

“Impossible only means you haven’t found the solution yet.”

Anonymous

Intent

At St Thomas a Becket, we intend to develop young scientists’ understanding, natural curiosity and wonder about the world around them, through scientific enquiry in the specific disciplines of biology, chemistry and physics.

The curriculum is organised so that working scientifically (disciplinary knowledge) is embedded within scientific knowledge and conceptual understanding (substantive content). Working scientifically includes developing an understanding of the nature, methods and processes of science through different types of scientific enquiry.

Science at St Thomas a Becket is cohesive, so that children develop a cumulative understanding of science within and across each key stage.

Scientific knowledge and understanding is reinforced and embedded across many different subject disciplines including Mathematics.

At St Thomas a Becket, pupils are taught the transferability of science-related knowledge, attitudes, experiences and resources that you acquire through life (science capital).

Implementation

Our children are taught how to be scientists by using and applying disciplinary knowledge.

They will think, and behave like scientists, learning through understanding of the nature, processes and methods of science. These processes include:

- Asking questions and recognising that they can be answered in different ways
- Observing over time
- Seeking patterns
- Comparative and fair testing
- Identifying, classifying and grouping
- Researching using secondary sources

Children will build and extend their substantive knowledge of science by making connections between scientific concepts, other subjects and the world in which they live.

Children will retain this knowledge due to the recurring concepts and vocabulary in a well sequenced and coherent spiral curriculum. This helps them make connections between prior learning and help them make sense of future learning.

Resources

SCIENCE CURRICULUM PROGRESSION



- Explorify [Explorify](#)
- CLEAPPS
- ASE 'Be Safe'
- [Ogden Trust](#)
- [PSTT](#)
- [How the different types of knowledge in the primary science curriculum are linked](#)
- <https://www.stem.org.uk/cpd> - online training for all science units

Substantive Conceptual Knowledge (Revisited over time)

Biology • Organisms require a supply of energy and materials • Genetic information • Evolution	Chemistry • All matter (stuff) in the universe is made of tiny building blocks. • Materials (properties and changes) • States of matter	Physics • The universe follows unbreakable rules that are all about forces, matter and energy • Forces • Energy • The earth in relation to the universe. • The earth spins on its axis
• Plants (EYFS, Y1 2 3) • Animals including humans (EYFS, Y1 2 3 4 5 6) • Living things and their habitats (EYFS, Y2 4 5 6) • Evolution and Inheritance (Y6)	• Everyday materials (EYFS, Y1) • Use of everyday materials (Y2) • States of matter (EYFS, Y4) • Properties and changes of materials (y5) • Rocks (Y3)	• Earth and Space (EYFS, Y5) • Seasonal changes (EYFS, Y1) • Light (Y3 6) • Forces and magnets (EYFS, Y3 5) • Sound (Y4) • Electricity (EYFS, Y4 6)

Disciplinary Knowledge (Revisited over time)

- Observing over time: (observing or measuring how one variable changes over time)
- Identifying and classifying: (identifying and naming materials/living things and making observations or carrying out tests to organise them into groups.)
- Looking for patterns: (making observations or carrying out surveys of variables that cannot be easily controlled and looking for relationships between two sets of data)
- Comparative and fair testing: (observing or measuring the effect of changing one variable when controlling others)
- Answering questions using secondary sources of evidence: (answering questions using data or information that they have not collected first hand)
- Using models: (Developing or evaluating a model or analogy that represents a scientific idea, phenomenon or process)

SCIENCE CURRICULUM PROGRESSION



Biology

	EY	Y1	Y2	Y3	Y4	Y5	Y6
Biology Substantive Concept	• <u>Organisms require a supply of energy and materials</u>: Living things are special collections of matter that reproduce, use energy and grow. Food provides materials and energy for life and growth. Plants and bacteria use energy from the sun to generate food. Animals break down food and are ultimately dependant on green plants for energy. In any ecosystem there is competition for the energy and materials needed to live and reproduce. • <u>Genetic information</u>: Genetic information is passed down from one generation of organisms to another. Genes determine the development and structure of organisms. • <u>Evolution</u>: The diversity of organisms is the result of evolution. Different kinds of life, animals, plants and microorganisms, have evolved into different forms best suited to the environments in which they live. Organisms not able to respond sufficiently to changes in their environment become extinct.						
Biology	1. Plants <u>Organisms require a supply of energy and materials</u> - Living things are special collections of matter that reproduce, use energy and grow. - Food provides materials and energy for life and growth. - Plants and bacteria use energy from the sun to generate food. - Animals break down food and are ultimately dependant on green plants for energy. - In any ecosystem there is competition for the energy and materials needed to live and reproduce.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6

Substantive Knowledge	Nursery: Children will be able to talk about different types of plants and how they grow and change over time (e.g big tree/ little flower, green bush, dead plant). Reception: Children will have opportunities to explore what a plant / flower is, how it grows from a seed/bulb, has a stem and leaves, flowers have petals. Children will know where to see plants.	Children will identify and name a variety of plants - common wild plants - garden plants - deciduous trees - evergreen trees Children will identify and describe the basic structure of - common flowering plants (leaves, flowers, petals, roots, stem) - common trees (leaves, trunk, branches, roots)	Children will observe and describe how - Seeds grow into mature plants - Bulbs grow into mature plants Children will find out and describe how plants need water, light and a suitable temperature for germination, growth, survival and reproduction.	Children will identify and explain the functions of different parts of flowering plants and trees: leaves, flowers, petals, fruit, roots, bulb, seed, stem/trunk/branches. Children will 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. Children will understand how water is transported in plants. Children will explore the part that flowers play in the life cycle of flowering plants, including - Pollination - Seed formation - Seed dispersal	
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Disciplinary Knowledge	Nursery Children will describe different types of plants and how they grow and change over time (e.g big tree/ little flower, green bush, dead plant).	Children will be able to identify and classify . Children will be able to describe how they were able to identify and classify. Children will be able to observe change over time and keep records of their observations .	Children will be able to ask questions and set up a simple test to answer them . Children will be able to observe change over time and use their observations to suggest answers to questions .	Children will understand how to use a simple microscope and be able to use one. Children will be able to record their observations in labelled diagrams . Children will understand what a comparative test is. Children will be able to ask relevant questions and answer them using a comparative test. Children will be able to set up a comparative test . Children will understand how to and be able to look for patterns . Children will be able to use straight forward scientific evidence to support their findings .	
	Reception Children will describe different plants using key vocabulary. Children will ask questions about what they see.	Children will understand how to and be able to compare and contrast living things. Children will be able to ask relevant questions .	Children will be able to draw diagrams with labels to record their observations over time .		
Vocabulary	Exposure to: Nursery: plant	Tier 2 investigate change Observe	Tier 2 temperature Tier 3	Tier 2 dispersal	

SCIENCE CURRICULUM PROGRESSION

	grow flower tree Reception: Tier 2 flower seed grow stem leaf petal Plant bulb	Tier 3 deciduous evergreen leaves flowers petals roots stem trunk branches	seeds bulbs nutrients	Tier 3 life cycle pollination pollen fertiliser	
Enrichment	Planting a seed Walk to the woods	Woods visit to look at different trees/plants	Planting seeds and bulbs	Look at a range of flowers and plants in classroom	

Biology	2. Animals including humans						
	<u>Organisms require a supply of energy and materials:</u> - Living things are special collections of matter that reproduce, use energy and grow. - Food provides materials and energy for life and growth. - Animals break down food and are ultimately dependant on green plants for energy.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6

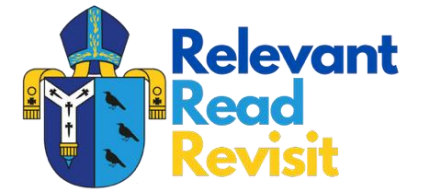
Substantive Knowledge	Nursery: Children will talk about changes the life cycle of an animal or insects (e.g. caterpillars, tadpoles) Children will begin to understand the need to respect and care for the natural environment and all living things. Children will recognise and name different animals and some features (through exploration and stories) Children will recognise and name own body parts and their function (nose, eyes, head, toes). Reception: Children will recognise and name a variety of different animals including insects Children will know the names of different body parts of humans	Children will identify and name a variety of common animals including: - Fish - Amphibians - Reptiles - Birds - Mammals Children will identify and name a variety of <i>common animals that are</i> - Carnivores - Herbivores - omnivores Children will describe and compare the structure of a variety of common animals: - Fish - Amphibians - Reptiles - birds - mammals including pets Identify, name, draw and label the basic parts of the human body (including head, neck, arms, elbows, legs, knees, face, ears,	Children will know that animals reproduce and grow through a life cycle (egg, chick, chicken; egg, caterpillar, pupa, butterfly; spawn, tadpole, frog; lamb, sheep). Children will notice that animals, including humans have offspring which grow into adults. Children will find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Children will describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	Children will identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Children will identify that humans and some other animals have skeletons and muscles for support, protection and movement.	Children will describe the simple functions of the basic parts of the digestive system in humans (mouth, tongue, teeth, oesophagus, stomach, and small and large intestine). Children will identify the different types of teeth in humans and their simple functions. Children will understand what damages teeth and how to look after them.	Children will describe the changes as humans develop to old age, including puberty.	Children will identify and name the main parts of the human circulatory system and describe the functions of: - the heart - the blood vessels - blood Children will recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Children will describe the ways in which nutrients and water are transported within animals including humans.
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	(and animals that they have had experience of). Children will understand what some body parts do and how they help us learn (i.e listening ears)	eyes, hair, mouth, teeth) and say which part of the body is associated with each sense.					
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Disciplinary Knowledge	Nursery Children will make close observations of the life cycle of an animal or insects (e.g. caterpillars, tadpoles). Children will describe things that they can see, hear, smell, taste and touch.	Children will understand how to and be able to group animals based on their observations . Children will be able to compare and contrast based on their observations . Children will be able to ask and answer questions.	Children will be able to ask questions and suggest ways to answer them . Children will be able to recognise that questions can be answered in different ways . Children will understand how to and be able to observe change over time . Children will perform simple tests to answer a question. Children will gather and record data to help in answering questions .	Children will understand how to and be able to identify and classify . Children will be able to compare and contrast different animals based on behavioural traits. Children will be able to report on their findings from an enquiry in written form . Children will be able to use straightforward scientific evidence to answer questions or to support their findings.	Children will understand what a comparative test is. Children will be able to ask questions and set up a comparative test to find out the answer. Children will be able to use their results to draw simple conclusions and make predictions for new values . Children will be able to compare and contrast , suggesting reasons for differences . Children will be able to draw diagrams with labels .	Children will show an awareness of the degree of trust in results. Children will be able to draw diagrams with labels . Children will understand the difference between a comparative and fair test . Children will understand the need to change and control variables where necessary. Children will be able to plan a scientific enquiry to answer their questions , including recognising, controlling and changing variable where necessary . They should decide what observations to make and what measurements to use and how long to make them for. Children will be able to choose the most appropriate
	Reception Children will sort and group animals according to key features (e.g these animals live in the sea, these fly). Children will ask questions about what they see.					

							equipment to take measurements and explain how to use it accurately. Children will understand the need for repeat readings.
Vocabulary	Exposure to: Nursery animal insect human names of farm animals, pets (cow, sheep, pig, chicken, hen, dog, cat) names of body parts (head, shoulders, knees and toes) Reception - Tier 2 birds fish pet animal human nose head toes land sea Tier 3	Tier 2 identify compare change Tier 3 amphibians reptiles mammals carnivore herbivore omnivore	Tier 2 healthy measure growth Tier 3 offspring survival	Tier 2 function contrast Tier 3 skeleton vertebrae invertebrate nutrition muscles exposure to: protein carbohydrate fats fruit vegetables	Tier 2 comparative Tier 3 digestive system oesophagus small intestine large intestine molar pre-molar incisor canine producer predator prey	Tier 2 Tier 3 puberty gestation adolescent embryo foetus	Tier 2 variable precision Tier 3 circulatory system blood vessels vein artery capillaries organ skeletal muscular pulse

SCIENCE CURRICULUM PROGRESSION



	habitat						
Enrichment	Farm visit	Zoo visit or Reptile show					Heart Dissection

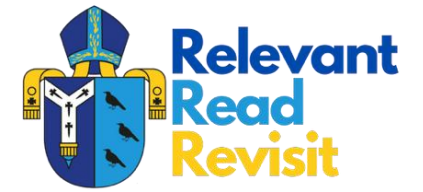
Biology	3. Living things and their habitats						
	<u>Organisms require a supply of energy and materials:</u> - Living things are special collections of matter that reproduce, use energy and grow. - Food provides materials and energy for life and growth. - Plants and bacteria use energy from the sun to generate food. - Animals break down food and are ultimately dependant on green plants for energy. - In any ecosystem there is competition for the energy and materials needed to live and reproduce. <u>Genetic information:</u> - Genetic information is passed down from one generation of organisms to another. - Genes determine the development and structure of organisms.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6

Core Substantive Knowledge	Nursery: Children will know that animals have different habitats (under the ground, in the sea, on a farm). Reception: Children will recognise and describe different animals in their local habitat and from around the world (talk about animals that live in different climates).		Children will explore and compare things that are living, dead and things that were never alive. Children will 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. Children will be able to identify a variety of plants and animals in their habitats, including micro-habitats. Children can 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.		Children can recognise that living things can be grouped in different ways. (Vertebrate animals: fish, amphibians, reptiles, birds and mammals, Invertebrate animals: snails, slugs, worms, spiders and insects, Plans: flowering plants (including grasses) and non-flowering plants (ferns and mosses). Children will be able to use classification keys to help group, identify and name a variety of living things in their local and wider environment. <i>Children will construct and interpret a variety of food chains, identifying producers, predators and prey.</i> Children will be able to recognise that environments can change both positively (nature reserves, ecologically planned parks, or garden ponds) and negatively (population, development, litter or	Children will describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Children will describe the life process of reproduction in some plants (asexual and sexual reproduction) and animals (sexual reproduction). <i>Children will construct and interpret a variety of food webs, identifying producers, predators and prey.</i>	Children will describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. Children will give reasons for classifying plants and animals based on specific characteristics.
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					deforestation) and this can sometimes pose dangers to living things.		
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Disciplinary Knowledge	Nursery Children will identify different habitats featured in stories Reception Children will describe different animals in their local habitat and from around the world (talk about animals that live in different climates). Children will learn how to observe what they see. Children will ask questions about what they see.		Children will be able to identify and classify. Children will be able to describe how they decided where to place things. Children will be able to describe conditions and explore the impact of different conditions. Children will be able to compare animals in familiar and unfamiliar habitats.		Children will understand what classification is and the function of a classification key is. Children will be able to use and make simple classification keys. Children will be able to raise relevant questions. Children will be able to classify animals and plants. Children will be able to report on their findings from an enquiry in oral form.	Children will be able to ask pertinent questions and suggest reasons for similarities and differences. Children will be able to observe change over a period of time. Children will be able to report on their findings about causal relationships from an enquiry in oral form. Children will create scientific diagrams with labels.	Children will be able to create and use classification systems and keys. Children will be able to identify scientific evidence that has been use to support or refute ideas or arguments.
Vocabulary			Tier 2 explore compare living alive		Tier 2 categories impact enquiry	Tier 2 differences insect observe environment	Tier 2 characteristics Tier 3

SCIENCE CURRICULUM PROGRESSION

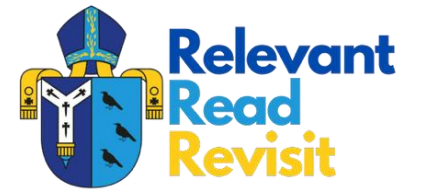


			dead needs classify Tier 3 habitat food chain prey predator producer		Tier 3 vertebrate invertebrate population amphibian reptile consumer	Tier 3 reproduction life cycle asexual reproduction sexual reproduction food web	micro-organisms
Enrichment	Trip to the farm		Local habitat walk		Local habitat walk	Growing cuttings Growing butterflies	Local habitat walk

Biology	4. Evolution and inheritance						
	<u>Genetic information:</u> - Genetic information is passed down from one generation of organisms to another. - Genes determine the development and structure of organisms. <u>Evolution:</u> - The diversity of organisms is the result of evolution. - Different kinds of life, animals, plants and microorganisms, have evolved into different forms best suited to the environments in which they live. - Organisms not able to respond sufficiently to changes in their environment become extinct.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Substantive Knowledge							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. Children will recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. Children will identify how animals and plants are adapted to suit their environment in different ways and that

							adaptation may lead to evolution. Children will know about Mary Anning, Charles Darwin and Alfred Wallace and the impact they had on the world today.
Disciplinary Knowledge							Children will be able to compare adaptations. Children will be able to analyse advantages and disadvantages. Identify scientific evidence that has been used to support or refute ideas or arguments. Children will be able to use scientific language and illustrations to communicate and justify their scientific ideas.
Vocabulary							Tier 2 inheritance variation adaptation

SCIENCE CURRICULUM PROGRESSION



							prediction Tier 3 evolution fossil
Enrichment							

Chemistry

Chemistry Substantive Concept	• <u>All matter (stuff) in the universe is made of tiny building blocks.</u> • <u>Materials (properties and changes):</u> The arrangement, movement and types of building blocks of matter, and the forces that hold them together/push them apart, explain all the properties of matter (eg: hot/cold, soft/hard, light/heavy etc...) • <u>States of matter:</u> Matter can change if the arrangement of these building blocks change (eg: chemical reactions)						
Chemistry	1. Everyday materials(Y1)/Uses of everyday materials (Y2)/ States of matter (Y4)/Properties and changes of materials(Y5) <u>All matter (stuff) in the universe is made of tiny building blocks.</u> <u>Materials (properties and changes):</u> - The arrangement, movement and types of building blocks of matter, and the forces that hold them together/push them apart, explain all the properties of matter (eg: hot/cold, soft/hard, light/heavy etc...) <u>States of matter:</u> - Matter can change if the arrangement of these building blocks change (eg: chemical reactions)						
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Substantive Knowledge	Reception: Children will recognise that everyday objects are made from different materials.	Children will distinguish between an object and the material from which it is made. Children will be able to identify and name a variety of everyday materials including wood, plastic, glass, metal, water and rock. Children will be able to describe the simple physical properties of a variety of everyday materials (hard/soft, stretchy/stiff, shiny/dull,	Children can identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. Children will understand that some materials can be used for more than one thing (metal can be used for coins, cans, cars and table legs; wood can be used for		Children will compare and group materials together, according to whether they are solids, liquids and gases (solids hold their shape, liquids form a pool not a pile, gases escape from an unsealed container). Children can observe that some materials change state when they are heated or cooled, and measure or research the temperature at which	Children will compare and group together materials based on their properties including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets. Children will know some materials will dissolve in a liquid to form a solution. Children will describe how to recover a	

		rough/smooth, bendy/not bendy, waterproof/not waterproof, absorbent/not absorbent, opaque/transparent). Children will compare and group together a variety of everyday materials on the basis of their simple physical properties.	matches, floors and telegraph poles). Children can find out how the shapes of solid objects made from some materials can be changed by: • Squashing • Bending • Twisting • Stretching		this happens in degrees Celsius. Children can identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	substance from a solution. Children will use knowledge of solids, liquids and gases to describe how mixtures can be separated, including through sieving, filtering and evaporating. Children will be able to give reasons based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Children will be able to demonstrate that dissolving, mixing and changes of state are reversible changes. Children will be able to explain that some changes results in the formation of new material and that this kind of change is not usually reversible, including changes associated with burning, rusting and	
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						the action of acid on bicarbonate of soda.	
Disciplinary Knowledge	Nursery Children will use senses to describe different materials. Children will describe what is similar and different between materials. Reception Children will describe the properties of materials (hard, soft, smooth, etc) Children will describe some changes in state (each ice melts when heated and water freezes when cooled). Children will ask questions about what they see.	Children will be able to ask questions and recognise that they can be answered in different ways. Children will be able to perform simple tests to answer their own questions. Children will be able to gather and record data to help in answering questions.	Children will be able to compare objects. Children will be able to use their observations to identify and classify objects. Children will be able to ask questions and recognise that they can be answered in different ways. Children will be able to record their observations using a table to help in answering questions.		Children will be able to classify. Children will understand what a thermometer is used for and know that temperature is measured in degrees Celsius. Children will be able to use a thermometer to measure temperature. Children will understand what a fair test is. Children will be able to set up a fair test to answer a question they have posed. Children will be able to suggest improvements to a fair test. Children will understand what a bar graph is and be able to	Children will understand the difference between a comparative and fair test. Children will be able to plan a scientific enquiry to answer their questions, including recognising, controlling and changing variable where necessary. They should decide what observations to make and what measurements to use and how long to make them for. Children will be able to make predictions based on results and set up further comparative and fair tests. Children will understand the importance of taking repeated readings.	

					record their data in a bar graph. Children will be able to record results in a table. Children will be able to draw conclusions, make predictions based on results and raise further questions.	Children will understand what a line graph is. Children will understand the difference between a line graph and a bar graph. Children will be able to take repeat readings and decide how to record their data. Children will be able to choose the most appropriate equipment to take measurements and explain how to use it accurately.	
Vocabulary	Exposure to: Tier 2 plastic fabric wood strong bendy material freeze melt light heavy	Tier 2 waterproof bendy stretchy hard soft rough smooth Tier 3 opaque transparent absorbent	Tier 2 material property		Tier 2 gas liquid solid Tier 3 condensation Evaporation precipitation water cycle thermometer substances	Tier 2 thermal insulation prediction Tier 3 dissolving solution reversible irreversible filtering sieving	
Enrichment							

Chemistry	2. Rocks						
	<u>All matter (stuff) in the universe is made of tiny building blocks.</u> <u>Materials (properties and changes):</u> - The arrangement, movement and types of building blocks of matter, and the forces that hold them together/push them apart, explain all the properties of matter (eg: hot/cold, soft/hard, light/heavy etc...						
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Substantive Knowledge				Children will be able to compare and group together different rocks based on appearance, and simple physical properties. Children will be able to describe in simple terms how fossils are formed when things that have lived are trapped within rock. Children can recognise that soils are made from rocks and organic matter. Children will know about Mary Anning the impact she had on the world today.			

Disciplinary Knowledge				Children will understand how to use a simple microscope and be able to use one. Children will be able to use keys to classify and identify similarities and differences. Children will be able to ask relevant questions to further their understanding. Children will be able to use straight forward scientific evidence to answer questions. Children will be able to record their observations in a table. Children will be able to use their data to draw simple conclusions and make predictions for new values.			
Practical activities to support learning of substantive and disciplinary knowledge				Children will observe what happens when rocks are rubbed together or what changes occur when they are in water.			

				Children will ask questions about how and why rocks might have changed over time. Children will use straightforward scientific evidence to answer questions. Children will use a hand lens or microscope to help identify and classify rocks according to whether they have grains or crystals and whether they have fossils in them. Children will explore different soils and identify similarities and differences between them. Children will gather, classify and present data to observe whether rocks are porous or not. Record findings in a table using simple scientific language. Children will use results to draw simple conclusions and make predictions for new values.			
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				Children will use keys to identify different types of rocks.			
Vocabulary				Tier 2 fossils soils grains Tier 3 matter organic sedimentary igneous metamorphic crystal microscope porous			
Enrichment							

Physics

Physics Substantive Concepts	• <u>The universe follows unbreakable rules that are all about forces, matter and energy.</u> • <u>Forces:</u> Forces are different kinds of pushes and pulls that act on all the matter in the universe. Changing the movement of an object requires a force to be acting on it. Gravity is a universal force of attraction between all objects, however large or small. • <u>Energy:</u> There are many different forms of energy eg: light, sound, electricity, heat and wind. Energy can be transferred from one object to another and can cause changes. The total amount of energy in the universe is always the same but energy can be transformed when things change or are made to happen. • <u>The Earth in relation to the universe:</u> The Earth is one of 8 planets orbiting the sun. Our solar system is a very small part of one of millions of galaxies in the universe. • <u>The Earth spins on its axis:</u> The Earth is tilted and spins on its axis leading to 'day and night', the seasons and climate.						
Physics	3. Earth and space <u>The universe follows unbreakable rules that are all about forces, matter and energy.</u> <u>Forces:</u> - Forces are different kinds of pushes and pulls that act on all the matter in the universe. - Changing the movement of an object requires a force to be acting on it. - Gravity is a universal force of attraction between all objects, however large or small. <u>Energy:</u> - The total amount of energy in the universe is always the same but energy can be transformed when things change or are made to happen. <u>The Earth in relation to the universe:</u> - The Earth is one of 8 planets orbiting the sun. - Our solar system is a very small part of one of millions of galaxies in the universe. <u>The Earth spins on its axis:</u> - The Earth is tilted and spins on its axis leading to 'day and night', the seasons and climate.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Substantive Knowledge						Children will describe the movement of the Earth and other	

						planets, relevant to the Sun in the solar system. Children will describe the movement of the moon relative to the Earth. Children will describe the Sun, Earth and Moon as approximately spherical bodies. Children will use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. Children will know about Katherine Johnson and Neil Armstrong the impact they had on the world today. <i>Children should understand that it is not safe to look directly at the sun, even when wearing dark glasses.</i>	
Disciplinary Knowledge						Children will be able to create simple models.	

						Children will identify scientific evidence that has been used to support or refute ideas or arguments. Children will be able to report and present findings from enquiries into causal relationships. Children will be able to talk about how scientific ideas have developed over time.	
Practical activities to support learning of substantive and disciplinary knowledge						Children will construct simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day. Children will find out about the way that ideas about the solar system have developed.	
Vocabulary						Tier 2 construct calibrate refute Tier 3 atmosphere eclipse	

SCIENCE CURRICULUM PROGRESSION



						axis gravity orbit universe crescent asteroid galaxy meteorite comet	
Enrichment							

Physics 4. Seasonal changes <u>The universe follows unbreakable rules that are all about forces, matter and energy.</u> <u>The Earth spins on its axis:</u> - The Earth is tilted and spins on its axis leading to 'day and night', the seasons and climate.							
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Core Substantive Knowledge	Nursery: Children will notice different types of weather and how it feels/what we wear in different weather. Reception: Children will notice and describe different weather patterns across the year.	Children will observe changes across the four seasons. - Know that there are 4 seasons and their names. Children will observe and describe weather associated with the seasons and how day length varies. <i>Children should understand that it is not safe to look directly at the sun, even when wearing dark glasses.</i>					
Disciplinary Knowledge	Nursery Children will describe different types of weather and how it feels/what we wear in different weather. Reception Children will describe different weather	Children will be able to ask simple questions and recognise that they can be answered in different ways. Children will be able to observe and talk about change. Children will be able to create tables and					

	patterns across the year. Children will learn how to observe what they see. Children will ask questions about what they see.	charts to record their observations for a display. Children will understand how a rain gauge (ml), thermometer (degrees Celsius) and anemometer are used to measure the weather.					
Vocabulary	Exposure to: Tier 2 autumn spring summer winter rain wind cloud sun weather storm fog frozen Ice, names of clothing hot/cold	Tier 2 observe varies describe Tier 3 rain gauge anemometer thermometer					
Enrichment	Seasonal walks	Seasonal walks					

Physics	Light <u>The universe follows unbreakable rules that are all about forces, matter and energy.</u> <u>Energy:</u> - There are many different forms of energy eg: light, sound, electricity, heat and wind. - Energy can be transferred from one object to another and can cause changes. - The total amount of energy in the universe is always the same but energy can be transformed when things change or are made to happen.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Substantive Knowledge	Nursery Children will know the difference between day and night and talk about what happens at night and in the day. Reception Children will understand that the sun gives us light. Children can identify a shadow.			Children will recognise that they need light in order to see things and that dark is the absence of light. Children will notice that light is reflected from surfaces. Children will recognise that light from the sun can be dangerous and that there are ways to protect their eyes. Children will recognise that shadows are formed when the light from a light source is blocked by an opaque object. Children will understand how the size of shadows change.			Children will recognise that light appears to travel in straight lines. Children will 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. Children will 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. Children will use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Disciplinary Knowledge	Nursery + Reception Children will be able to describe what they see. Children will learn how to observe what they see. Children will ask questions about what they see.			Children will be able to look for patterns. Children will understand what a fair test is. Children will be able to ask relevant questions about patterns and set up a simple fair test to look for patterns. Children will understand what a data logger is and be able to take accurate measurements, using standard units to record the amount of light (lux). Children will be able to record their data in a table.			Children will understand the difference between a comparative and fair test. Children will understand the need to change and control variables where necessary. Children will plan a scientific enquiry to answer their questions, including recognising, controlling and changing variable where necessary. They should decide what observations to make and what measurements to use and how long to make them for. Children will be able to take repeat readings and decide how to record their data. Children will be able to choose the most appropriate equipment to take measurements and

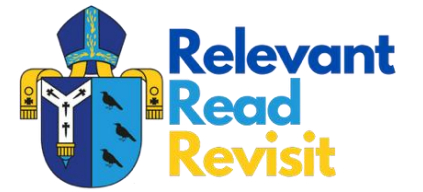
							explain how to use it accurately. Children will be able to use their results to make further predictions and set up further tests. Children will be able to create models of light. Children will understand what a data logger is and be able to use it to record the amount of light (lux).
Vocabulary	Exposure to: Tier 2 light dark shadow			Tier 2 fair test Tier 3 shadow light source opaque datalogger systematic transparent translucent			Tier 2 variables investigate prediction straight relationship Tier 3 reflection incidence refraction spectrum
Enrichment							

Physics	Forces and magnets						
	<u>The universe follows unbreakable rules that are all about forces, matter and energy.</u> <u>Forces:</u> - Forces are different kinds of pushes and pulls that act on all the matter in the universe. - Changing the movement of an object requires a force to be acting on it. - Gravity is a universal force of attraction between all objects, however large or small.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Core Substantive Knowledge				Children will compare how things move on different surfaces. Children will notice that some forces need contact between two objects (opening a door, pushing a swing) but magnetic forces can act at a distance. Children will explore the behaviour and everyday uses of different magnets (bar, ring, button and horseshoe). Children will observe how magnets attract or repel each other and attract some materials and not others. Children will compare and group together a variety of everyday		Children will explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Children will identify the effects of air resistance (parachutes, sycamore seeds), water resistance and friction (effects of a brake on a bicycle wheel) that act between moving services. Children will recognise that some mechanism, including levels, pulleys and gears, allow a smaller force to have a greater effect. Children will know about Isaac Newton and Galileo and the	

				materials on the basis of whether they are attracted to a magnet and identify some magnetic materials. Children will describe magnets as having two poles. Children will predict whether two magnets will attract or repel each other, depending on which poles are facing.		impact they had on the world today.	
Disciplinary Knowledge				Children will be able to classify. Children will understand what a comparative test is. Children will be able to ask relevant questions and set up a comparative test to answer them. Children will understand what a bar graph is and be able to record their data in a bar graph.		Children will understand the difference between a comparative and fair test. Children will understand the need to change and control variables where necessary. Children will be able to ask questions and plan a scientific enquiry to answer their questions, showing which variables will be changed and controlled where necessary. They should decide what observations to make	

				Children will record their results in a table. Children will be able to observe and look for patterns and what might affect this. Children will be able to record their results using simple scientific language and drawings. Children will be able to use their results to draw simple conclusions and make predictions for new values. Children will be able to suggest improvements and raise further questions.		and what measurements to use and how long to make them for. Children will use straightforward scientific evidence to answer questions or to support their findings. Children will understand how to use a newton meter and be able to use it to take measurements. Children will understand that weight is measured in newtons. Children will understand the difference between a line graph and a bar graph. Children will be able to take repeat readings and decide how to record their data. Children will be able to write a conclusion based on their results.	
Vocabulary				Tier 2 compare		Tier 2 explain	

SCIENCE CURRICULUM PROGRESSION



				observe predict comparative classify evidence Tier 3 pole magnet magnetism force friction attract repel		variables evidence refute Tier 3 air-resistance water-resistance mechanism pulley lever gear gravity machine Newton	
Enrichment							

Physics	Sound						
	<u>The universe follows unbreakable rules that are all about forces, matter and energy.</u> <u>Energy:</u> - There are many different forms of energy eg: light, sound, electricity, heat and wind. - Energy can be transferred from one object to another and can cause changes. - The total amount of energy in the universe is always the same but energy can be transformed when things change or are made to happen.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Substantive Knowledge					Children will identify how sounds are made, associating some of them with something vibrating (including musical instruments from around the world). Children will recognise that vibrations from sounds travel through a medium to the ear. Children will be able to find patterns between the pitch of a sound and features of the object that produced it. Children will find patterns between the volume of a sound and the strength of the vibrations that produced it.		

					Children will recognise that a sound gets fainter as the distance from the sound source increases.		
Disciplinary Knowledge					Children will be able to find patterns. Children will understand what a comparative test is. Children will be able to set up a comparative test. Children will be able to record their data in a table. Children will be able to ask relevant questions about patterns.		

					Children will understand what a data logger is and take accurate measurements using standard units (Decibels). Children will understand what a bar graph is and be able to record their data in a bar graph.		
Vocabulary					Tier 3 comparative pitch vibration volume		
Enrichment							

Physics	Electricity <u>The universe follows unbreakable rules that are all about forces, matter and energy.</u>
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	<u>Energy:</u> - There are many different forms of energy eg: light, sound, electricity, heat and wind. - Energy can be transferred from one object to another and can cause changes. - The total amount of energy in the universe is always the same but energy can be transformed when things change or are made to happen.						
	EY	Y1	Y2	Y3	Y4	Y5	Y6
Substantive Knowledge					Children will be able to identify common appliances that run on electricity. Children will be able to construct a simple series electrical circuit, identifying and naming its basic parts including: • Cells • Wires • Bulbs • Switches • Buzzers Children can 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. Children can recognise that a switch opens and closes a circuit and associate this with whether or not a lamp		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. Children will 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. Children will use recognised symbols when representing a simple circuit in a diagram.

					lights in a simple series circuit. Children can recognise some common conductors and insulators, and associate metals with being good conductors. Children will know about Thomas Edison and Lewis Howard Latimer and the impact they have had on the world today.		
Disciplinary Knowledge					Children will be able to observe patterns. Children will be able to ask relevant questions. Children will be able to use results to make predictions for new values and raise further questions. Use straightforward scientific evidence to answer questions or to support their findings. Children will be able to use results to draw simple conclusions and		Children will understand the difference between a comparative and fair test. Children will understand the need to change and control variables where necessary. Children will plan a scientific enquiry to answer their questions, including recognising, controlling and changing variable where necessary. They should decide what observations to make.

					make predictions for new values.		Children will be able to report and present findings from enquires, including conclusions and explanations of degree of trust in results. Children will understand how to systematically identify the effect of changing one component. Children will show their findings through scientific diagrams.
Practical activities to support learning of substantive and disciplinary knowledge					Children will ask questions about circuits and conductors. Children will observe patterns including that the bulbs get brighter if more cells are added, that metals tend to be conductors of electricity and that some materials can and some cannot be used to connect across a gap in a circuit. Children will use results to make predictions for new		Children will systematically identify the effect of changing one component at a time in a circuit. Children will show their findings through scientific diagrams.

					values and raise further questions. Children will ask relevant questions about circuits and their components. Use straightforward scientific evidence to answer questions or to support their findings.		
Vocabulary					Tier 2 light electricity bulb switch wire lamp metal symbol Tier 3 conductor insulator circuit motor buzzer cell component appliance prediction relevant		Tier 2 diagram function volume circuit Tier 3 voltage power current component systematically
Enrichment							

