that when materials are drawn to magnets this is called attraction. Know that when materials are not drawn to magnets this is called repulsion. Know that magnets can come in different forms: horseshoe, ring, button, bar. Know the benefits of magnetic materials: sorting through different types of metals, keeping fridge doors sealed, attaching items to whiteboards without damaging them. Know what a compass looks like. 1. A compass is used to find which direction you are facing. 2. They were invented over 2000 years ago 3. It was often used by sailors and explorers in the past to help find their way 4. The thin metal pin inside is suspended so it can spin freely 5. The pin always points North 6. Now people often use Global Positioning Systems (GPS) rather than a compass	Compose and perform a song	Magnet Max - Monica Lozano Hughes What Makes A Magnet? - Franklyn M. Branley Science in a flash - Forces

		(Recap the 8 points of the compass from Year 2). **Key vocabulary** Force, push, pull, friction, surface, magnet, magnetic, magnetic field, pole, north, south, attract, repel, compass **Working Scientifically** Plan an experiment comparing different materials, to see which are magnetic (they attract) and which are not (do not attract). Use wood, plastic, rubber, steel, iron, aluminum, glass and rock. Record results in a table. (Note - this experiment is not to be used to teach the magnetic and non-magnetic materials but to prove what they have been taught already) **Key questions** What are magnetic materials? How can we find out? Can I make a magnetic material non-magnetic? How far away does a magnet have to be before it attracts a magnetic material? How far away can the magnetic attraction between two magnets be experiences? Is the repulsive force the same size? How is the magnetic attraction of repulsion force affected by putting materials between the magnets? Are bigger magnets stronger? How could you use magnets to measure the number of pages in a book? **Key scientists** William Gilbert (Theories on Magnetism); Andre Marie Ampere (Founder of Electro-Magnetism)		

Light and shadow - linked to science topic: electricity				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
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 a solid object. Find patterns in the way that the sizes of shadows change.	Building on prior learning: **In Year 1/2 children should have:** Observed changes across the four seasons. Observed and described weather associated with the seasons and how day length varies. **Children may:** Have some knowledge of where light comes from. Have seen their shadows and may know they appear when it is sunny. Have some understanding of a reflection. May understand they need light to be able to see things. Links to future learning: **In Year 5/6 children will:** Recognise that light appears to travel in straight lines. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. Know how simple optical instruments work, e.g. periscope, telescope,	The study of light is part of the discipline of physics - the study of the processes that shape our world and how we use it. Know that light is a form of energy Know that energy is needed to make things happen. Every movement or change, no matter how small, requires energy. Know that energy comes in different forms and can be neither created nor destroyed, only changed from one form to another. Know that we need light to see things and that darkness is the absence of light Know that light travels in straight lines Pupils should know that we require light to see and that darkness is the absence of light. Know that light is reflected from surfaces (smooth, shiny surfaces reflect light more efficiently), and is not the producer of the light source itself. Reflection of light is when we can see the light on another surface. Other sources of light are all man made. Know that light reflects off objects and enters our eyes. This is how we see. Know that natural sources of light include - sun, stars, fire, lightning and bioluminescence in animals (such as fireflies). Know that there are man-made sources of light such as light bulbs, televisions, neon signs. Know that many light sources give off light and heat. Know that the Sun gives off light and heat Know that filaments in traditional bulbs heat up until they glow, giving off light and heat Know that fluorescent bulbs glow when electricity adds energy to a gas within the bulb Know that looking directly at the sun is dangerous, as the light is too strong. Understand that Ultraviolet (UV) light causes blindness or other long term vision problems and that eyes should be protected by covering with either a wide brimmed hat / cap and sunglasses. Know that a rainbow occurs when it is sunny and raining. Through teacher demonstration, know that light can be separated with a prism into different colours. Know that white light consists of many different colours. These are - Red, Orange, Yellow, Green, Blue, Indigo, Violet. This is known as the spectrum of colours. This can be recalled with the mnemonic 'Richard of York Gave Battle In Vain' or ROY G BIV. Know that in a rainbow drops of rain act like a prism to create a rainbow. Know that sometimes double rainbows can occur. Rainbows occur when the sun is low in the sky. Understand that shadows are formed when an opaque object blocks light from passing through. This means it blocks out the light. Transparent and translucent objects let light through, creating no clear shadows. Know the following definitions: Opaque - you cannot see through it (wood, stone, metal) Translucent- some light can pass through it but you cannot see clearly through it (some glass, some plastic, tissue paper)	Create a shadow puppet show for another class/group of children	Charging About - Jacqui Bailey and Matthew Lilly Electricity for Kids - Facts, Photos and Fun How Does A Lighthouse Work? - Roman Beliaev The Dark - Lemony Snickett Light Is All Around us - Wendy Pfeffer You Are Light - Aaron Becker

	binoculars, mirror, magnifying glass etc.	Transparent - you can see through it clearly (glass, plastic, cling film) **Key vocabulary** Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent **Working Scientifically** Take part in an experiment to see how the distance of the light source away from an opaque object changes the length of the shadow. Use a man-made light source to create the light for the shadow. Know that the further away the light source, the smaller the shadow as less light. is blocked. Know that the nearer the light source the larger the shadow as more light is blocked. Know that in a fair test one thing is altered (independent variable) and one thing that may change as a result is measured (dependent variable) while all other conditions are kept the same. Know that the conclusions of scientific enquiries can lead to further questions, where results can be clarified or extended to different contexts (e.g. effect of changing sunlight on a plant – does this work with other plants / different types of light / etc). Know that a theory is an explanation of observations that has been tested to some extent and that a hypothesis is an explanation that has not yet been tested, but that can be tested through a scientific enquiry. **Key questions** A coin is lost, what would be the best way to find it? (Turn the lights out and see it shine? Use a torch to see it reflect?) How does distance from a light source affect how bright it looks? How does being in darkness affect your sense of hearing? What colour would be the best to make a safety jacket from? How does the colour of a material affect how reflective it is? What would be the best material to make a blind for a baby's room? How does thickness of a material affect how much light can pass through it? How many pieces of tracing paper are as translucent as a single piece of white paper? How does the shape of a mirror affect how the light reflects? How can we change the darkness, size and shape of a shadow? **Key scientists** James Clerk Maxwell (Visible and Invisible Waves of Light)		

Sound - linked with the science topic: forces and magnetism				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Know how sound is made associating some of them with vibrating. Know what happens to a sound as it travels from its source to our ears. Know the correlation between the volume of a sound and the strength of the vibrations that produced it. Know how sound travels from a source to our ears. Know the correlation between pitch and the object producing a sound.	Building on prior learning: **In KS1 children:** May have some understanding that objects make different sounds. Some understanding that they use their ears to hear sounds. Know about the different senses. Links to future learning: **In KS3 children will learn about:** Frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound. Sound needs a medium to travel, the speed of sound in air, in water, in solids. Sound produced by vibrations of objects, in loud-speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. Auditory range of humans and animals.	The study of sound is part of the discipline of physics - the study of the processes that shape our world and how we use it. Sound travels from its source in all directions and we hear it when it travels to our ears. Sound travel can be blocked. Sound spreads out as it travels. Changing the shape, size and material of an object will change the sound it produces. Sound is produced when an object vibrates. Sound moves through all materials by making them vibrate. Changing the way an object vibrates changes its sound. Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds. Faster vibrations (higher frequencies) produce higher pitched sounds. Metal vibrates when it is struck, vocal chords inside our throat vibrate when we speak. This causes the air around the source of the sound to vibrate. The vibration travels through the air to our ear in a wave. Sound waves can travel through solids (such as metal, stone and wood), liquids (such as water) and gases (such as air). Know that sound travels in longitudinal waves as each particle pushes the particles next to it. Know that where there is no gas, there is no sound. Sound cannot travel through space as there is no air. This is called a vacuum. Whale Song Know that whales can communicate over many miles underwater. They communicate through a combination of clicks, whistles and pulsing sounds. This is often called Whale Song. Know that sound travels four times faster underwater than through air. Some whale song can be heard over 100 miles away from the source. Know that ambient noise created by humans such as boats, machines in the water can cause difficulties for whales trying to communicate. **Anatomy of the ear** Know the structure/ anatomy of the human ear. Know that the ear consists of the outer ear and inner ear. Know that the eardrum is a thin piece of stretched skin inside the ear which vibrates. These vibrations then travel through a sequence of small bones (the smallest bones in the human body). These bones connect to the cochlea. The cochlea looks like a snail shell (the word 'cochlea' means snail in Ancient Greek). Small hairs in the cochlea convert the vibrations into nerve impulses which send information to the brain for processing. **Pitch**	Compose and perform a song	Peace At Last - Jill Murphy Zin! Zin! Zin! A Violin - Lloyd Moss Sound - Moving Up With Science I Go Quiet - David Ouimet

		Know that pitch is how high or low a sound is. Know that the following words would be used to describe low and high pitch sounds Low Pitch squeak, squeal, High Pitch rumble, grunt, boom Know that pitch and volume are different - volume is how loud or quiet a sound is. Know that there are high pitches and low pitches. A short string gives a higher-pitched sound than a long string when they are plucked. A tight drum skin gives a higher-pitched sound than a loose drum skin. **Volume** Know that the volume of a sound is how loud or quiet a sound is. Know that the stronger the vibrations the louder the sound. The weaker the vibrations the quieter the sound. Know that as sounds travel the vibrations become weaker, because they run out of energy. This means that the volume of the sound will decrease the further away a sound is from an ear to hear it. **<u>Key vocabulary</u>** Amplitude, volume, quiet, loud, ear, pitch, high, low, particles, instruments, wave **<u>Key questions</u>** How can you change the volume of a sound? How does the size of an ear trumpet affect the volume of sound detected? How does the type of material affect how well is blocks a sound? How does thickness of material affect how well it blocks a sound? Which materials vibrate better and produce louder sounds? Can we identify any patterns? Which materials make the best string telephone components? (tin cans, paper cups, plastic cups, wire, cable, string, plastic or elastic – predict and test) How does length of the tube (when making a straw oboe) affect the pitch and volume? Can you predict the relative pitch of tuning forks from the patterns of ripples they make in the water? **<u>Key scientists</u>** Gailileo Galilei (Frequency and Pitch of Sound Waves); Alexander Graham Bell (Invented the Telephone)		

Living things and their habitats - linked to geography topic: North America				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Recognise that living things can be grouped in a variety of ways. Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. Recognise that environments can change and that this can sometimes pose danger to living things.	Building on prior learning: **In Year 1/2 children should:** Explore and compare the difference between things that are living, dead and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including micro habitats. Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name the different sources of food. Links to future learning: **In Year 5/6 (Animals, Including Humans) children will:** 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. **In Year 5/6 (Living things & their Habitats) children will:** Classify living things into broad groups according to observable characteristics and based on similarities and differences. Give reasons for classifying plants and	Environmental change affects different habitats differently. Different organisms are affected differently by environmental change. Different food chains occur in different habitats Human activity significantly affects the environment. **Grouping plants and animals** Know that animals and plants can be put into different groups; this is called classification. Know that animals can be divided into warm and cold blooded Warm Blooded - animals that can make their own body heat even when it is cold outside (humans, mammals, birds). Cold Blooded - animals that cannot make their own heat. They need the sun's warmth to heat their bodies (reptiles, amphibians, fish). Know that animals can be classified into vertebrates and invertebrates. Know that vertebrates are animals with a backbone and that invertebrates have no backbone and can be hard bodied or soft bodied. Know that vertebrates will include fish, amphibians, reptiles, birds and mammals. Invertebrates into molluscs, worms, arachnids and insects. Mammals are warm blooded, have fur or hair, usually give birth to live young and typically feed their young milk. Fish are cold blooded, breathe using gills, lay eggs and have fins. Reptiles are cold blooded, have dry scaly skin and lay their eggs on land. Birds are warm blooded, have feathers and lay eggs. Amphibians are cold blooded, breathe air but lay eggs underwater as their young use gills to breathe. Molluscs have soft, unsegmented bodies but use shells for protection. They live in damp, wet habitats. Worms are long, slender unsegmented animals that burrow underground and have no additional limbs. (Know that limb is a word used to mean arms and legs) Arachnids usually have segmented body parts and eight legs. Insects have six legs, 3 segmented body parts and generally have one or two sets of wings. Know that insects have 3 parts to their body structure head, thorax and abdomen Know the names of these common UK Woodland animals, the classification groups they are members of and identify pictures of them - Mammals: Weasel, badger, rabbit, bat, deer, fox, mole Fish: Salmon, brown trout Birds: Barn owls, blackbird, kestrel, cuckoo, great spotted woodpecker, kingfisher Reptiles: Adder, Grass Snake, Common lizard Amphibians: Common frog, Common toad, Smooth newt Molluscs: Slug, Garden Snail	Create a road trip through North America for Mrs heath, making sure to include some places where she can see living things in their habitats!	Red Alert! - Catherine Barr How Animals Build - Lonely Planet Kids Creature Features - Natasha Durley What A Waste - Jess French

	animals based on specific characteristics.	Arachnids: Harvestman, Garden Spider Worms: Common earthworm Insect: Peacock Butterfly, wood ant, wasp. bee, cricket, centipede, millipede, woodlouse, grasshopper **Classifying Flowers** Know that plants can be classified into flowering and non-flowering plants. Flowering plants such as grasses and non-flowering plants such as ferns, mosses. Discuss the key features of each plant group. Know how to identify grass and moss in the local environment. Flowering plants will have a flower head or fruit. Non flowering plants do not produce flowers or fruit. Flowering plants: dandelion, buttercup, daisy, bluebell Non-flowering plants: fern and moss **Changing Environments** Know that humans can impact positively and negatively on the environment. Know that negative impacts include cutting down trees (deforestation), building roads/houses, growing population, littering, plastic in oceans. Know that positive impacts include building nature reserves, protecting land, introducing different species e.g reintroduction of Beavers. Conservation groups such as the Royal Society for the Protection of Birds (RSPB), Tiggywinkles and Bumblebee conservation trust. **Key vocabulary** Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation **Working Scientifically** Know how to use a classification key to sort animals into groups Know how to create a classification key to sort the UK woodland animals studied above focusing on mammals, birds, amphibians and reptiles. **Key questions** What food chains and webs are there in our local habitat? How does energy move through the food chain? How does removal of one species from an environment affect others? (keystone species) How does environmental change affect different organisms? What are the most important things we could do to improve our outside area? (big hotels, pond, compost, wildflowers) How does human activity affect our environment (ferries on the Solent? Sandown Airport? KFC?) **Key scientists** Cindy Looy (Environmental Change and Extinction); Jaques Cousteau (Marine Biologist)		

Materials - Rocks and Soils - linked to grapgraphy topic: natural disasters				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soils are made from rocks and organic matter.	Building on prior learning: **In Year 1/2 children should:** 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 shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. **Children may:** Have some understanding of a variety of different rocks in the natural world. Have some understanding of what soil is. (how to identify soil etc). Have some knowledge of what a fossil is. Links to future learning: I**n Year 5/6 children will:** Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.	The study of rocks, fossils and soils is part of the discipline of physics - the study of the processes that shape our world and how we use it. It is also part of the discipline of Chemistry - the identification of the properties a substance is made from. Know the three natural types of rocks: igneous, sedimentary and metamorphic. Know that the Earth has a solid crust made up of tectonic plates with molten rock beneath. Igneous rocks are formed from the heat of lava or magma. They have large crystals. E.g. Granite and basalt Sedimentary rocks are formed from sediment (small pieces of rock and earth that settle at the bottom of a liquid i.e. water) being compressed by the weight of the liquid above and cementing over time. They are made of small grains. e.g. Limestone (chalk), coal and sandstone. Metamorphic rocks are formerly igneous or sedimentary rocks that have been changed at a chemical level due to intense heat from magma. e.g. Marble and slate. Know how to use a magnifying glass to identify features of the rock types. Identify if the rocks have grains or crystals. Know that a fossil is the hard remains of a prehistoric animal or plant that are found inside a rock Know that fossils are comprised of body fossils (animal bones) and chemical fossils (that contain carbon and prove life once existed such as imprints in the ground and leave trace fossils behind) and understand how fossils are formed. Know that fossils are only found in sedimentary rock and go through the same process of compression and cementation in the ground over long periods of time. Know that it is very rare for living things to become fossilised. Usually after most animals die their bodies just rot away and nothing is left behind. However, under certain special conditions, a fossil can form. Know the sequence of fossil formation as - 1. Animal dies and is buried by sediment 2. Soft parts of the animal decay or decompose 3. More sediment builds up around the animal and is compressed to form rock 4. Bones start to be dissolved by water underground 5. Minerals in the water then turn to rock Know that Mary Anning is famous for finding many important fossils. Know that she was born in 1799 in Lyme Regis, Dorset which is near the coast. Know that 200 million years ago Dorset was beneath the sea. Know that her fossils helped us to understand more about prehistoric animals. Know the term palaeontology means ‘a person who studies fossils’.	Create a natural disaster survival guide	The Pebble In My Pocket - Meredith Hooper A Rock Is Lively - Diana Hutts Aston Stone Girl Bone Girl - Laurence Anholt The Street Beneath My Feet - Charlotte Guillian and Yuval Zommer

		Know the term dinosaur comes from the Greek word deinos (terrible) and sauros (lizard) which, put together, makes 'terrible lizard.' Know that dinosaurs are actually reptiles not lizards. Learn about the discovery of the ichthyosaur skull and a complete plesiosaur and how this changed the view of the prehistoric (pre-written history) natural world. Know that previously people did not believe in dinosaurs as real, as there was no evidence. It also helped people realise the world was much older than previously thought. **Soil** Know that soil is a mixture of air, water, broken down rock matter and other organic material (dead or living animal tissue) Know the names of common soil types: sand, clay and silt. Know that sandy soil is dry and gritty, and does not hold onto water. Silty soil is richer in nutrients and smoother to the touch. It has smaller particles (a tiny piece of matter) and it can retain water for longer but will eventually start to lose this. Clay soil has the smallest particles and so absorbs more water. It is silky when wet but smooth and solid when dry. It contains the most nutrients as they cannot escape in water. Know that topsoil is dark in colour and high in organic matter. Know that subsoil usually appears to be lighter in colour and has a sticky texture. Know that bedrock is the solid rock in the ground which supports all the soil above it. **Key vocabulary** Rocks, igneous, metamorphic, sedimentary, anthropic, permeable, impermeable, chemical fossil, body fossil, trace fossil, Mary Anning, cast fossil, mould fossil, replacement fossil, extinct, organic matter, top-soil, subsoil, base rock **Working Scientifically** Know how to test a range of rocks for density (use comparative weight of similar sized rocks), permeability/impermeability (waterproof - pour a small amount of water and observe it is is absorbed or runs off) and strength (hard or soft - use a coin or similar object to scratch the rock and observe whether particles are easily dislodged). They will then decide which rock group the rock belongs to based on the properties. Know that scientific enquiries are limited by the accuracy of the measurements (and measuring equipment) and by the extent to which conditions can vary even, and that repeating enquiries, measurements and taking measures to keep conditions as consistent as possible can improve an enquiry. Understand that using comparative weight (holding a similar sized object in either hand and deciding which is heavier) is not a scientifically accurate measure and that this could be improved by taking rocks of the same size and weighing using digital scales. **Key questions** How are the soils different? Which do you think has the best drainage? Which is more likely to lead to flooding? How many soil types have we found?		

		Where might you find more? How might the soil be different in different countries? What rock is best for a kitchen chopping board? What might be the issues with various materials and what they have to withstand? What types of rocks are there? How do rocks change? What would grow best in your soil? Why do you think worms are important to the creation of soil? How can we use composting to make our own soil? Does it currently look like real soil? How long do you think this process will take and why? How are fossils created? Why do fossils help us find out about historical events? **Key scientists** Mary Anning (Discovery of Fossils); Inge Lehmann (Earth's Mantle)		

Materials - States of matter - linked to geography topic: rivers and the water cycle				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Compare and group materials together, according to whether they are solids, liquids or gases. Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius. Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	Building on prior learning: **In KS1 children should:** 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 of everyday materials on the basis of their simple physical properties. 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. Links to future learning: **In Year 5/6 children will:** 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. Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution.	The study of changes of materials is part of the discipline of physics - the study of the processes that shape our world and how we use it. It is also part of the discipline of Chemistry - the identification of the properties a substance is made from. Know that everything is made up of tiny particles. The properties of a substance depend on what its particles are like, how they move, and how they are arranged. Most substances can exist in three states: solid, liquid and gas. The particles of a substance are the same in each state, but their arrangement and movement change. This explains the different behaviour of a substance in its three states. In a solid state the vibrating particles form a regular pattern. This explains the fixed shape of a solid and why it can't be compressed or poured. In a liquid the particles still touch their neighbours but they move around, sliding over each other. This is why you can pour, but not compress (squash), a liquid. In the gas state, widely-spaced particles move around randomly. This explains why you can compress gases and why they flow. Know that air is a collection of gases (not a single gas) and it contains - 78% nitrogen, 21% oxygen and a small amount of other gases including carbon dioxide. Know that steam and smoke are not the same thing. Know that steam is water in gas form and that smoke comes from burning solid material. Know that when atoms are heated, the bonds between them break, allowing for solids to become liquids, and liquids to become gases. Know that when materials are cooled, bonds are created in air to form liquids, and bonds are strengthened and become rigid, creating solids from liquids. Know that water can exist in all three states. Know the information in the following diagram and be able to recreate it (use the word water vapour alongside steam) **Water Cycle (links with geography curriculum)** The study of the water cycle is part of the discipline of physics, (the hydrologic cycle) - the study of the processes that shape our world and how we use it. Know the term for each part of the water cycle: evaporation, condensation, precipitation, runoff Know that evaporation is when water changes from a liquid to vapour (gas) as a result of becoming hotter. Understand that water becomes vapour at 100 °C as it is the boiling point of water. Know that we measure temperature using degrees Celsius (°C) Know that in many countries they use a Fahrenheit scale. Compare the two scales shown in the diagram above. Know that condensation is the name of the process when water vapour changes into liquid through cooling. Know that condensation also refers to the liquid as it appears on windows on a cold day.	Publish a book of river poems and art work	Many Kinds Of Matter - Jennifer Boothroyd What is the world made of? - Kathleen Weidner Zoehfeld Why water's worth it - Water Environment Federation Once Upon A Raindrop - James Carter

	Use knowledge of solids, liquids, and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Give reasons based on evidence from comparative and fair tests, for the particular uses of everyday materials, including wood, metals 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 this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	Know that as water condenses clouds form in the sky. When it is cool enough, and a vast amount of water has formed, it falls in the form of rain and is called precipitation. Understand that water will change from a liquid to a solid when cooled to 0°C and that this is the freezing process. When ice melts, it becomes liquid which becomes part of the water cycle again. Know that about 70% of the earth's surface is water. Know that about 96% of earth's water is stored in the oceans. Know that the remaining 4% is stored in rivers, lakes, ice caps, glaciers, water vapour in the air, in the soil and even in animals. **Key vocabulary** Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection **Working Scientifically** Demonstration of different foods melting. Observe and record how long butter, chocolate and whipped cream take to melt. Measure the temperatures as the solids are heated using a thermometer (adult demonstration) **Key questions** How does the amount of water added to flour affect its state? How does the amount of detergent added to water affect how slippy it is? How does the temperature affect how viscous a liquid is (use cooking oil)? Place a peach in a glass of lemonade and watch it spin. Why does it behave that way, and can you prove it? How does the material sprinkled on ice and snow affect how quickly it melts? What chocolate would be best to smuggle? How does the type of chocolate affect its melting temperature? What is the melting temperature of ice and how does it compare with the freezing temperature of water? Is the melting temperature of wax the same as its freezing temperature? **Key scientists** Anders Celcius (Celcius Temperature Scale); Daniel Fahrenheit (Fahrenheit Temperature Scale / Invention of the Thermometer)		

Year 5 and Year 6 - Knowledge to be taught

<table>
<tr><th colspan="5">Animals including humans - reproduction (linked to PSHE unit in summer term) and the circulatory system</th></tr>
<tr><th>National Curriculum Links</th><th>Context</th><th>Key knowledge and vocabulary</th><th>End of topic outcome</th><th>Key texts that link to the topic</th></tr>
<tr>
<td>Describe the changes as humans develop to old age.
Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird.
Know the differences between different life cycles.
Know the process of reproduction in plants.
Know the process of reproduction in animals.
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</td>
<td>Building on prior learning:
In Year 3/4 children should:
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
Links to future learning:
In KS3 children will learn about:
The hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms.
The tissues and organs of the human digestive system, including adaptations</td>
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<table>
<tr><th>Reproduction and living things</th><th>The circulatory system</th></tr>
<tr>
<td>The study of animals, including humans regarding the changes a human goes through as they develop across their lifetime is part of the discipline of biology - the study of living organisms.
To know that all humans grow and develop from the time they are born until old age.
To know the terms baby, toddler, child, teenager, adolescent, adult and pensioner and the periods with which they roughly refer.
Baby: 0 - 1 year
Toddler: 1 - 3 years
Child: 3 - 12 years
Teenager/ adolescent: 12 - 18 years
Adult: 18+ years
Pensioner (old age): 65+ years
To know that puberty is when changes occur in the body during adolescence. It is the end of the development of the body.
Draw a timeline to indicate stages in the growth and development of humans.
Know that an embryo develops into a foetus in the mother’s womb and that over time the foetus develops typical human features including arms and legs.
Know that nearly all mammals are viviparous - they give birth to live young rather than laying eggs.
Know that the gestation is the development of an embryo up to the point of birth.</td>
<td>The study of animals, including humans regarding the human circulatory system is part of the discipline of biology - the study of living organisms.
Know the circulatory system is the system that circulates blood through the body.
Know that this consists of the heart, blood vessels, blood, veins, arteries, capillaries, oxygen, lungs and ribcage.
Know the following definitions -
Heart - the organ in your chest that pumps the blood around your body.
Blood vessels - the general name for the narrow tubes through which your blood flows includes the arteries, veins and capillaries
Blood - a red fluid that is pumped by the heart through the arteries and
Veins - supplies tissues with nutrients and oxygen. veins blood vessels that carry blood to the heart. arteries blood vessels that carry blood away from the heart.
Capillaries - microscopic blood vessels found in the muscles and lungs
Oxygen - a colourless gas that exists in large quantities in the air. All animals need oxygen in order to live.
Lungs - the two spongy organs inside your chest which fill with air when you breathe in. They remove carbon dioxide from blood and add oxygen.</td>
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</td>
<td>Create a working model of a circulatory system with an explanation text accompanying it</td>
<td>Pig Heart Boy - Malorie Blackman

Why is ice slippery? And other questions about materials

Materials and Properties - Peter Riley

The Solid Truth About States of Matter with Max Axiom, Super Scientist - Agnieszka Bishop

Let’s Talk About the Birds and the Bees - Molly Puther

Hair in funny places - Babette Cole</td>
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their bodies function. Describe the ways in which nutrients and water are transported within animals, including humans.	to function and how the digestive system digests food. Calculations of energy requirements. The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases The structure and functions of the gas exchange system in humans.		Know that an embryo is an unborn animal at the very early stages of development. Know that the gestation period refers to the time an embryo spends in development in the womb. Know that an embryo develops into a foetus (in humans this is after 8 weeks). **Old Age** Know that there are a number of changes as adults move into old age. Know that older people need a different diet to stay healthy, they may keep their teeth throughout old age, they need to exercise, they can learn new information. Know that some older people suffer from severe memory loss (become senile) Know that some older people have difficulty in moving around and may use a walking stick or frame. Know that the immune system becomes weaker in old age and it is more difficult for the body to fight off illness. Know that the immune system defends people against germs and microorganisms every day. In most cases, the immune system does a great job of keeping people healthy and preventing infections. But sometimes problems with the immune system can lead to illness and infection. **Life Expectancy** Know that life expectancy is the length of time that a particular species of animal is expected to live. **<u>Key vocabulary</u>** Foetus, Embryo, Womb, Gestation, Baby, Toddler, Teenager, Elderly, Growth, Development, Puberty, Hormone, Physical, Emotional, Sexual, Asexual, Pollination, Dispersal, reproduction, cell, fertilisation, pollination, male, female, pregnancy, young, mammal, metamorphosis, amphibian, insect, egg, embryo, bird, plant **<u>Key questions</u>** What do humans look like?	Ribcage - the bony structure consisting of the ribs and their connective tissue that encloses and protects the lungs, heart. Know the location of the lungs and heart Know how to label the following diagram Know that the heart is a hollow muscular organ that pumps the blood through the circulatory system by regular contractions. There are four chambers with two atria and two ventricles. Know the following sequence that explains the function of the heart - 1. Deoxygenated blood flows into the heart from the body through the veins 2. This blood is pumped out to the lungs through the pulmonary artery 3. Blood is then oxygenated in the lungs 4. Blood returns to the heart through the pulmonary vein 5. The oxygenated blood is then pumped out of the heart through the aorta 6. The blood travels around the body delivering oxygen and nutrients to the organs. Know that oxygenated means 'to be enriched with oxygen' Know that deoxygenated means 'to be depleted of oxygen' Know that blood is red when oxygenated and deep purple or blue looking through skin when not. Diet, exercise, drugs and lifestyle Know that diet can impact on lifestyle as fatty rich foods can clog arteries and veins, preventing blood from delivering what is needed. Know that exercise can improve the health of a person by removing fatty deposits from the body. Know that some exercises are called cardiovascular, and are designed to improve the fitness of the overall circulatory system by strengthening the organs and pulse rate. Know the impact of having little exercise and poor diet will have, and know that taking certain drugs such as cocaine can cause permanent damage to the circulatory system.		

			Do all animal embryos look the same? How do humans change? Why do humans change? What is a life cycle? What types of life cycles are there? Are life cycles the same? What causes puberty? What changes do we go through during puberty? Are there any patterns between vertebrate animals and their gestation periods? Do plants reproduce in the same ways as us? How do plants spread their seeds? **Key scientists** David Attenborough (Naturalist and Nature Documentary Broadcaster); James Brodie of Brodie (Reproduction of Plants by Spores)	**Key vocabulary** Oxygenated, deoxygenated, valve, exercise, respiration, circulatory system, heart, lungs, blood vessels, blood, artery, vein, pulmonary, alveoli, capillary, digestive, transport, gas exchange, villi, nutrients, water, oxygen, alcohol, drugs, tobacco **Working Scientifically** Take measurements of pulse rate before and after a range of exercises. Make predictions as to what will happen if measurements are taken at regular intervals. Repeat over time and record results in a line graph. **Key questions** Why do we need oxygen? How do we breathe? Do fish and plants breathe? Do all living things need oxygen? How does the size of a person's lungs affect lung capacity? Are there ways to increase/decrease our lung capacity? Why do we have blood? How does our heart work? How does the size of muscle affect our pulse rate? How might the circulatory system of an elephant, a hummingbird or a polar bear differ? Is the air you breathe out the same as air you breathe in? **Key scientists** Justus von Liebig (Theories of Nutrition and Metabolism); Sir Richard Doll (Linking Smoking and Health Problems); Leonardo Da Vinci (Anatomy)		

Electricity - linked with the science topic: light				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
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.	Building on prior learning: **In Year 3/4, children should:** 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. Links to future learning: **In Key Stage Three children will learn:** Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge. Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current. Differences in resistance between conducting and insulating components (quantitative). Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects. About electric fields. Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is	The study of electricity is part of the discipline of physics - the study of the processes that shape our world and how we use it. Know that electricity is created by generators which can be powered by gas, coal, oil, wind or solar. Know that the electrical energy can be converted into other types of energy such as light, heat, movement or sound. Electricity is dangerous, so be careful when using electrical appliances. **Discovery of electricity** Know that American scientist Benjamin Franklin carried out important experiments relating to electricity in the 1700s. He conducted an experiment to show that lightning was electricity. He flew a kite in a thunderstorm and tied a metal key to the string to conduct the electricity. Lightning hit the kite and Franklin received an electric shock. It was lucky he was not seriously injured but it showed that lightning was electrical. Know that it took until 1879 for people to find a way to turn electrical power into light - American inventor Thomas Edison invented the electric light bulb in this year. **Conductors and Insulators Revision from Y4** Know that some materials let electricity pass through them easily. These materials are known as electrical conductors. Know that many metals, such as copper, iron and steel, are good electrical conductors. That is why the parts of electrical objects that need to let electricity pass through are always made of metal. Know that metal is used in plugs to allow electricity to transfer from the wall socket, through the plug, and into a device such as a radio or TV. Know that some materials do not allow electricity to pass through them. These materials are known as electrical insulators. Know that plastic, wood, glass and rubber are good electrical insulators. That is why they are used to cover materials that carry electricity. Know that the plastic covering that surrounds wires is an electrical insulator. It stops you from getting an electrical shock. **Circuits** Know that electricity can flow through the components in a complete electrical circuit. Know that a circuit always needs a power source, such as a battery, with wires connected to both the positive (+) and negative (-) ends. A battery is made from a collection of cells connected together. Know that a circuit can also contain other electrical components, such as bulbs, buzzers or motors, which allow electricity to pass through. Know that electricity will only travel around a circuit that is complete. That means it has no gaps. You can use a switch in a circuit to create a gap in a circuit. This can be used to switch it on and off. Know that when a switch is open (off), there is a gap in the circuit. Electricity cannot travel around the circuit. When a switch is closed (on), it makes the circuit complete. Electricity can travel around the circuit.	Create some steady hand games for a fair	You wouldn't want to live without electricity - Ian Graham Electricity - DK Thomas Edison - Barbara Kramer (National Geographic Readers) Timeless Thomas- Gene Barretta

	part of a complete loop with a battery.	Know that a circuit always has a battery (cell) but it can also contain other electrical components, such as bulbs, buzzers and motors. Know that when drawing circuit diagrams, rather than drawing detailed components, we use simple symbols to represent the different components. Know that electricity flows through a circuit, with the volt being the push that moves electrons along the wires. Know which symbols to use when drawing a circuit (Revision from previous unit) Know that the more volts there are in a circuit, the more power there is travelling through it. Understand that the higher the volts, the brighter a lamp and the louder a buzzer. Know the following vocabulary: Circuit - An electrical circuit is a complete route which an electric current can flow around. Voltage - The voltage of an electrical current is its force measured in volts. Volt - A volt is a unit used to measure the force of an electric current. Battery - Batteries are small devices that provide the power for electrical items such as torches and children's toys. Components - The individual parts of an electrical circuit Current - The flow of electricity through a wire or circuit series circuit **Key vocabulary** Electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor **Working Scientifically** (Note - ensure children are confident with their understanding of how circuits work before designing circuits. Practical work then supports what they already know and is not used to teach knowledge) Draw and design circuits using the correct symbols then build them. Systematically identify the effect of changing one component at a time. Predict and test outcomes. **Key questions** Do all batteries push as hard as each other? What is electricity? How does the voltage of a battery affect how much current is pushed? How does the length of time I leave the current flowing affect the brightness of the bulb? How does the number of bulbs affect the brightness of a bulb? Are all types of wires as good as conducting electricity? Why are wires insulated in plastic? Does type of material make a difference? Does length of wire make a difference? Does the type of circuit affect how the components work/long the battery lasts? What renewable ways can we generate electricity? How does current affect heat? What are the dangers of a short circuit?		

		Key scientists Alessandro Volta (Electrical Battery); Nicola Tesla (Alternating Currents)		

Forces				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives. Identify the effects of air resistance, water resistance and friction, which act between moving surfaces. Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	Building on prior learning: **In Year 3/4 children should:** Compare how things move on different surfaces. Know how a simple pulley works and use making lifting an object simpler. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Observe how magnets attract and 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 with attract or repel each other, depending on which poles are facing. Links to future learning: **In KS3 children will learn about:** Opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface. Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only).	The study of forces is part of the discipline of physics - the study of the processes that shape our world and how we use it. Know that the force that pulls things to the ground on Earth (and other planets) is called gravity. Know that gravity acts as a pull force making unsupported objects fall towards Earth. Know that gravity pulls towards earth wherever you are on Earth. Know that gravity holds Earth and the other planets in their orbits around the Sun. Know that the force of gravity also exists on the Moon but it is not as strong as it is on Earth. This is because the Moon is much smaller than our planet. Know that objects appear to float in space because of the lack of gravity. Astronauts experience weightlessness in space. Know that objects with greater mass have a stronger force of gravity. As the earth is bigger than the Moon the force of gravity is stronger. Understand the difference between mass and weight. Know that mass is constant (never changes regardless of whether you are, for example, on Earth or in space). Know that weight is the force of gravity on an object and therefore changes depending on where you are. Your weight on the moon is about ⅙ of your weight on earth although your mass does not change. Know that this means astronauts move differently when walking on the moon. **Galileo Galilei** Know that Galileo Galilei (1564 - 1642) was a scientist from Italy. He discovered that when you drop two objects of similar shape and size but of different mass they will fall at the same rate. This went against the common sense idea at the time from Aristotle who believed that heavier objects fell faster. He is said to have dropped objects from the Leaning Tower of Pisa to demonstrate this. Most scientists and historians believe this was a 'thought experiment' and did not actually happen. A thought experiment is when you imagine the outcome of an experiment rather than carry it out directly. **Isaac Newton** To know that Sir Isaac Newton (1642 - 1726) was an English mathematician and scientist. He is known as one of the most influential scientists of all time. He developed Newton's law of universal gravitation. Know that he is said to have 'discovered' the concept of gravity when sitting under a tree and an apple fell to the ground near him. There is a common myth that the apple landed on his head which is generally considered to be untrue. Newton also discovered that white light was made from a range of colours (review previous work on rainbows and the colour spectrum). Know that he is buried in Westminster Abbey with other famous people Charles Dickens, Charles Darwin, Queen Elizabeth I and most recently Professor Stephen Hawking. Many Kings and Queens are also buried in Westminster Abbey.	Create some food dishes and invite parents in for food tasting	Gravity - Jason Chin Newton's Rainbow - Kathryn Lasky Simple Machines - Wheels, Levers and Pulleys - David A. Adler Why Do Moving Objects Slow Down? - Jennifer Boothroyd

	Change depending on direction of force and its size.	**<u>Friction, Air Resistance and Water Resistance</u>** Know that friction occurs when objects move through water or air. Air resistance is a type of friction between air and another material (this is sometimes called drag). Know that air resistance is the frictional force air exerts against a moving object. As an object moves, air resistance slows it down. The faster the object's motion, the greater the air resistance exerted against it. Air resistance affects all moving objects. For example, when an aeroplane flies through the air, air particles hit the aeroplane making it more difficult for it to move through the air. It's the same for an object moving through water. If you go swimming, there is friction between your skin and the water particles. This is known as water resistance. When something is in water, there are two forces acting on it. Its weight and the force of the water pushing up, the upthrust. If the weight is equal to or less than the upthrust, it floats. Things that float are 'buoyant'. Know that 'buoyancy' is the ability of an object to float in liquid or the air. Know that a buoy is a floating object that is used to show ships and boats where they can go and to warn them of danger. Know that if the weight of an object is greater than the upthrust, it sinks. Know how to use arrows on diagrams to show the forces at work in given situations e.g. submarine in water, parachute falling, car moving on the road. **<u>Levers, Pulleys and Gears</u>** Know that levers, pulleys and gears are mechanisms that allow a small force to have a greater effect. **Levers** Know that a lever is a simple mechanism used to move or lift objects. Know how to label a diagram showing a lever, load, effort and a fulcrum or pivot. Know that the nearer the fulcrum/pivot to the load then the less effort is needed. Know that a seesaw works because the fulcrum is in the middle. Consider what would happen if a seesaw had the fulcrum closer to one end. **Gears** Know that gears are toothed wheels that lock together and turn each other. Know that gears are often different sizes. A number of gears connected together are called a gear train Small gears rotate faster than large ones and need less effort to move. Know that gears on a bike enable us to go faster than we could normally move without using up a lot of energy. **Pulley** Know that a pulley is a device consisting of a wheel over which a rope or chain is pulled in order to lift heavy objects. Know that when someone raises a flag up a flagpole a pulley system is used. **<u>Key vocabulary</u>** Air resistance, Water resistance, Friction, Gravity, Newton, Gears, Pulleys, force, push, pull, opposing, streamline, brake, mechanism, lever, cog, machine, pulley **<u>Working Scientifically</u>** Teacher demonstration of dropping a cricket ball and ball of scrunched up paper of the same size. Students should predict what will happen based on Galileo's rule and then be shown that the balls fall at		

		the same rate. Understand the rule that objects of the same size and shape fall at the same speed regardless of their mass. Observe the fall of sycamore seeds. Demonstrate how a paper helicopter can act as a model of a sycamore seed. Know how air pushes the blades of the paper helicopter as it falls and causes it to rotate. Conduct an experiment to test paper helicopters and measure resistance with designs that are weighted and unweighted. Paper clips and blue tack can be used to act as comparative amounts of mass acting on the object (helicopter). Use graphs to map the results. **Key questions** What actually is a force? How can a force act on an object? How can we see forces? How can we measure forces? How does the saltiness (salinity) of water affect the water resistance? How does the length of a piece of a paper helicopter's wings affect the time it takes to fall? How does changing the shape of a piece of plasticine affect water resistance? How does adding holes to a parachute affect the time it takes to fall? How does the amount/depth of tread affect the friction between a shoe and a surface? How can we use levers to lift more? What is the most effective way to move an object? How do see-saws work? Can you create a pulley system to lift a given load? **Key scientists** Galileo Galilei (Gravity and Acceleration); Isaac Newton (Gravitation); Archimedes of Syracuse (Levers)		

Light - linked with the science topic: electricity				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Recognise that light appears to travel in straight lines. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. Know how simple optical instruments work, e.g. periscope, telescope,	Building on prior learning: **In Year 3/4 children should:** 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 a solid object. Find patterns in the way that the sizes of shadows change. Links to future learning: **In Key Stage 3, children will learn about:** The similarities and differences between light waves and waves in matter. Light waves travelling through a vacuum; speed of light. The transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface. Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye. Light transfers energy from source to absorber leading to chemical and electrical effects.	The study of light is part of the discipline of physics - the study of the processes that shape our world and how we use it. Know that light travels in straight lines from its source. Know that some light sources are natural (stars, sun, fire, lightning, bioluminescence) and some are man-made (torch, light bulb, digital screen, laser pointer). Know that light either travels in a straight line directly from the source or by reflecting off a surface into our eye. Know how to draw arrows to show light entering the eye from a light source or reflection. Know that reflection is when light bounces off a surface, changing the direction of a ray of light. Know that all objects reflect light; smooth and shiny surfaces reflect all the rays of light at the same angle, rather than scattering the rays of light like rough or dull surfaces. Know that when rays of light reflect, they obey the law of reflection: The angle of incidence always equals the angle of reflection. Demonstrate with a laser pointer and mirror. Predict where the laser will point given a change in angle. **Shadows** Know that a shadow is formed when light is blocked by an opaque object. Know that opaque means light cannot pass through, translucent means some light can pass through but it is difficult to see through and that transparent means light can pass easily through and it is easy to see through. Understand that as light travels in straight lines shadows have the same shape as the objects that cast them. Understand that if something casts a light or shadow somewhere, it causes it to appear there. Know that the further the light source from the opaque object the bigger the shadow. Know that the nearer the light source from the opaque object the smaller the shadow. Know that the shadow of an object can be moved by moving the light source. Know that a silhouette is different from a shadow because a silhouette is the solid dark shape that you see when someone or something has a bright light or pale background behind them. **The eye** Know that the amount of light entering the eye is controlled by the pupil, which is surrounded by the iris – the coloured part of the eye. Know that the pupil dilates when it is darker to let more light into the eye. The pupil constricts when it is bright to reduce the amount of light entering the eye. **Key vocabulary**	Create some steady hand games for a fair	Lights on Cotton Rock - David Litchfield Isaac Newton and Physics for Kids - Kerrie Logan Hollihan On a beam of light - Jennifer Berne

binoculars, mirror, magnifying glass etc.		Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent, absorb, emitted, scattered, refraction **<u>Working Scientifically</u>** Use sticks and mirrors to create simple periscopes that allow people to see what is happening behind or above them. Create labelled diagrams that show the path that the light took to reach the eye. **<u>Key questions</u>** How does the size of an object affect the size of a shadow? How does the distance between the light and the object change the size of a shadow? How does the distance between the object and the size of the screen affect the size of a shadow? How would a solar eclipse be different if: - The moon was a different size? - The earth span faster or slower? - The sun was larger or smaller? - If the earth and moon were the same size but further away in the solar system? How does the amount of aluminium foil scrunched affect how much light is scatters? How does the amount of polishing affect how well a piece of metal scatters light? How perfect are our mirrors? Do some scatter light more than others? What happens to light when it is shone through water? How is this affected by putting glitter, salt or talc in the water? How does a periscope/microscope/ telescope work? **<u>Key scientists</u>** Thomas Young (Wave Theory of Light); Ibn al-Haytham Alhazen (Light and our Eyes); Percy Shaw (The Cats Eye)		

Living things and their habitats - linked with Evolution and Inheritance and the geography topic: South America and the Galapagos				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Classify living things into broad groups according to observable characteristics and based on similarities and differences. Give reasons for classifying plants and animals based on specific characteristics.	Building on prior learning: **In Year 3/4 children should:** Recognise that living things can be grouped in a variety of ways. Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. Recognise that environments can change and that this can sometimes pose danger to living things. Links to future learning: **In Key Stage 3 children will learn about:** The dependence of almost all life on Earth on photosynthetic organisms using sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of o2 and co2 in the atmosphere. The adaptations of leaves for photosynthesis. The interdependence of organisms in an ecosystem How organisms affect, and are affected by, their	The study of life in various habitats is part of the discipline of biology - the study of living organisms. Know that an ecosystem is 'all the plants and animals that live in a particular area together and the relationship between them and the environment'. Understand the term biodiversity as 'the variety of animals and plant life in a particular ecosystem'. Know the names of the following species of animals which live in the Galapagos, identify pictures of these and whether they are herbivores, carnivores or omnivores - Galapagos Giant Tortoise, Galapagos Sea Lion, Hermit Crab, Flamingo, Galapagos Land Iguanas, Albatross Know the names of the following species of plants which live in the Galapagos and identify images of these -Mangrove, Candelabra Cactus, Lava Cactus, Tribulus, Palo Santo, Prickly Pear Use the terms predator and prey to describe the relationships in the food chain. Know that all food chains begin with Solar Energy. Know that a number of different species each year become extinct as a result of human impact. Know that extinct means 'no longer in existence'. e.g. dodo **Adaptations** In biology, an adaptation is defined as 'the process of change by which an organism or species becomes better suited to its environment.' Know that piranhas have adapted to live and hunt in schools, they have sharp teeth, they have interlocking jaws, they have an acute sense of hearing to detect prey. Understand the term evolution as 'the process by which different kinds of living organisms are believed to have developed from earlier forms during the history of the earth'. Know that adaptations can lead to evolution of species. **Life processes and life cycles** Revise the seven life processes (from Y2) are Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion and Nutrition. Use the acronym MRS GREN to recall these. Identify and explain the lifecycles of humans, another animal, a plant. **Key vocabulary** Variation Organisms Populations. Classification Characteristics Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. Classify, compare, bacteria, microorganism, organism, invertebrates, vertebrates, Linnaean	Create a tourist brochure for South America and the Galapagos	Living Things - Georgia Amson-Bradshaw The Incredible Ecosystems of Planet Earth - Rachel Ignotofsky Mummy Laid An Egg! - Babette Cole Life Cycles - DK

	environment, including toxic materials.	**Key questions** Why do we need to classify living things? How do we classify? What are the difficulties with classification? (penguins, whales, platypus) How do animals change over time? Why does variation exist? What happens if animals of different species breed? (hybrids) What happens to house plants outside? What are microorganisms? How can we prevent the spread of disease? Why do animals and plants compete – and what for? **Key scientists** Carl Linnaeus (Identifying, Naming and Classifying Organisms)		

Materials - changes including mixtures and separation				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
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. Give reasons based on evidence from comparative and fair tests, for the particular uses of everyday materials, including wood, metals 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	Building on prior learning: **In Year 3/ 4 children should:** Compare and group materials together, according to whether they are solids, liquids or gases. Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius. Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. **In KS1 children should:** 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 of everyday materials on the basis of their simple physical properties.	The study of properties and changes of materials, including dissolving is part of the discipline of physics - the study of the processes that shape our world and how we use it. It is also part of the discipline of Chemistry - the identification of the properties a substance is made from. Know how to compare materials based on the properties of hardness, solubility (how easily dissolvable it is), transparency, magnetism, conductivity of thermal (heat) and electricity. Know that different materials will have different purposes, based on their properties. **Hardness** Know that hardness can be measured by observing if one material can scratch another. Know that a common scale for doing this is Moh's Hardness Scale developed in 1812 Know how to conduct a scratch test. 1. If Specimen A can scratch Specimen B, then Specimen A is harder than Specimen B. 2. If Specimen A does not scratch Specimen B, then Specimen B is harder than Specimen A. 3. If the two specimens are equal in hardness then they will be relatively ineffective at scratching one another. Small scratches might be produced, or it might be difficult to determine if a scratch was produced. 4. If Specimen A can be scratched by Specimen B but it cannot be scratched by Specimen C, then the hardness of Specimen A is between the hardness of Specimen B and Specimen C. Know that Diamond scores the highest, 10, on the Moh's scale (therefore is the hardest mineral) Know that talc scores the lowest, 1, on the Moh's scale (therefore is the softest mineral) Know the following sequence of materials ordered by hardness Fingernail > glass> knife blade. **Solubility** Know that solubility is the ability of a substance to dissolve Know that dissolving is when a solid material mixes with a liquid and is no longer visible. Know that materials dissolved into liquid will create a solution: salt water, sugar water. Know that there is a limit to how much material can be dissolved in a given liquid. This is called saturation point. After this no more material will be dissolved it will be visible. Know that the hotter the solution the faster the dissolving process occurs. Know that stirring a solution can speed up the dissolving process. **Transparency** Revise vocab from previous year - transparent, translucent, opaque **Magnetism (Revision from Y3 unit)** Revise vocab from Y3 unit - north and south pole, magnetic field, attract, repel.	Create some food dishes and invite parents in for food tasting	Properties and Changes of Materials - Nichola Tyrell Materials and their properties - Suzanne Kirk

this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Use knowledge of solids, liquids, and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.	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. Links to future learning: **In KS3 children will learn about:** The concept of a pure substance mixtures, including dissolving. Diffusion in terms of the particle model. Simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography the identification of pure substances.	Know how to use a magnet to test for magnetism **Thermal Conductivity** Know that the term thermal refers to heat Know that a thermal conductor is a material that allows heat to be transferred easily Know that a thermal insulator does not conduct heat well. Know that a metal spoon heats up more quickly than a plastic one in a hot drink. Know that metal (such as aluminium and steel) conducts heat well so it is used to make saucepans so is known as a good thermal conductor. Know that wood does not conduct heat well so is often used for handles of saucepans. Know that plastic does not conduct heat well so is a thermal insulator. **Electrical Conductivity** Know that an electrical conductor allows electricity to flow through it. Know that an electrical insulator does not. Know that rubber is used for coating copper wires, as it is a poor conductor of electricity. Know that iron is used in circuits as it will conduct electricity. Know that silver, copper, gold and aluminium are the most effective electrical conductors. **Separating Solids and Liquids** Know that solids, liquids and gases can be separated using filtering, sieving and evaporation. Know the following terms Filtering: separates an insoluble solid from a liquid. Sieving: separates solids of different sizes. Evaporation: separating dissolved substances from liquids. **Reversible and Irreversible Changes** Know that reversible changes are changes that are not permanent. Dissolving, mixing and altering states are reversible changes. Water can be altered from solid to liquid, to gas and back. Butter can be melted then will solidify. Know that solidify means 'to become a solid' Know that some changes result in the making of a new material, and that this is irreversible. Bread, wood, paper that is burnt cannot be returned to its original state. Know that cooking an egg is an example of an irreversible change. Know that adding acid to bicarbonate of soda results in the bicarbonate breaking down into salt, water and gas. The resulting product cannot be transferred. **<u>Key vocabulary</u>** Hardness, Solubility, Transparency, Conductivity, Magnetic, Filter, Evaporation, Dissolving, Mixing Material, conductor, dissolve, insoluble, suspension, chemical, physical, irreversible, solution, reversable, separate, mixture, insulator, transparent, flexible, permeable, soluble, property, magnetic, hard, solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection **<u>Working Scientifically</u>** Know how to conduct a simple scratch test on familiar items.		

		Know that to get the salt or sugar back (the substance), the solution can be heated to evaporate the water from the substance. (Using a cold surface above the heat will catch the vapour and return it to liquid water). Observe the process and record findings. **<u>Key questions</u>** The key question we want children to interrogate is “have we made a new substance?” Wet clay / air-dried clay fired clay. Flour and water / dough / bread Add sugar to fizzy water; it fizzes up. Has a new substance been made? (No, the gas was dissolved in the water and adding sugar made it become un dissolved). Add baking powder to vinegar, it fizzes up. Has a new substance been made? (Yes the gas was not in the vinegar as it wasn’t fizzy, so it must have been made). Add water to instant snow. Use lemon juice as an invisible ink, heating gently makes the ink visible. Is this a new substance? When water is added to jelly and it is set, is it a new substance. When materials are heated or mixed with other materials they sometimes can be made to turn into new materials. The question is how would we know if it was a new material or the same material mixed differently? What are mixtures? What does dissolving mean? Which of the following dissolve in water: sugar, bicarbonate of soda, oil, chocolate, coffees, dark vinegar and wax? How does the amount of water used affect how much sugar will dissolve in it? Which sweets dissolve in water? How can we separate mixtures? How can we clean our dirty water? **<u>Key scientists</u>** Spencer Silver; Arthur Fry and Alan Amron (Post-It Notes); Ruth Benerito (Wrinkle-Free Cotton)		

Earth and Space - linked to history topic: space travel				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. Describe the movement of the Moon relative to the Earth. Describe the Sun, Earth and Moon as approximately spherical bodies. Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	Building on prior learning: **In Key Stage 1 and in Year 3/4 children should:** Understand changes in weather patterns and seasons. Compare how things move on different surfaces. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. Describe magnets as having two poles. Predict whether two magnets will attract or repel each other, depending on which poles are facing. Links to future learning: **In KS3 children will learn about:** 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).	The study of Earth and Space is part of the discipline of physics - the study of the processes that shape our world and how we use it. **Sun, Moon, Earth** Know that the Earth, sun and moon are approximately spherical bodies in space. Know that the sun is a star and the moon is a satellite, not planets. Know that the Earth rotates once every 24 hours. Know that this creates day and night as the Earth takes 24 hours to complete one spin on its axis. Know that the Earth orbits around the sun once every 365 and a quarter days (one year). Know that the sun is the ball of gas in the sky that the Earth goes round, and that gives us heat and light. Know that it is not safe to look directly at the Sun, even when wearing dark glasses Know that the orbit is the curved path in space that is followed by an object going round and round a planet, moon, or star Know that every 4 years the Earth year is 366 days long due to the 4 quarter days equalling an extra day. We refer to this as a leap year. Know that the extra day occurs on Feb 29th. Know that the Earth spins on an imagined axis, tilted at approximately 23° Explain how this also alters how we see the sun in different positions in the sky throughout the day, and this makes the sun look as if it is moving when it is in fact Earth. Know that the sun appears to rise in the east and sets in the west. **Moon** Know that the moon is not a light source it reflects the light from the sun. Know that the moon orbits our Earth every 28 days, and this is called the lunar cycle. Know that Earth has one moon; Jupiter has four large moons and numerous smaller ones. Know that in folklore a full moon is when werewolves are supposed to transform from humans into werewolves. Know that a full moon is regarded as a spooky symbol. Know that over 28 days the moon goes from a full moon to a sequence of shrinking crescent moons to a new moon (not visible) a sequence of increasing crescent moons to a full moon over 28 days. **Solar System**	Create a section for a TV programme about space aimed at younger children	Cosmic - Frank Cottrell Boyce A Galaxy of Her Own: Amazing Stories of Women in Space - Libby Jackson The Skies Above My Eyes - Charlotte Guillan and Yuval Zommer Curiosity: The Story of a Mars Rover - Markus Motum Dr Maggie's Grand Tour of the Solar System - Dr

	Our Sun as a star, other stars in our galaxy, other galaxies. The seasons and the Earth's tilt, day length at different times of year, in different hemispheres the light year as a unit of astronomical distance.	Know the names of the planets in our solar system in order from the sun - Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, (Pluto). Know that recently Pluto has been designated as a dwarf planet and is no longer included as a planet in the solar system. Know the mnemonic - My Very Easy Method Just Speeds Up Naming Planets Know that there is an asteroid belt between Mars and Jupiter Know the approximate relative size of planets from this diagram. Know that planets have their own moons Know that only Earth is habitable. The gas giants are: Jupiter, Saturn, Uranus and Neptune. The others are terrestrial planets: terra meaning land. **Solar System Models** Know the way that ideas about the solar system have developed, Know how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus. **Planets** Know that the planet names are derived from Roman and Greek mythology, except for the Earth which is Germanic and Old English in origin. Mercury: named after the Roman messenger god who was known for his ability to travel quickly with wings on his feet. Venus: named after the goddess of love and beauty. The planet Venus is the brightest object in our sky after the sun and the moon. Earth: the name comes from the German word 'erde' which means ground. This is the odd one out as it is not based on Roman or Greek Mythology. Mars: the Roman god of war. Red is the colour of blood and war and Mars is the Red Planet. The colour is due to a type of rust in the soil. Jupiter: the supreme god of the ancient Romans. The planet Jupiter, the largest planet in our solar system, is named after the king of the gods, Saturn: the king of the Titans who ruled the world before Jupiter. Saturn has over 30 moons in orbit Uranus: the Roman sky god. Neptune: named after the Roman god of the sea. For many years, Neptune was thought to lie on the edge of the Solar System, watching over the vast oceans of space. Pluto: Pluto was the brother of Jupiter and Neptune and the god of the underworld. The underworld was supposed to be dark and cold just like the planet Pluto. **Time Zones** Know that there are different time zones across the world because of the rotation of the earth. Know that as you move eastwards from the UK you add time on. Know that as you move westwards you subtract time. Know that to find the time in Sydney, Australia you add 9 hours on (this is true during the study of this unit but will change when the clocks change in October). Know the following terminology to discuss space: Orbit - The path of a celestial body Rotation - To turn or spin Solar System - A star and everything that travels around it Planet - A celestial body that revolves around the sun		Maggie Aderin - Pocock

		Cosmic - Related to space Galaxy - A collection of star systems Sun - The star at the centre of a solar system Nebula - A cloud of gas and dust in space Universe - Everything that exists anywhere Spherical - Shaped like a sphere ISS - The International Space Station Celestial Body - An object in space Atmosphere - The gases surrounding a planet Meteor - A small rock that hits the earth's atmosphere Satellite - Any celestial body orbiting around a planet or star Lunar - Relating to the moon Star - A glowing celestial body of burning gases **Key vocabulary** Earth, Sun, Moon, Axis, Rotation, Day, Night, Phases of the Moon, star, constellation, waxing, waning, crescent, gibbous. Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, planets, solar system, day, night, rotate, orbit, axis, spherical, geocentric, heliocentric **Key questions** How does temperature/size/day length/year length change as you get closer/further to the sun? How does distance from a light source affect how much light hits an object? Does having more moons result in more light hitting a planet? How could you test this? How does speed/size of a meteorite affect the size of the moon crater formed? If the moon became heavier as a result of meteorite collisions what would happen to its position relative to Earth? If the mass of the Earth is 80x that of the moon, why is the gravity at the Earth's surface only 6x greater than at the surface of the moon? Why do we have day/night/months/years/seasons? Why does day length change? Why does shadow size change over the course of a day? **Key scientists/significant people** Claudius Ptolemy and Nicolaus Copernicus (Heliocentric vs Geocentric Universe); Neil Armstrong (First man on the Moon); Helen Sharman (First British astronaut); Tim Peake (First British ESA astronaut)		

Evolution and Inheritance linked with Living things and their habitats and the geography topic: South America and the Galapagos				
National Curriculum Links	**Context**	**Key knowledge and vocabulary**	**End of topic outcome**	**Key texts that link to the topic**
Know about evolution and can explain what it is. Know how fossils can be used to find out about the past. 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- recognise that living. things have changed over time and fossils provide information about	Building on prior learning: **From Key Stages 1 & 2, children should:** Understand there is a variety of life on Earth. Know that some animal's differences are important to their survival. Know how animals and plants reproduce. Know how fossils form over time. Links to future learning: **In Key Stage 3 children will learn about:** Heredity as the process by which genetic information is transmitted from one generation to the next. The variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation. The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection. Changes in the environment may leave	**Classification** The study of plants is part of the discipline of biology - the study of living organisms. Know that plant taxonomy is the science that finds, identifies, describes, classifies, and names plants. **Classifying organisms** Know that there are millions of species of living things on our planet. Know that it would be difficult to describe and name each one individually. Know that while species can be very different from each other, many of them have similar features that allow us to put them into groups. Know that grouping things helps scientists identify gaps in their research and they get an idea of what to investigate next. **Modern classification system** Know that, in 1735 (in the eighteenth century), Carl Linnaeus started the modern system of organising species of organisms into certain groups and giving them scientific names. **Carl Linnaeus (1707 - 1778)** Each species is given a name using Latin words, so that the same name can be used all over the world. Know that Latin is the language which the ancient Romans used to speak and is used frequently in science for classifying animals. Know that the scientific name for modern human beings is 'homo sapiens'. Know that homo means 'man' and sapiens means 'wise'. Know that homo is the genus name and sapiens is the species name. Putting different species into different groups according to their features is called classification. Know that a genus is a class of similar things, especially a group of animals or plants that includes several closely related species. Know that a species is a class of plants or animals whose members have the same main characteristics and are able to breed with each other. Know that plants can be classified into two groups - flowering and non-flowering. Know that non-flowering plants can be divided into two groups - 1. those that reproduce with dust-like particles called spores 2. those that use seeds to reproduce	Create a tourist brochure for South America and the Galapagos	Charles Darwin's On The Origin Of Species - Sabina Radeva Moth - Isobel Thomas When We Became Humans - Michael Bright The Story of Life - Katie Scott Island: A Story Of The Galapagos - Jason Chin Exploring the classification of living

living things that inhabited the Earth millions of years ago.	individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction. The importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.	Know that mushrooms and fungi are not plants - they belong to a separate classification of living things called fungi. Revise the parts of a plant and their function - roots, stem, leaves, flower. **Life cycle of a plant** Know that sexual reproduction in plants happens in a cycle-like pattern. Flowers come from seeds, and they create seeds too. All flowering plants go through the following life cycle - 1. Germination is the process by which a plant begins to grow from a seed. Roots form under the soil. The stem, leaves and flower emerge above the soil. 2. Pollen produced by a flower is carried by insects or blown by the wind to another flower. This process is called pollination. 3. When the pollen reaches another flower, it travels to the ovary where it fertilises the ovules (egg cells) to make seeds. This process is called fertilisation. 4. These seeds are scattered by animals or the wind. This process is called dispersal. Some of the seeds will grow into new plants. Know the parts of a flower related to reproduction - stamen (male) consists of the anther and filament. The carpel (female) consists of the stigma, style, ovule and ovary. Know how to label these on a diagram of a flower. **Charles Darwin** Know that Darwin lived from 1809 - 1882 and is known for his theory of evolution. Know that Darwin studied animals and plants (a biologist) and developed the idea of natural selection to explain how different species had evolved over time. Know that he explained his theory in his most famous book 'On The Origin of Species' Know that his theory was formulated whilst studying animals on the HMS Beagle voyage between 1831 and 1836 including the Galapagos islands. Know that Darwin said 'A man who dares to waste one hour of time has not discovered the value of life' Know that the theory of evolution states that evolution happens by natural selection through the following process: **<u>The Process of Evolution</u>** 1. More organisms are born than can survive. 2. These individuals all have slight variations between them. 3. Some of these variations are helpful and improve an organism's chance of survival 4.Those that survive pass their characteristics onto their offspring. 5. Over time these helpful variations are passed on to the next generation. 6. This process takes thousands of years and can't be seen from one generation to the next. Know the term inheritance as 'the passing on of characteristics from parent to offspring'. **<u>Fossilisation - brief revision from Year 3/4</u>** Know that fossilisation is the process that forms fossils. Know that a fossil is 'the remains or impression of a prehistoric plant or animal embedded in rock and preserved in petrified form' Know that prehistoric means 'before written history'. Know that preserved means 'to keep something as it is'. Know that petrified means 'change into stone' Know that an ammonite (a-muh-nite) is a mollusc that lived in the sea over 65 million years ago. Know what an ammonite fossil looks like and identify them from images of fossils.		things - Ella Hawley

		Key vocabulary Fossils, Adaptation, Evolution, Characteristics, Reproduction, Genetics, Variation, Inherited, Environmental, Mutation, Competition, Survival of the Fittest, Evidence **Working Scientifically** Know the story of Darwin's finches and how the shape of their beaks helped Darwin to develop his theories. Know that in biology, an adaptation is defined as 'the process of change by which an organism or species becomes better suited to its environment.' Know the case study of the peppered moths as described in Moth: An Evolution Story - linked to English text.. **Peppered Moths Case Study** 1. Light-coloured moths were common 2. During the Industrial Revolution (1760 – 1840) coal burning covered the moth's habitats in black soot 3. This gave the dark coloured moths a greater chance of survival because they had better camouflage than the light moths 4. Many light-coloured moths died as they were easily spotted by their prey 5. Dark coloured moths became more common 6. As pollution has reduced over time the light-coloured moths have now become more common again. Understand the case study of Darwin's Finches as a further example of evolution and natural selection in action. **Key questions** Why are we all different? What is variation, and why is it important? How did life begin on Earth? How do we change? What is evolution? What evidence is there for evolution? How does evolution happen? What reasons do animals become extinct? Polar Bears habitat is rapidly changing, what possible futures do they face, and can we predict which is most likely? How did Darwin come up with the theory? Why was his theory not initially accepted? **Key scientists** Charles Darwin and Alfred Russel Wallace (Theory of Evolution by Natural Selection); Jane Goodall (Chimpanzees)		