Science

Why do we teach Science?

Within our school science is a practical, inspiring and inclusive subject. Our curriculum is designed to develop each child's science identity as someone who does and cares about science, we want all of our children to be naturally curious about the world around them. Our curriculum is progressive, building upon the learning and skill development of the previous years and actively encouraging cross-curricular links with other subjects. Throughout our school children learn a range of working scientifically skills including observation, research and questioning; this helps to prepare them to question and understand their ever-changing world.

We want our children to have a broad scientific vocabulary; this is taught and built upon as topics are revisited in different year groups and across Key Stages.

Science at St Mary's is studied through the lens of Catholic Social Teaching which inspires our children to develop the capacity to use their scientific knowledge, skills and practices to act on issues that matter to their own lives and to make the world a safer and fairer place. We are inspiring the scientists of the future.

How do we teach Science?

- **Science** is taught weekly
- Science is taught through the use of **The United Learning Curriculum**
- **Sticky knowledge** 'Lolly Sticks' are used to support acquisition of key knowledge
- **Quizzes** are used to assess key knowledge at the end of each unit
- **Floor Books** are used to capture some aspects of Science learning in KS1
- **Science** links to other areas of the curriculum where appropriate

What do we want our children to achieve through their Science lessons?
Our children will develop the enquiry skills and knowledge they need to be successful science learners and develop their identify as a scientist, questioning and enquiring their ever-changing World. For example, they will be confident in fair testing and drawing conclusions based upon precise observations. They will have a secure and broad scientific vocabulary which they use to good effect. They will be naturally curious about the world around them and apply their knowledge to new contexts. They will cover an exciting and broad curriculum and will be well prepared for Key Stage 3.

Where it all begins - laying the foundations for Science in EYFS

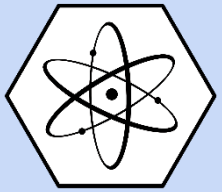
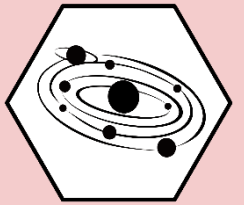
Autumn	Spring	Summer
It's Getting Cold Outside. We will explore the weather using our senses. We will identify key signs of each season and find out about hibernation.	**Spring in Our Step** We will take part in Spring/ nature walks, exploring the environment and looking for signs of spring. We will talk about what a plant needs to survive. We will talk about changes we observe such as melting and freezing and changes observed in cooking. We will learn about growing and talk about what a plant needs to survive. **Science Detectives** Seasons and weather We will talk about changes we observe e.g. melting and freezing, cooking.	**Science Detectives** We will learn to care for the natural world and living things. We will be able to sequence and talk about the life cycle of living things We will learn to describe some of the effects of changing seasons on the natural world and begin to understand what we can do to help the environment.

Vocabulary
Autumn - Spring, Summer, Autumn, Winter, sunny, rainy, windy Spring - sun, light, water, shoots, buds, melting, hot, freezing, cold, ice, rising, liquid, solid Summer – egg, pond, caterpillar, tadpole, frogspawn. Leaf, chrysalis, butterfly.

Science Curriculum – Big Ideas:

The Big Ideas are the key concepts. Pupils will develop an understanding of

They will learn how to

Living Things	Materials	Energy	The Universe
			
We learn that there are a wide variety of living things which have similar and different characteristics and need certain conditions to thrive. We understand that living things interact with their environment and are interconnected.	We learn that there are different materials that are made out of different particles; have different properties and are used for different reasons. We learn that all matter is solid, liquid or gas, but this can be changed by warming and cooling.	We learn that events happen because of a transfer of energy.	We understand that we live on Planet Earth, which is part of the Solar System.
Working Scientifically Working scientifically is embedded within the content of the Big Ideas and is taught through and clearly related to each unit of work.			

Year 1 Autumn 1: Plants Duration: ½ term Big Idea: Living Things (plants)			
	Prior Knowledge	**New Knowledge to be explicitly taught (Including 3 Keys)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Recognise differences between two seasons: spring and winter (EYFS)	To know that Coniferous plants keep their leaves all year round (e.g. pine, yew, juniper in UK) and that Deciduous plants lose their leaves in winter (e.g. oak, silver birch, horse chestnut, sycamore, ash) To know and name 3 common wild and garden plants (daffodil, daisy, buttercup, oak, sycamore, birch, primrose, rose) To know that trees are a type of plant that have a tall stem made of wood and that the basic parts of a plant are leaves, flowers, roots, stem/trunk/branch	Plant growth from germination (Y2) • Requirements for plant life (Y2, Y3) • Purpose of leaves, stem/trunk, roots and flowers (Y3) • Coniferous trees transport their seeds in cones; deciduous trees use seeds and flowers/fruit (Yr3 Spr) • Classifying plants (Y4)
Disciplinary Knowledge	Measure/observe using senses (EYFS)	**Draw and label a scientific diagram of a plant** • Draw a diagram, a simple scientific drawing that explains or informs **Classify trees as deciduous or coniferous using images of them at different times in the year** • Use a table to classify items based on properties	Use Carroll diagrams (Y1 Spr), Venn diagrams (Y1 Sum), and a pair of axes (Y2) to classify items based on properties
Vocabulary	Coniferous Deciduous trees wood plant leaves, flowers, roots, stem/trunk/branch		
Mission Advocate SJA	How can we be better stewards of God's creation?		

Year 1 Autumn 2 - SEASONAL CHANGE Duration: ½ term

Big Idea: Living Things

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	• Recognise differences between two seasons: spring and winter (EYFS) Types of weather include sunny, rainy, and windy (EYFS) • Coniferous plants keep their leaves all year round (e.g. pine, yew, juniper in UK) (Y1) • Deciduous plants lose their leaves in winter (e.g. oak, silver birch, horse chestnut, sycamore, ash) (Y1) • Geography: We live on the Earth (Y1)	***As a Scientist, I know that there are 4 seasons in the year, each made up of different months.*** Autumn (September, October, November), Winter (December, January, February), Spring (March, April, May) & Summer (June, July, August). ***As a Scientist, I know that there are natural changes from season to season.*** Living things: leaves, animals hibernating. Daylight hours: become shorter in the winter and longer in the summer. ***As a Scientist, I can talk about the weather changes from season to season.*** I know that Autumn and Winter bring colder, wetter weather, and that Spring and Summer bring warmer, drier weather.	Geography: Observing weather patterns (Y2) • Earth rotates in 24 hours, meaning that only half of the Earth is facing the Sun at any one time; this creates night and day (Y5) • The Moon orbits the Earth in 28 days and, during this time, the sun shines on different parts (Y5) • Seasons are caused by the Earth's tilt (KS3)
Disciplinary Knowledge		*Use information from images of four seasons to identify and record differences in wildlife and weather in four seasons* • Scientists look for patterns in the world around them • Gather information from text/books/images • Record numerical or descriptive observations in a table	Scientists look for patterns in data to try to identify correlations (Y5) Gather information from the internet (Y3)
Vocabulary	Season, Weather, Autumn, Winter, Spring, Summer, Planet, Sun, Moon, Daylight		
Mission Advocate SJA	How can we care for the poor as the seasons change (winter – colder weather)?		

Year 1 Spring 1: Everyday Materials Duration: ½ term Big Idea: Materials			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Materials melt when it is hot and freeze when it is cold (EYFS)	To know the difference between and object and the material that it is made from and name a variety of common materials (e.g. wood, paper, metal, glass, water, rock) To describe the simple physical properties of a variety of everyday materials (e.g. wood, paper, metal, glass, water, rock) To know that materials can be grouped in a number of ways based on their physical properties	Materials have physical properties that make them better or worse for certain uses, such as waterproof, absorbent, windproof, heatproof, malleable (Y2) • Materials such as wood, metal, plastic, brick, rock, paper and cardboard have these physical properties to different extents (Y2) • Different combinations of materials could be used to create different object, including a wall, a mop and a saucepan (Y2)
Disciplinary Knowledge	Use a table to classify items based on properties (Y1)	Sort materials into a Carroll diagram based on their characteristics • Scientists group objects or living things based on their properties • Use a Carroll diagram to classify items based on properties Find the best material for a dog bed (waterproof and soft) • It is important that we keep as much as we can the same, apart from the thing we measure and the one thing we change • Make simple statements about the results of an enquiry	The thing that we measure is called the dependent variable; the thing we change is the independent variable (Y3)
Vocabulary	material object wood glass rock plastic properties water metal soft hard dull shiny rough smooth		
Mission Advocate SJA	What does Pope Francis say about looking after our planet?		

Year 1 Summer 1: Animals	Duration: ½ term		
Big Idea: Living Things			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	• A plant is a living thing that usually grows in one place (Y1) • Coniferous plants keep their leaves all year round (e.g. pine, yew, juniper in UK) (Y1) • Deciduous plants lose their leaves in winter (e.g. oak, silver birch, horse chestnut, sycamore, ash) (Y1)	To know and name a variety of common animals including amphibians, reptiles, birds and mammals. To know and name a variety of common animals that are carnivores, herbivores and omnivores. To know simple features of animals such as fins, wings, scales, legs, feathers, claws, paws etc.	• Classification refers to a method used to place all living things into groups.(Yr4) • Organisms can be classified in a number of ways • A species is a group of one type of organism, individuals in this group can breed with each other to produce offspring that can go on to breed(Yr4) • Early classification from Aristotle placed animals into groups based on land, water and air, plants were grouped according to size, small, medium and large(Yr4) • Fish, amphibians, reptiles, birds and mammals are all vertebrates (Yr4) • Vertebrates have endoskeletons (Yr4) • Vertebrates can be grouped in a number of ways based on their characteristics, e.g. warm/cold blooded; or physical features like fur, beak, wings etc.(Yr4) • Invertebrates can be grouped based on their characteristics as snails and slugs; worms; spiders and insects (Yr4)
Disciplinary Knowledge	Scientists group objects or living things based on their properties (Y1) Gather information from text/books/images (Y1) Use a Carroll diagram to classify items based on properties (Y1)	*Research different animals and use images and text to classify the animals as herbivores, carnivores or omnivores, and based on their physical characteristics* • Scientists conduct secondary research to learn from what other scientists have already learned • Use a Venn diagram to classify items into two or three sets based on properties	Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations (Y5)
Vocabulary	animals mammals reptiles amphibians birds fish carnivores herbivores omnivores fins wings beak feathers scales fur paws		

Mission Advocate SJA	What does Pope Francis say about how to care for living things?

Year 1 Summer 2: Humans Duration: ½ term Big Idea: Living things			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Animals can be grouped into fish, amphibians, reptiles, birds and mammals (name common examples) (Y1) • Animals can be placed into different groups (carnivores, herbivores and omnivores) based the foods they eat (Y1)	To know and name the basic parts of the body. To know how to draw and label a diagram of the human body. To know that humans have 5 senses and say which parts of the body is associated with each sense.	• The main food groups are carbohydrates (starch and sugars), proteins, fats, dairy, fruit and vegetables(Y3) • Humans need a balanced diet which is made of main food groups (Y3 Spr) • Our skeleton is made up of bones that grow as we grow (Y3) • Humans and some other animals have skeletons (Y3 Spr) • Organs are parts of the body that do a particular job, the heart pumps blood around the body and the lungs are used for breathing which gets air into your body. (Y3) • The skeleton protects organs, e.g. the skull protects the brain; and the ribcage protects the lungs, heart and other important organs (Y3) • The skeleton supports the body, e.g. the spine helps the body stand (Y3 Spr) • The skeleton helps the body move, e.g. pelvis and knee joints (Y3) • The muscles and skeleton are required to help the body move. When muscles contract they pull the bone (Y3)
Disciplinary Knowledge	Draw a diagram, a simple scientific drawing that explains or informs (Y1)	Draw a scientific diagram, labelling key human body parts	
Vocabulary	head, neck, back, ears, eyes, nose, mouth, arms, shoulders, elbows, hands, fingers, legs, knees, feet, toes, face, ears, eyes, nose, mouth, arms, legs, hands, feet, toes body senses touch taste smell sensitivity sight tongue		
Mission Advocate SJA	What does Pope Francis say about caring for each other? Who is our neighbour?		

Year 2 Autumn 1: Plant Growth Duration: ½ term Big Idea: Living Things 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	The basic parts of a plant are leaves, flowers, roots, stem/trunk/branch (Y1) • Plants are classed as living things because they grow, move, reproduce, and need nutrition (food) (Y1)	To know that seeds and bulbs grow into mature plants To know that during germination roots and shoots emerge and grow. To know the conditions a plant needs to grow and stay healthy (water, light and suitable temperature)	• The four main stages of the plant's life cycle include germination, pollination, fertilisation and seed dispersal (Y3) • Pollination and fertilisation usually takes place in flowers. Dispersal is important to make sure there is enough space for seeds to germinate and plants to grow.(Y3) • Seeds can be dispersed in a variety of ways (Y3) • Plants need air (oxygen and carbon dioxide), water, light, nutrients from the soil, space, and a suitable temperature to grow (Y3) • Requirements for life vary from plant to plant and they adapt to their environment (e.g. some plants need less space, a lower temperature, fewer nutrients etc.) (Y3 • Roots absorb nutrients from the soil and help anchor the plant (Y3) • The stem/trunk supports the plant and transports water up the plant. The xylem transports water and nutrients from the roots, and the phloem transports food from the leaves to the all parts of the plant (Y3) • Leaves use sunlight, carbon dioxide from the air and water to make their own food (Y3)
Disciplinary Knowledge	• Maths: Use words to describe lengths and heights (Y1) • It is important that we keep as much as we can the same, apart from the thing we measure and the one thing we change (Y1) • Measure/observe using senses (EYFS) • Record numerical or descriptive observations in a table (Y1) • Make simple statements about the results of an enquiry (Y1)	Investigate the conditions required for germination • Make a prediction based on substantive knowledge Investigate how light affects the growth of plants • Make systematic observations of an object	• Explain findings using scientific knowledge (Y3) • The thing that we measure is called the dependent variable; the thing we change is the independent variable (Y3)

Vocabulary	plant seed bulb germination temperature water light root shoot
Mission Advocate SJA	What does Pope Francis say about caring for our common home?

Year 2 Autumn 2: The Needs of Animals Duration: ½ term

Big Idea: Living Things

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Animals can be grouped into fish, amphibians, reptiles, birds and mammals (name common examples) (Y1 Sum) • Temperature is a measure of how hot or cold something is (Y2) • Plants need water, light and a suitable temperature to grow (Y2) • Plants are classed as living things because they grow, move, reproduce, and need nutrition (food) (Y1)	1. ***As a Scientist, I know that animals and humans reproduce and that some animals change as they grow.*** This means animals and humans have offspring that grow into adults. 2. ***As a Scientist, I know that the basic needs of humans and animals are water, food, air and temperature.*** 3. ***As a Scientist, I know that humans and animals need exercise, to eat a healthy and balanced diet, and practice hygiene to stay healthy.***	• Life cycles of hedgehogs, peregrine falcons, frog and ladybird, including metamorphosis (Y5) • Living things grow, need air and nutrients, react to their surroundings, move, get rid of their waste, reproduce (Y2) • Living things are adapted to their environment. This means they may not be able to survive in other habitats (Y2) • The main food groups are carbohydrates (starch and sugars), proteins, fats, dairy, fruit and vegetables (Yr3) • Humans need a balanced diet which is made of main food groups (Y2) • Vitamins, minerals and fibre are needed and being deficient in these causes diseases (Y2) • Different animals have different nutritional needs (Y2)
Disciplinary Knowledge	A&P: Scientists conduct secondary research to learn from what other scientists have already learned (Y1) • A&P: Scientists group objects or living things based on their properties (Y1) • M&O: Gather information from text/books/images (Y1) • R&P: Use a Carroll diagram to classify items based on properties (Y1)	Gather information from images and text and sort images into a **Carroll diagram** based on the animal kingdom and extent of change	Using and drawing a classification key to classify organisms (Y4)
Vocabulary	Reproduce, Offspring, Grow, Water, Food, Air, Temperature, Balanced diet, Exercise, Hygiene		

Mission Advocate SJA	Do all humans have what they need to survive? (food/water/clean air)

Year 2 Spring 1: Uses of everyday materials		Duration: ½ term	
Big Idea: Materials 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	• An object is a 'thing' that can be seen and touched (Y1) Objects have a name and often have a purpose for example a cup is the object and its purpose is for drinking from.(Y1) • The material is what an object is made of, for example a cup can be made of paper or plastic. Common materials include wood, paper, metal, glass, water, rock (Y1) • Materials have different physical properties, some materials are hard whilst others are soft, some can be described as rough whilst others are smooth, some are dull whereas others are shiny. (Y1) • Materials can be grouped in a number of ways based on their physical properties (Y1) • The material that we choose to make an object from depends on its purpose (e.g. no chocolate kettle) (Y1)	Materials have different physical properties such as malleable, waterproof, heatproof, windproof and absorbent. These physical properties make the materials more suitable for certain uses Everyday materials such as wood, metal, plastic, brick, rock, paper and cardboard have these physical properties but to different extents The shape of some solid objects made from some materials can be changed by squashing, bending, twisting or stretching the material. Know that people have developed useful new materials, for example John Dunlop, Charles Macintosh or John McAdam.	• There are three states of matter: solid, liquid and gas (Y2) • Physical properties include being malleable, windproof, hard/soft, opaque/transparent, magnetic, electrical conductivity, thermal conductivity, and boiling and melting points (Y5) • Chemical properties are properties that scientists need specialist equipment to measure (Y5)

Disciplinary Knowledge	A&P: It is important that we keep as much as we can the same, apart from the thing we measure and the one thing we change (Y1) • M&O: Make systematic observations of an object (Y2) • R&P: Use a Carroll diagram to classify items based on properties (Y1) • A&E: Make simple statements about the results of an enquiry (Y1)	Classify materials based on the extent of its properties by using a pair of axes • R&P: Use a pair of axes to classify items based on the extent to which it displays two properties Investigate the best material to use to make an umbrella that is waterproof and windproof • A&P: There are four main stages of enquiry (A&P, M&O, R&P, A&E) • A&P: Scientists identify potential hazards in their experiments and plan ways to reduce them • A&E: Ask further questions that could be explored to extend findings	
Vocabulary	squashing bending twisting stretching wood, metal, plastic, brick, rock, paper cardboard material properties malleable, waterproof heatproof windproof absorbent.		
Mission Advocate SJA	Which materials should we be using so that we look after our planet? (plastics/recycling etc.)		

Year 2 Spring 2: Living things and their habitats Duration: ½ term

Big Idea: Living Things

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Geography: Deserts are places where there is very little precipitation (Y2) • Geography: Hot deserts have a very hot and dry climate (Y2) • Geography: Cold deserts have a very cold and dry climate (Y2) • Temperature is a measure of how hot or cold something is (Y2) • Plants need water, light and a suitable temperature to grow (Y2) • Animals, including humans, need water, food, air	To know everything in the world can be categorised as either alive, used to be alive or has never been alive. To know that different habitats provide basic needs for different types of animals and plants and that they depend on each other (food, shelter etc.) Show this using a simple food chain. To know and name a variety of plants and animals in their habitats, including mico-habitats.	The main food groups are carbohydrates (starch and sugars), proteins, fats, dairy, fruit and vegetables. Humans need a balanced diet of these (Y3). Vitamins, minerals and fibre are needed and being deficient in these causes diseases (Y3) • Different animals have different nutritional needs (Y4) • A food chain starts with a producer (usually a plant) who can produce its own food. Organisms that eat producers are called consumers (Y4) • A predator hunts prey to eat (Y4) • A food web shows the transfer of energy between different organisms (Y4) • An ecosystem is made up of all organisms living in an area and the non-living features of the environment (Y4) • Animals and plants need to digest food to transfer energy from it (Y4) • Geography: Adaptations of plants and animals in different climate zones, including tundra and hot desert (Y5)
Disciplinary Knowledge	There are four main stages of enquiry (A&P, M&O, R&P, A&E) (Y2) • Scientists look for patterns in the world around them (Y1) • Make simple statements about the results of an enquiry (Y1)	*Examine microhabitats using a magnifying glass and counting the number and type of living organisms found in an area* • Scientists conduct investigations to identify whether a pattern they think they've seen is really there • Observe using a magnifying glass safely	Scientists look for patterns in data to try to identify correlations (Y5)

Vocabulary	Habitat food chain nutrients micro habitat energy adapted
Mission Advocate SJA	How can we look after our school grounds to protect the habitats for a wide range of animals and insects?

Year 2 Summer 2: Solids, liquids and gases			Duration: ½ term
Big Idea: Materials 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter (EYFS) An object is a 'thing' that can be seen and touched (Y1) Objects have a name and often have a purpose for example a cup is the object and its purpose is for drinking from (Y1)	As a scientist I 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. As a scientist I can find out how the shapes of solid objects made from some materials can be changed squashing, bending, twisting and stretching. As a scientist I can decide is a substance is a solid, liquid or gas by looking at its properties.	The different substances in their different forms (solids, liquids and gases) are all made of particles (Y4) The particles in the different states of matter are arranged differently (Y4) Substances can change from one state of matter to another. Solids can change to become a liquid (melting), liquids can change to become a gas (evaporating), gases can change to become liquids (condensing) and liquids can change to become a solid (freezing) (Y4) Materials change state at different temperatures, i.e. they have different melting and boiling points (Y4) The water cycle relies on evaporation and condensation. Water is collected in the oceans from rivers; it evaporates and then condenses to form clouds; it then precipitates and the cycle begins again (Y4)
Disciplinary Knowledge	A&P: Scientists group objects or living things based on their properties (Y1 Spr)	Classify different substances as solids, liquids or gases	
Vocabulary	Magnification, solid, liquid, gas, substance, properties, states of matter		
Mission Advocate SJA	What is happening to the ice at the North and the South Pole as the temperatures on our planet increases? What can we do about it?		

Year 3 Autumn 1: Organisms (Animals and Humans) Duration: ½ term Big Idea: Living Things 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Animals can be placed into groups (carnivores, herbivores and omnivores) based on the foods they eat (Y1) Humans are omnivores, but some choose to eat only plants (Y1) Humans need to eat a healthy and balanced diet (Y2) Humans are made of many different body parts including head, neck, back, ears, eyes, nose, mouth, arms, shoulders, elbows, hands, fingers, legs, knees, feet, toes, ears, eyes, nose, mouth, arms, legs, hands, feet, toes(Y2) Living things grow, need air and nutrients, react to their surroundings, move, get rid of their waste, reproduce (Y2) Living things are called organisms (Y2) Animals get their food from plants and other animals, this food provides the energy animals need (Y2)	As a scientist I can 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. As a scientist I can identify that humans and some other animals have skeletons and muscles for support, protection and movement As a scientist I can identify Some organisms that have endoskeletons, some that have exoskeletons, and some that have neither.	Invertebrates can be placed into groups based on their skeletons; endoskeletons, exoskeletons, or hydrostatic skeletons (Y4) There are four main types of teeth: incisors, canines, pre-molars and molars. They each have a different purpose (Y4) Herbivores, carnivores and omnivores have these types of teeth in different proportions (Y4) Animals and plants need to digest food to transfer energy from it (Y4) The digestive system is the group of organs that help your body digest food (Y4) The heart is a muscle that pumps blood around the body through blood vessels (Y6)
Disciplinary Knowledge	R&P: Draw a diagram, a simple scientific drawing that explains or informs	Science is studied as three disciplines: biology (study of living organisms), chemistry (study of materials) and physics (study of energy) Label the main bones on a diagram of a human skeleton, give the function of each bone.	• A&P: Science is studied as three disciplines: biology (study of living organisms), chemistry (study of properties of matter and how it interacts with energy) and physics (study of energy) (Y5)
Vocabulary	**Carbohydrates proteins fats dairy vegetables fruit balanced diet vitamins minerals fibre diseases nutritional skeleton organs heart lungs protects supports muscles endoskeleton exoskeleton**		

Mission Advocate SJA	How does ‘Fratelli Tutti’ relate to this topic?

Year 3 Autumn 2: Forces & Motion Duration: ½ term

Big Idea: Energy

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Solids keep their shape unless a force is put on it. They will change their shape if you cut or squash them (Y2)	*As a Scientist, I understand that a force is a push, pull or twist.* *As a Scientist, I know that opposing forces can affect the movement of forces.* Some forces are balanced and some are unbalanced. *As a Scientist, I know the greater the mass of an object, the longer it will take to speed up / slow down.*	Contact forces require contact between two objects (e.g. friction). Non-contact forces can affect an object at a distance (e.g. magnetism) (Y3) • Friction is a contact force between two surfaces that are sliding or trying to slide over each other (Y3) • Magnetism is a non-contact force exerted by magnets when they attract or repel each other (Y3) • Gravity is a non-contact force (Y5 Sum) • Air and water resistance are contact, frictional forces (Y5)
Disciplinary Knowledge	Mathematics: Measure length and height (cm/m) (Y2) A&P: Science is studied as three disciplines: biology (study of living organisms), chemistry (study of materials) and physics (study of energy) (Y3) A&P: Dependent, independent and control variables (Y3) R&P: Design a table to collect data with the appropriate number of rows and columns and correct headings A&E: Make simple statements about the results of an enquiry	Investigate the how long it takes cars of different masses to stop after travelling down a ramp M&O: Data is repeatable if the same person repeats the investigation and gets the same results; data is reproducible if the investigation is repeated by a different person and the results are the same A&E: Suggest ways to improve practical procedures to obtain more accurate measurements A&E: Draw conclusions (e.g. 'the greater the… , the greater the…')	The difference between accurate data and precise data (KS3) Using the mean as a method of analysing a set of data (Y6)
Vocabulary	Forces, Push, Pull, Twist, Directions, Opposing forces, Balanced forces, Speed, Mass, Motion		
Mission Advocate SJA	How can we ensure a balance / equality of resources for all people? subsidiarity		

Year 3 Spring 1: Rocks Duration: ½ term			
Big Idea: Materials 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Geography: We live on the Earth (Y1) • Materials have physical properties that make them better or worse for certain uses, such as waterproof, absorbent, windproof, heatproof, malleable (Y2) • Materials such as wood, metal, plastic, brick, rock, paper and cardboard have these physical properties to different extents (Y2) • Living things are called organisms (Y2) • Everything in the world is either living (or used to be living) or not-living (Y2)	To know, in simple terms, how fossils are formed in sedimentary rocks when things that have lived are trapped within rock. To be able to describe different types of rocks on the basis of appearance and simple physical properties To know that soils are made from rocks and organic matter	• Geography: Beneath the Earth's solid crust is a hot later called the mantle (Y3) • Geography: Volcanic eruptions release magma (Y3) • Fossils provide evidence for evolution, because they show how organisms have changed over time (Y6) • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks (KS3) • The composition of the Earth (KS3) • The structure of the Earth (KS3) • Earth as a source of limited resources and the efficacy of recycling (KS3)
Disciplinary Knowledge	• Scientists group objects or living things based on their properties (Y1) • Observe using a magnifying glass safely (Y2) • Make systematic observations of an object (Y2) • Use a pair of axes to classify items based on the extent to which it displays two properties (Y2)	Make observations about rocks using senses and magnifying glass, and classify them in a Carroll diagram/pair of axes	
Vocabulary	Metamorphic sedimentary igneous fossil sediment compressed soil organic permeable/impermeable minerals Earth preserved crust magma		
Mission Advocate SJA	Why was St Peter called 'The Rock'? How can we imitate his qualities?		

Year 3 Spring 2: Magnetism and Friction — Duration: ½ term

Big Idea: Energy

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Solids keep their shape unless a force is put on it. They will change their shape if you cut or squash them (Y2)	• Contact forces require contact between two objects (e.g. friction). Non-contact forces can affect an object at a distance (e.g. magnetism) Friction is a force between two surfaces that are sliding or trying to slide over each other Friction is a contact force because it requires the two objects to be touching • The bumpier or rougher the surfaces, the more friction there will be • Magnetism is the force exerted by magnets when they attract or repel each other • Magnets can exert a force at a distance, which is called a non-contact force • Magnets have a north and a south pole. • If opposite poles are facing the magnets will be attracted to one another (the magnets pull towards each other). If the same poles are facing the magnets will repel (the magnets will push away from each other). • Magnets attract magnetic objects Some metals are magnetic but not all are. Plastics, wood, fabric, glass are all non-magnetic • The stronger the magnet, the heavier the object it can attract or the further away it can attract the object from	Contact forces require contact between two objects (e.g. friction). Non-contact forces can affect an object at a distance (e.g. magnetism) (Y3) Friction is a contact force between two surfaces that are sliding or trying to slide over each other (Y3) Magnetism is a non-contact force exerted by magnets when they attract or repel each other (Y3) Gravity is a non-contact force (Y5) Air and water resistance are contact, frictional forces (Y5)
Disciplinary Knowledge	Mathematics: Measure length and height (cm/m) (Y2) A&P: Science is studied as three disciplines: biology (study of living organisms), chemistry (study of materials) and physics (study of energy) (Y3) A&P: Dependent, independent and control variables (Y3) R&P: Design a table to collect data with the appropriate number of rows	**Investigate the how long it takes cars of different masses to stop after travelling down a ramp** M&O: Data is repeatable if the same person repeats the investigation and gets the same results; data is reproducible if the investigation is repeated by a different person and the results are the same A&E: Suggest ways to improve practical procedures to obtain more accurate measurements A&E: Draw conclusions (e.g. 'the greater the… , the greater the…')	The difference between accurate data and precise data (KS3) Using the mean as a method of analysing a set of data (Y6)

	and columns and correct headings • A&E: Make simple statements about the results of an enquiry		
Vocabulary	**Contact non-contact friction magnetism north and south pole attracted repel magnetic**		
Mission Advocate SJA	How can we prevent friction in our relationships?		

Year 3 Summer 1: Plants Duration: ½ term Big Idea: Living Things			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Coniferous plants keep their leaves all year round; deciduous plants lose their leaves in winter (e.g. oak, silver birch, horse chestnut, sycamore, ash) (Y1) Trees are a type of plant that have a tall stem made of wood (Y1) The basic parts of a plant are leaves, flowers, roots, stem/trunk/branch (Y1) Germination is the development of a plant from a seed , during germination roots and shoots emerge and grow (Y1) Germination is the development of a plant from a seed. During germination roots and shoots emerge and grow • A seed is living. A seed is the embryonic stage of the plant life cycle. A seed consists of three parts: the seed coat, the endosperm and the embryo. To germinate, a seeds needs water and a certain temperature (Y2) Many plants make fruits or vegetables; some of these grow below ground (Y2) Animals and plants depend on each other in their habitats (Y2) Living things have adapted to their environment. This means they may not be able to survive in other habitats (Y2) Soil is a mixture of particles of rock, dead plants and animals, air and water (Y2)	• Oxygen and carbon dioxide are found in the air • Plants need air (oxygen and carbon dioxide), water, light, nutrients from the soil, space, and a suitable temperature to grow • Requirements for life vary from plant to plant and they adapt to their environment Roots absorb nutrients from the soil and help anchor the plant • The stem/trunk supports the plant and transports water up the plant. The xylem transports water and nutrients from the roots, and the phloem transports food from the leaves to the all parts of the plant • Leaves use sunlight, carbon dioxide from the air and water to make their own food The four main stages of the plant's life cycle include germination, pollination, fertilisation and seed dispersal • Coniferous trees transport their seeds in cones; deciduous trees use seeds and flowers/fruit Pollination and fertilisation usually takes place in flowers. Dispersal is important to make sure there is enough space for seeds to germinate and plants to grow. • Seeds can be dispersed by wind (e.g. sycamore), by animals in their droppings (e.g. things that are eaten, like a raspberry), attached to animal fur (e.g. goosegrass), or seeds can be self propelled (pea pod)	The male part of the plant is called the stamen, made up of the anther and filament, and the anther produces pollen grains (Y5) The female parts of the plant are the ovary (which produces the female sex cells which are contained in the ovule) and the stigma which collects pollen (Y5) Sexual reproduction is two parents - usually male and female - create a new organism by mixing their gene (Y5) Asexual reproduction does not involve sex cells or fertilisation. Only one parent is needed, and the offspring are (genetically) identical to the parent and each other (Y5) Potatoes develop tubers and daffodils have bulbs, which will grow to be identical copies of the plant (Y5) Geography: Adaptations of some plants in rainforests (e.g. buttress roots) (Y4) Geography: A symbiotic relationship is a long-term relationship between one or more species, in which both species receive benefits (Y4)

Disciplinary Knowledge	Mathematics: Measure length and height (cm/m) (Y2); Interpret and construct block diagrams (Y2) A&P: Dependent, independent and control variables (Y3) A&P: Make a prediction based on substantive knowledge (Y2) A&P: Scientists identify factors in an investigation that should be controlled, and try to find ways to control them	**Investigate the impact of light on the growth of plants, drawing a block diagram to illustrate results** R&P: Design a table to collect data with the appropriate number of rows and columns and correct headings Research methods of seed dispersal of different plants M&O: Gather information from the internet	
Vocabulary	**Oxygen carbon dioxide environment roots nutrients stem trunk xylem phloem germination pollination fertilisation seed dispersal coniferous deciduous**		
Mission Advocate SJA	How does this topic reflect the principles of 'Laudato si'?		

Year 3 Summer 2: Light	Duration: ½ term		
Big Idea: Energy 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Daytime happens when we are facing the sun; nighttime happens we are facing away from the sun (Y1) The Moon is more visible at night (Y1)	To recognise that light is needed to see things and that darkness is the absence of light. To know that light is reflected from surfaces To recognise that shadows are formed when the light from a source is blocked by an opaque object and how their size can be changed. To know that light from the sun can be dangerous and that there are ways to protect their eyes. To know that Opaque, translucent and transparent materials allow no, some or all light to pass through them	In ray diagrams, straight lines with arrows show where the energy is being transferred from and to by light (Y6) On a flat surface, all light meeting a surface from one direction will be reflected in the same direction. This is known as specular reflection (Y6) On a rough surface, light will be reflected in all directions. This is known as diffuse reflection (Y6) Specular reflection between mirrors allow us to see the objects that do not directly reflect light into our eyes (e.g. periscope) (Y6) When light meets an opaque object, some of the light is reflected and some of it is absorbed (Y6) White light, which comes from most light sources we use in the classroom, contains all the colours of the visible spectrum (Y6) When a light meets a surface, some colours are absorbed and some are reflected. We see the colour(s) that are reflected (Y6) Objects appear black if they absorb all the colours in white light,and reflect none. Objects appear white if they reflect all the colours in white light, and absorb none (Y6)
Disciplinary Knowledge	Mathematics: Measure length and height (cm/m) (Y2) A&P: There are four main stages of enquiry (A&P, M&O, R&P, A&E) (Y2) A&P: Scientists look for patterns in the world around them; they conduct investigations to identify whether a pattern they think they've seen is really there (Y2) A&P: It is important that we keep as much as we can the same, apart from the thing we measure and the one thing we change (Y1)	Investigate how the height of a shadow varies as the distance between light source and object changes A&P: A dependent variable is what you measure; an independent variable is what you change; controlled variables are things that stay the same A&P: Scientists identify factors in an investigation that should be controlled, and try to find ways to control them A&P: Recognise risk and build a plan to minimise them A&P: Select most appropriate equipment to measure (the variables) A&P: Write an appropriate method	A&P: Scientists must work out if the factor is the cause of the outcome in a correlation (Y5)

Vocabulary	Reflect Opaque, translucent transparent source emit darkness reflective
Mission Advocate SJA	How can we be better reflect the light of Christ in our community?

Year 4 Autumn 1: Classification of Plants & Animals			Duration: ½ term
Big Idea: Living Things 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	• Plants are classed as living things because they grow, move, reproduce, and need nutrition (Y1) • Animals can be grouped into fish, amphibians, reptiles,birds and mammals (name common examples) (Y1) • Animals can be placed into groups (carnivores, herbivores, omnivores) based on what they eat (Y1) • Animals, including humans, reproduce. This means they have offspring that grow into adults (Y2) • Living things are called organisms (Y2) • Animals move from place to place, while plants move on the spot (Y2) • Habitats are the places that living things live. A very small habitat is called a micro-habitat (Y2) • Living things are adapted to their environment. This means they may not be able to survive in other habitats (Y2) • Geography: Land use is how land is used by humans, and could include housing, farm land, office or shop (Y2) • Some organisms have endoskeletons, some have exoskeletons, and some have neither (Y3)	To know that living things can be grouped in a variety of ways such vertebrates, invertebrates, species and flowering / non-flowering. To know how to use classification keys to help group, identify and name a variety of living things in their local and wider environment To know that habitats can change and that this can sometimes pose dangers to living things	• Invertebrates can be grouped based on their characteristics as poriferans (sponges) cnidarians, echinoderms, molluscs, annelids, platyhelminths and arthropods (spiders, insects, crustaceans and myriapods). Plants can be grouped into moss, ferns, conifers and flowering plants. (Y6 Spr) • Fungi are different to plants and animals. They cannot make their own food (like animals) but do not move (like plants) (Y6 Spr) • Micro-organisms are organisms that are so small that we cannot see them with our eyes alone. (Y6) • Some fungi are microorganisms (e.g. yeast), but not all are (e.g. mushrooms). (Y6) • Bacteria are microorganisms, some bacteria can cause disease in other organisms (Y6) • Variation occurs within

Disciplinary Knowledge	Observe using a magnifying glass safely	Use a classification key to sort organisms • Use a classification key to identify an object Draw a classification key to identify four animals, and then several leaves (using a magnifying glass) • Draw a dichotomous classification key to help others identify an object	Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations (Y5)
Vocabulary	Classification, Organisms, species, offspring, reproduce, Vertebrates, warm/cold blooded, Invertebrates, endoskeletons, exoskeletons, or hydrostatic skeletons flowering and non-flowering plants, habitats.		
Mission Advocate SJA	How does this theme reflect the principles of Laudato Si and what difference can we make?		

Year 4 Autumn 2: Electricity	Duration: ½ term		
Big Idea: Energy 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Common materials include wood, paper, metal, glass, water, rock (Yr1 Spr) • Materials have different physical properties, some materials are hard whilst others are soft, some can be described as rough whilst others are smooth, some are dull whereas others are shiny(Yr1 Spr) • Materials can be grouped in a number of ways based on their physical properties(Yr1 Spr) • The material that we choose to make an object from depends on its purpose (e.g. no chocolate kettle) (Yr1 Spr)	***As a Scientist, I know that an electrical circuit needs to be complete to work.*** I can identify and name its basic parts, including cells, wires, bulbs, switches and buzzer ***As a Scientist, I understand that a switch can complete or break a circuit.*** I know that a lamp will not light if elements of the circuit are not present. ***As a Scientist, I understand what electrical conductors and insulators do.*** I can associate metals with being good conductors.	In a circuit that has a battery, the battery is the chemical store of energy. Energy is transferred electrically to the device in the circuit but the device does not store the energy, the device changes the way the energy is transferred (Y5 Aut) • There are recognised symbols for cell, lamp, buzzer, motor, and switch. Wires are represented with straight lines (Y6 Aut) • Increasing the voltage in a circuit will increase the brightness of a lamp and increase the volume of a buzzer (Y6 Aut) • The more components in the circuit, the dimmer the lamps in the circuit (Y6 Aut) • As long as batteries have the same voltage, the size of the battery does not affect the brightness of the lamp/loudness of the buzzer (though the smaller batteries will not last as long as the larger ones) (Y6 Aut)
Disciplinary Knowledge	A&P: Dependent, independent and control variables (Y3 Aut) • A&P: Scientists identify factors in an investigation that should be controlled, and try to find ways to control them (Y3 Aut) • A&P: Scientists identify potential hazards in their experiments and plan ways to reduce them (Y2 Aut) • A&E: Use findings of investigation to make further predictions (Y3 Sum) • R&P: Design a table to collect data with the appropriate number of rows and columns and correct headings (Y3 Spr)	Investigate which materials are electrical conductors and which are electrical insulators Draw diagram of the investigation Present information in a written format	

Vocabulary	Circuit, Cell / Batteries, Power, Incomplete Circuit, Wire, Lamp, Buzzer, Motor, Switch, Electrical conductors, Electrical insulators, Appliance
Mission Advocate SJA	How can we ensure the light of Christ lights up the darkness in Advent? Can we make a circuit of love?

Year 4 Spring 1: Sound	Duration: ½ term		
Big Idea: Energy 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Humans have features that are associated with each sense (eyes, ears, nose, mouth and tongue) (Y1) • In a solid the particles are packed tightly together, they vibrate slowly and are unable to move away from their neighbours (Y4) • In a liquid the particles are close together, but they can slide past each other (Y4) • In a gas the particles are spread out and can move freely (Y4)	• To know how sounds are made, associating some of them with something vibrating and travel through a medium to the ear • To know simple patterns between the pitch of a sound and features of the object that produced it • To know simple patterns between the volume of a sound and the strength of the vibrations that produced it	Sound cannot travel in a vacuum, in space (Y5 Sum) • Frequencies of sound waves, measured in hertz (Hz) (KS3) • Echoes, reflection and absorption of sound (KS3) • Sound needs a medium to travel in (KS3) • The speed of sound in air, water and solids (KS3) • Sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum (KS3) • Sound waves are longitudinal waves (KS3) • The auditory range of humans and animals (KS3)
Disciplinary Knowledge	Set a hypothesis to test (Y4) Suggest ways to improve practical procedures to obtain more accurate	Investigate the pitch / volume •Gather information using a data logger e.g. sound meter	Gather information using other data loggers (Y6)
Vocabulary	Sound, vibrate, particles, a medium (e.g. air, water) Inner ear, vacuum, pitch,		
Mission Advocate SJA	How can we be peace makers in a noisy world?		

Year 4 Spring 2: Food & Digestion	Duration: ½ term		
Big Idea: Living Things 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Animals can be placed into groups (carnivores, herbivores and omnivores) based on the food they eat (Y1) • Humans are omnivores, but some choose to eat only plants (Y1) • Animals get their food from plants and other animals; this food provides the energy animals need • Most plants produce their own food and are called producers (Y2) • In a food chain, the arrows show where the energy is being transferred from and to (Y2) • Different animals have different nutritional needs (Y3) • Organs are parts of the body that do a particular job, like the heart pumps blood around the body and the lungs are used for breathing, which gets air into the body (Y3)	To know the simple functions of the basic parts of the digestive system in humans To know the different types of teeth in humans and their simple functions To know how to construct and interpret a variety of food chains, identifying producers, predators and prey	• Each organ and muscle in the human body needs oxygen and nutrients (from breathing in and eating/ digesting) (Y6) • Blood carries oxygen, nutrients and carbon dioxide around the body (Y6) • Nutrients are absorbed by the blood along the small intestine, and transported to other organs in the body (Y6) • Some bacteria are helpful for other organisms (e.g. those that help break down food in our digestive system) and those that form part of a symbiotic relationship (Y6) • The role of enzymes in chemical digestion(KS3) • The interdependence of organisms in an ecosystem and how organisms affect and are affected by their environment to include the accumulation of toxic materials (KS3)
Disciplinary Knowledge	Draw a diagram, a simple scientific drawing that explains or informs (Y1)	Explain the digestion process Present information in a chosen format (orally using a prop or demonstration)	
Vocabulary	Producer, consumers, predator, prey , food web shows the ecosystem, energy, incisors, canines, pre-molars and Molars, Herbivores, carnivores and omnivores Digest, digestive system, chemical and mechanical oesophagus , small intestines, nutrients, faeces, rectum, anus.		
Mission Advocate SJA	Is it fair that some people go hungry? What can we do to help?		

Year 4 Summer 1: Particle model		Duration: ½ term	
Big Idea: Energy 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Materials melt when it is hot and freeze when it is cold (EYFS) • Geography: Precipitation is the fall of water as rain, sleet,snow or hail (Y2) • All materials of made of a single substance or a mixture of substances (Y2) • There are three states of matter: solids, liquids and gases (Y2) • Liquids take the shape of the container they are in, when you move the liquid into a different container the shape will change (Y2) • Solids keep their shape unless a force is put on it. They will change their shape if you cut them or squash them (Y2) • Gases have no fixed shape or volume, they spread out to fill a container. If they are not in a container, they will keep spreading out (Y2) • We can decide if a substance is a solid, liquid or gas by looking at its properties (Yr) • One substance can exist in the different states, when the substance is in a different state it is still the same substance (Y2) • Each substance in its state of matter is made up of parts that are too small to see without magnification (Y2)	• To know how compare and group materials together, according to whether they are solids, liquids or gases • To know how to observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) • To know the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	• Conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving (KS3) • Similarities and differences, including density differences between solids, liquids and gases(KS3) • Brownian motion of gases (KS3) • Diffusion in terms of the particle model (KS3) • Energy changes on changes of state (KS3)

Disciplinary Knowledge	Mathematics: Measure temperature (°C) and volume (ml/litres) (Y3) • dependent, independent and control variables (Y3 Aut) • Scientists identify factors in an investigation that should be controlled, and try to find ways to control them (Y3 Aut) • Science is studied as three disciplines: biology (study of living organisms), chemistry (study of materials) and physics (study of energy) (Y3 Spr) • Scientists identify potential hazards in their experiments and plan ways to reduce them (Y2 Aut) • Draw a diagram,	Investigate the effect of temperature on the rate of evaporation • Set a hypothesis to test • Science is studied as three disciplines: biology (study of living organisms), chemistry (study of properties of matter and how it interacts with energy) and physics (study of energy) • Scientists use models to help explain their ideas	Scientists must work out if the factor is the cause of the outcome in a correlation (Y5)
Vocabulary	Substances, particles, melting, melting point, boiling point, condensing, freezing, room temperature water cycle, evaporation, condensation.		
Mission Advocate SJA	How can the Holy Spirit guide us to turn our love into action?		

Year 4 Summer 2: Properties of Materials		Duration: ½ term	
Big Idea: Materials 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Materials have different physical properties, som materials are hard whilst others are soft, some can be described as rough whilst others are smooth, some are dull whereas others are shiny (Y1) • Materials have different physical properties such as malleable, waterproof, heatproof, windproof and absorbent. (Y2) • The shape of some solid objects made from some materials can be changed by squashing, bending, twisting, or stretching the material (Y2) • Opaque, translucent and transparent materials allow no, some or all light to pass through them (Y3) • Magnets attract magnetic objects (Y3) • Materials that allow electricity to pass through them easily are called electrical conductors (Y4) • Materials that do not allow electricity to pass through them easily are called electrical insulators(Y4)	• Thermal conductors allow energy to be transferred through it easily when it is heated • Metals are good thermal conductors • Thermal insulators do not allow heat to be transferred (conducted) through it easily. Thermal insulators include air, plastic and wood • Physical properties are properties that we can measure or observe in the classroom • Physical properties include electrical conductivity; melting and boiling points; thermal conductivity; being malleable; windproof; hard/soft; and magnetic • Chemical properties are properties that scientists need specialist equipment to measure • Chemical properties include how easy a substance is to set on fire (flammability) or how poisonous something is (toxicity) • As we learn more about a substance's properties, we may decide to stop using it to make certain objects (e.g. lead in pencils is toxic; asbestos is a good insulator but is toxic	Differences between physical and chemical changes (Y6) • The varying physical and chemical properties of different elements (KS3) • The properties of metals and non-metals (KS3) • The chemical properties of metal and non-metal oxides with respect to acidity (KS3) • Properties of ceramics, polymers and composites (KS3)

Disciplinary Knowledge	Scientists conduct secondary research to learn from what other scientists have already learned (Y1) • Scientists identify factors in an investigation that should be controlled, and try to find ways to control them (Y3) • Ask further questions that could be explored to extend findings (Y2) • Identify scientific evidence that has been used to support or refute ideas (Y4)	**Investigating the physical properties (thermal conductivity; malleability; transparency; magnetism; electrical conductivity etc.) of materials, using own knowledge or setting up comparative tests Conduct secondary research to identify an object that was once made of one material but, when new evidence showed other chemical or physical properties, are now made of new materials (e.g. asbestos insulation; lead pencils; plastic bottles)**	
Vocabulary	**Thermal conductors heated thermal insulators physical properties chemical properties**		
Mission Advocate SJA	Is it fair that some people are homeless? Should companies be able to use any material to produce things for us?		

Year 5 Autumn 1: Changing Materials Duration: ½ term

Big Idea: Materials

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	In Year 4, we investigated the physical properties of materials. (Thermal conductivity; malleability; transparency; magnetism; electrical conductivity etc.)	To know that materials can be grouped together according to their properties. To understand the process of dissolving and separating materials, and know these are different depending on the material's properties. To know the difference between reversible and irreversible changes for materials.	At KS3, pupils will learn about atoms, elements and compounds.
Disciplinary Knowledge	A&P: Write an appropriate method (Y2) A&P: Scientists identify potential hazards in their experiments and plan ways to reduce them (Y2) A&E: Make a prediction based on substantive knowledge (Y2) A&E: Use findings of investigation to make further predictions (Y3)	**Separate a mixture including coarse sand, water, salt and lumps of a magnetic material.**	
Vocabulary	Materials, Properties, Dissolve, Soluble, Insoluble, Separate, Reversible Change, Irreversible Change, Boil, Condense		
Mission Advocate SJA	If we're sensible with our resources, have we got everything we need on Earth?		

Year 5 Autumn 2 (summer 1 2024): Life cycles Duration: ½ term

Big Idea: Living Things

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Germination is the development of a plant from a seed. During germination roots and shoots emerge and grow (Y2) Some plants grow from bulbs (Y2) A seed is the embryonic stage of the plant life cycle (Y2) Animals, including humans, reproduce. This means they have offspring that grow into adults (Y2) As animals grow they get bigger, some animals change during their life cycle as the mature (e.g. tadpole to frog) (Y2) The four main stages of the plant's life cycle include germination, pollination, fertilisation and seed dispersal (Y3) Pollination and fertilisation usually takes place in flowers. Dispersal is important to make sure there is enough space for seeds to germinate and plants to grow (Y3) A species is a group of one type of organism, individuals in this group can breed with each other to produce offspring that can go on to breed (Y4) Fish, amphibians, reptiles, birds and mammals are all vertebrates (Y4) Invertebrates can be grouped based on their characteristics as snails and slugs; worms; spiders and insects (Y4)	As a scientist I can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. As a scientist I can describe the life processes of reproduction in some plants and animals. As a scientist I understand that Asexual reproduction does not involve sex cells or fertilisation. Only one parent is needed and offspring are (genetically) identical to the parent and each other. As a scientist I know something of the works of the naturalist David Attenborough and Jane Goodall.	The human life cycle goes through the same stages as those for other animals: fertilisation, gestation, growth (Y5) Humans are viviparous and a foetus develops inside the mother (or surrogate mother). A human embryo is considered a foetus at the end of the 10th week of pregnancy (Y5) The gestation period for humans is 40 weeks The bigger the animal, the longer the gestation period (Y5) A foetus is considered a baby when it is born (Y5) Fertilisation in most humans is internal, but it can happen externally (in vitro fertilisation - IVF - which means 'in glass' fertilisation) (Y5)
Disciplinary Knowledge	A&P: Scientists conduct secondary research to learn from what other scientists have already learned (Y1) A&P: Science is studied as three disciplines: biology (study of living organisms), chemistry (study of properties of matter and how it interacts with energy) and physics (study of energy) (Y5) M&O: Gather information from text/books/images (Y1) and the internet (Y3)	Using images, text and the internet to research internal and external fertilisation, and viviparous and oviparous organisms	9: In a human body, most cells contain 23 pairs of chromosomes. These provide information that is needed to make more cells in growth and reproduction (KS3)
Vocabulary	Reproduction, fertilisation, gestation, viviparous, oviparous, born, hatch, germinate, metamorphosis, stamen, stigma, pollen grains, ovary, anther, filament		

Mission Advocate SJA	How does this theme reflect the principles of Laudato Si and what difference can we make?

Year 5 Spring 1 (summer 2024): Human Development			Duration: ½ term
Big Idea: Living Things 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Humans are made of many different body parts including head, neck, back, ears, eyes, nose, mouth, arms, shoulders, elbows, hands, fingers, legs, knees, feet, toes, ears, eyes, nose, mouth, arms, legs, hands, feet, toes (Y1) Plants and animals look similar to their parents in many features because information is passed from one generation to the next. This information comes from the parents genome (Y5) Sexual reproduction is two parents - usually male and female - create a new organism by mixing their genomes (Y5) Sexual reproduction begins with fertilisation of an egg, which mixes the genomes from two parents (Y5) Fertilisation can be internal or external (Y5) After an egg is fertilised, an embryo will develop (Y5) Almost all mammals are viviparous (Y5) Embryos develop inside the body in the gestation period for viviparous animals. (Y5) Viviparous animals are born, oviparous animals hatch from eggs, plant seeds germinate (Y5)	As a scientist I can describe the changes as humans develop to old age. As a scientist I understand that the larger the animal the longer the gestation period As a scientist I understand the changes that occur during puberty.	The structure and function of the male and female reproductive systems (KS3) The female menstrual cycle (KS3) The male and female gametes, as specialised cells (KS3) Fertilisation, gestation and birth (KS3) The effect of maternal lifestyle on the foetus (through the placenta) (KS3)
Disciplinary Knowledge	Mathematics: Use coordinates in the first quadrant (Y4); Interpret and construct line graphs (Y4) A&P: Scientists look for patterns in the world around them (Y1) A&P: Set a hypothesis to test (Y4) A&E: Draw conclusions (e.g. 'the greater the…, the greater the…') (Y4) Geography: Recognise that people have differing opinions about environmental issues (Y4)	**Draw a scatter graph to suggest whether there is a relationship between animal size and length of gestation period** A&P: Scientists look for patterns in data to try to identify correlations R&P: Scatter graphs can help you decide if there is a relationship between two variables Discuss one aspect of IVF that is appropriate to your class (e.g. who in the world has access; post code lottery within the UK) A&E: Some people may agree or disagree with the use of some scientific discoveries	
Vocabulary	Fertilisation, gestation, growth, embryo, foetus, infant, child, adolescent, adult, senior		

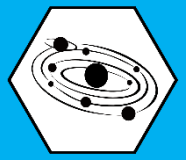
Mission Advocate SJA	With reference to Fratelli Tutti, how well do we care for the elderly in our community?

Year 5 Spring 2: Forces Duration: ½ term

Big Idea: Energy

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Forces are pushes or pulls that act in particular directions. They can cause a change in speed, direction or shape of an object (Y3) Forces that act in opposite directions are called opposing forces (Y3) Forces that are equal and act in opposite directions are described as balanced forces. They 'cancel each other out' (Y3) When forces are balanced, an object will move at a constant speed in the same direction. This includes being stationary (Y3) Contact forces require contact between two objects (e.g. friction). Non-contact forces can affect an object at a distance (e.g. magnetism) (Y3) Friction is a force between two surfaces that are sliding or trying to slide over each other (Y3) Friction is a contact force because it requires the two objects to be touching (Y3) The bumpier or rougher the surfaces, the more friction there will be (Y3)	As a scientist I can explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. As a scientist I can identify the effects of air resistance, water resistance and friction, that act between moving surfaces. As a scientist I can recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	The Earth's Moon is smaller than the Earth and has less mass, so its gravitational force is less (Y5) Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces (KS3) Moment as the turning effect of a force (KS3) Forces associated with deforming object; stretching and squashing- springs (KS3) • Measurement of stretch or compression as force is changed (KS3) Work done and energy changes in deformation (KS3) Non-contact forces: gravity forces acting at a distance on earth and in space, forces between magnets and forces due to static electricity (KS3) Opposing forces and equilibrium; weight held by stretched spring or supported on a compressed surface (KS3) Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (KS3) Change depending on direction of force and its size (KS3)
Disciplinary Knowledge	•Mathematics: Round numbers with 1 decimal place to the nearest whole number (Y4); Understand difference between discrete and continuous data (Y4); Interpret and construct bar and line graphs (Y4); Area is the space inside a shape and can be measured by counting squares (Y4) A&P:Dependent, independent and control variables (Y3) A&P: Scientists identify factors in an investigation that should be controlled, and try to find ways to control them (Y3) M&O: Anomalous results should be discarded and rerecorded (Y3)	**Fair test to investigate how the distance between the load and the fulcrum affects the force required to lift it** A&P: Scientists must work out if the factor is the cause of the outcome in a correlation M&O: Measure force using a Newtonmeter R&P: Line graphs can be used when data is continuous; bar charts can be used when data is discrete	

	M&O: Data is repeatable if the same person repeats the investigation and gets the same results; data is reproducible if the investigation is repeated by a different person and the results are the same (Y3) M&O: Taking multiple readings allows you to see if your data is repeatable, and helps identify outliers (Y3)	A&E: Make judgements on the reliability of the data	
Vocabulary	Gravity, mass gravitational pull, resistance, air resistance, friction, water resistance , levers, pulleys, gears, beam, fulcrum (pivot) Newton meter		
Mission Advocate SJA	How can our small actions impact on the global community?		

Year 5 Summer 1(Autumn 2 2024): Earth and Space			Duration: ½ term
Big Idea: Universe 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Geography: We live on the Earth (Y1) Daytime is when the Earth is facing the sun; nighttime is when the Earth is facing away from the sun (Y1) The Moon is more visible at night (Y1) Animals, including humans, need water, food, air, and the right temperature to survive (Y2) Light travels in a straight line (Y3) Sources of light emit their own light, and others reflect light; both occur in nature as well as manmade objects (Y3) Shadows form behind an opaque object when light from a source is blocked (Y3) Sound travels through a medium; it cannot travel in a vacuum (Y4) Gravity is a non-contact force that pulls all objects towards each other (Y5) The greater the mass of the object, the greater the gravitational pull around it (Y5) Air resistance is a frictional force that acts between air and a moving object to slow it down (Y5)	As a scientist I can describe the movement of the Earth, and other planets, relative to the sun in the solar system. As a scientist I can describe the movement of the moon relative to the Earth As a scientist I can describe the Sun, Earth and Moon as appropriate spherical bodies As a scientist I can use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	The Earth's tilt creates seasons, and different day lengths at different times of the year (KS3) Calculating gravity force on different planets and stars (KS3) The light year as a unit of astronomical distance (KS3) Movement of stars and constellations (KS3)
Disciplinary Knowledge	Mathematics: Number of minutes in an hour; hours in a day (Y3); Number of days in a month, year and leap year (Y3) • A&P: Scientists must work out if the factor is the cause of the outcome in a correlation (Y5) A&E: Draw conclusions (e.g. 'the greater the… , the greater the…') (Y3) A&E: Identify scientific evidence that has been used to support or refute ideas (Y4)	**Look for patterns between a planet's distance from the Sun and it's temperature and size** **Consider how the number of planets that humans consider to be planets has changed over time** A&E: Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations	Scientists seek to understand how accurate their results are, and how confident they can be in their findings (KS3)

Vocabulary	Universe, solar system, moon, rotates, axis, orbit, new moon, crescent, quarter moon, gibbous moon full moon
Mission Advocate SJA	How does this theme reflect the principles of Laudato Si and what difference can we make?

Year 5 Summer 2 (Spring 1 2024): Electricity Duration: ½ term			
Big Idea: Energy 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	A complete circuit must have a power source (cell/batteries) and have all the components connected in a loop. If it is missing any of these things it is an incomplete circuit (Y4) A short circuit is the easiest route for electricity to travel and can be created by accident by connecting just the wire to the cell in a circuit. They can be dangerous (Y4) Components include wire, lamp, buzzer, motor or switch Materials that allow electricity to flow through them easily are called electrical conductors; materials that do not are called electrical insulators (Yr4) Appliances use electricity to serve a purpose (e.g. toaster, kettle etc.) (Y4) Energy can be transferred from one store to another store (Y5) Fossil fuels, batteries and the Sun are all examples of chemical energy stores (Y5) In a circuit that has a battery, the battery is a chemical store of energy. Energy is transferred electrically to the device in the circuit, but the device does not store energy. Instead, it changes the way that it is transferred (Y5) Geography: Fossil fuels are materials made from fossils of organisms over millions of years, like coal and oil. Humans use these to run cars/electrical items (Y5)	To know that adding more cells in the circuit increases the voltage. Increasing the voltage in a circuit makes the lamp in the circuit get brighter or the buzzer get louder. To know that there are recognised symbols for cell, lamp, buzzer, motor, and switch. Wires are represented with straight lines To know that a non-renewable energy source is one where we have a fixed amount of the source, and where it would take too long for more to be formed and that burning fossil fuels to transfer electrical energy is a non-renewable energy source To know that renewable energy sources quickly replenish themselves, meaning that we can use them again and again. Wind, solar, geothermal and hydrological power are all examples of renewable energy sources	Geography: Improving the environment, and places in the world that have climates or physical features that lend themselves to using renewable sources to generate electricity (Y6) Electric current is measured in amperes using an ammeter. Current is a flow of charge (KS3) Current can be measured in parallel and series circuits. The current will be the same at all points in a series circuit (KS3) Current splits where the circuit branches in a parallel circuit, currents add where branches meet (KS3) Potential difference is measured in volts (V) using a voltmeter. It is measured across a component (KS3) In a series circuit the sum of the potential difference across all components will equal the battery voltage. In a parallel circuit the potential difference across each of the components will be the same as that of the battery (KS3) Resistance is measured in ohms and is the ratio of potential difference to current (KS3) Conducting and insulating components will differ in resistance (KS3)

Disciplinary Knowledge	Mathematics: Interpret and construct bar charts (Y3);: Discrete data is data you count; continuous data is data you can measure (Y4); Interpret and construct bar, line graphs (Y4) A&P: dependent, independent and control variables (Y3) A&P: Scientists identify factors in an investigation that should be controlled, and find ways to control them M&O: Gather information using a data logger (e.g. sound meter app; heart rate app) (Y4) R&P: Line graphs can be used when data is continuous; bar charts can be used when data is discrete (Y5) A&E: Draw conclusions (e.g. 'the greater the… , the greater the…') (Y40	**Three different enquiries, where pupils will plan the most appropriate type of investigation and how they should present their results:** **1. Investigating the effect of increasing voltage on the volume of a buzzer or the brightness of a lamp** **2. Investigating the effect of changing the number of components in a circuit on the volume of a buzzer** R&P: Decide which graph is most appropriate for the enquiry	Planning more complex investigations to answer more challenging questions (KS3)
Vocabulary	Symbol voltage parallel series continuous appliances electricity renewable non-renewable energy source wind solar geothermal hydrological		
Mission Advocate SJA	How does this theme reflect the principles of Laudato Si and our use of the world's resources?		

Year 6 Autumn 1: Further Classification & Microorganisms Duration: ½ term

Big Idea: Living Things

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Coniferous plants keep their leaves all year round; deciduous plants lose their leaves in winter (Y1) Animals can be grouped into carnivores, herbivores and omnivores (Y1) Animals move from place to place, while plants move on the spot (Y2) Classification refers to a method used to place all living things into groups. Organisms can be classified in a number of ways (Y4) A species is a group of one type of organism, individuals in this group can breed with each other to produce offspring that can go on to breed (Y4) Fish, amphibians, reptiles, birds and mammals are all vertebrates. Vertebrates have endoskeletons (Y4) Vertebrates can be grouped in a number of ways based on their characteristics, e.g. warm/cold blooded; or physical features like fur, beak, wings etc. (Y4) Invertebrates can be grouped based on their characteristics as snails and slugs; worms; spiders and insects (Y4) Invertebrates can be grouped based on their skeletons; endoskeletons, exoskeletons, or hydrostatic skeletons (Y4) Plants can be grouped into flowering and non-flowering plants (Y4) Geography: A symbiotic relationship is where plants and animals live along and rely on one another (Y4)	To know the difference between biotic and abiotic things. To know that classification is the process of grouping living organisms by their similarities and differences. To know and understand the different types of microorganisms.	At KS3, we will observe, interpret and record cell structure using a light microscope. Plants and animals are made of cells. There are similarities and differences between the cells of animals and plants. (KS3) Many plant cells have chloroplasts, and this enable plants to photosynthesise. The reactants of this process are carbon dioxide and water, and the products are sugar (glucose) and oxygen. (KS3) The differences between species and how this difference can drive natural selection. (KS3)
Disciplinary Knowledge	Gather information from text/books/images (Y2) and the internet (Y3) R&P: Use a classification key to identify an object (Y4) R&P: Draw a dichotomous classification key to help others identify an object (Y4) R&P: Present information in a written format (Y4)	Use and draw classification keys to help classify invertebrates and plants Research the harmful and helpful effects that bacteria can have on humans and other organisms, and present this information in a written format	

Vocabulary	Living Things, Biotic, Abiotic, Classification, Living Organism, Vertebrate, Dichotomous, Microorganism, Microbe, Food Chain / Food Web
Mission Advocate SJA	How can we take care of the living things which God has given us?

Year 6 Autumn 2: Light Duration: ½ term

Big Idea: Energy & The Universe

	Prior Knowledge	New Knowledge to be explicitly taught (Must Haves)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Light travels in straight lines (Y3) We see when light enters our eyes (Y3) Darkness is the absence of light (Y3) Sources of light emit their own light, and others reflect light; both occur in nature as well as man-made objects (Y3) Opaque, translucent and transparent materials allow no, some or all light to pass through them (Y30 Shadows form behind an opaque object when light from a source is blocked (Y3) The shape of shadows changes with the angle and the distance of the light source (Y3) Light from the sun can be dangerous and there are ways to protect our eyes (Y3 Energy can be transferred from one store to another store (Y5) Fossil fuels, batteries and the Sun are all examples of chemical energy stores (Y5) When energy is transferred from one store to another, it can be transferred by light or electrically (Y5) When energy is removed from one store and is transferred to another store, the amount of energy in the first store goes down and the amount of energy in the second store goes up (Y5) Energy is not used up; it is just moved around from store to store (Y5) • Light travels from the Sun to the Earth (Y5)	***As a Scientist, I know that light appears to travel in straight lines.*** I understand how light enables us to see and that objects need a light source so that we can see them. ***As a Scientist, I know that shadows are the same shape as the object that casts them.*** ***As a Scientist, I know that reflection between mirrors allows us to see objects that do not directly reflect light into our eyes.*** I know that white light contains all the colours from the spectrum.	The transmission of light through materials, to include absorption, diffuse scattering and specular reflection at a surface (KS3) Light waves can travel through a vacuum they do not require a medium (KS3) Light waves travel at the speed of light (KS3) The similarities and differences between light waves and waves in matter (KS3) Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and the action of a convex lens in focusing (KS3) The human eye (KS3) Light transferring energy from a source to an absorber leading to chemical and electrical effects; photosensitive material in the retina and in cameras (KS3) Colours and the different frequencies of light, white light and prisms; differential colour effects in absorption and diffuse reflection (KS3)
Disciplinary Knowledge	R&P: Draw a diagram, a simple scientific drawing that explains or informs	Draw ray diagrams to show how light travels and how shadows are formed	
Vocabulary	Light, Ray diagrams, Emit, Reflect, Light Sources, White Light, Shadow		
Mission Advocate SJA	‘The people of darkness have seen a great light? How can we be a light in the lives of others?		

Year 6 Spring 1: Functions of the Human body	Duration: ½ term		
Big Idea: Living Things 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Humans are made of many different body parts (Y1) Humans need exercise to stay healthy (Y2) Humans need a balanced diet of these food groups (Y3) Organs are parts of the body that do a particular job, the heart pumps blood around the body and the lungs are used for breathing which gets air into your body. (Y3) The skeleton protects organs, e.g. the skull protects the brain; and the ribcage protects the lungs, heart and other important organs (Y3) The muscles and skeleton are required to help the body move. When muscles contract they pull the bone (Y3) Oxygen and carbon dioxide are found in the air (Y3) The digestive system is the group of organs that help your body digest food (Y4) Food is further broken down (chemical digestion) in the small intestines where most of the nutrients are absorbed (Y4) Water is absorbed in the large intestine, leaving behind the waste products (Y4)	As a scientist I can identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood As a scientist I can recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function As a scientist I can describe the ways in which nutrients and water are transported within animals, including humans	The hierarchical organisation of multicellular organisms. Organisms consist of organ systems which are made of organs. Organs are a collection of different tissues and tissues are made of cells. An example being the circulatory system (KS3) Aerobic respiration occurs in the cells of living organisms, it involves the breakdown of organic molecules (sugar) and using oxygen (KS3) The blood is oxygenated in the lungs and this is transported to the organs (and cells) that require it for aerobic respiration, along with sugar, by the blood vessels in the circulatory system (KS3) Gas exchange systems in humans are adapted to their function as they have many alveoli which provides a large surface area for diffusion (KS3) The mechanism of breathing moves air in and out of the lungs (KS3) The role of diffusion in the movement of materials in and between cells (KS3) The impact of smoking on the human gas exchange surface. (KS3)

Disciplinary Knowledge	Mathematics: Calculate and interpret the mean (Y6) A&P: Set a hypothesis to test (Y4 Spr) A&P: Make a prediction based on substantive knowledge (Y2) A&E: Use scientific understanding to explain their findings (Y3) A&P: Scientists must work out if the factor is the cause of the outcome in a correlation (Y5) A&E: Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations (Y6) M&O: Repeatable and reproducible data (Y3) M&O: Taking multiple readings allows you to see if your data is repeatable and helps identify outliers (Y3)	**Investigate the effect of exercise on heart rate** M&O: Planning to take multiple readings allows anomalous data to be identified and enables a mean to be calculated. Repeats show if our data is repeatable. A&E: Calculating the mean can be used as a method of analysing data Research effects of smoking on the human body, and how our scientific understanding has changed over time, including in the current day. The difference between correlation and cause can be discussed in relation to the move from saying smoking is bad for your health to the idea of the many disease smoking cause.	
Vocabulary	Organ muscle oxygen nutrients carbon dioxide heart blood vessels pressure deoxygenated oxygenated arteries veins heart rate small intestines		
Mission Advocate SJA	We are made in the image of God – how can we take care of ourselves as God intended?		

Year 6 Spring 2: Evolution Duration: ½ term			
Big Idea: Living Things 			
	Prior Knowledge	**New Knowledge to be explicitly taught (Must Haves)**	**Future Knowledge How knowledge will be built upon**
Substantive Knowledge	Living things have adapted to their environment. This means they may not be able to survive in other habitats (Y2) A fossil is physical evidence of an ancient plant or animal , this could be their preserved remains or other traces that they made when they were alive. Trace fossils are not physical remains of living things they are indirect evidence of life (Y3) A species is a group of one type of organism, individuals in this group can breed with each other to produce offspring that can go on to breed. (Y4) Geography: Animals and plants have adapted to life in the rainforest (buttress roots, lianas, spider monkey, toucan, fig wasp and fire ants) (Y4) Sexual reproduction is two parents - usually male and female - create a new organism by mixing their genomes (Y5) Geography: Flora and fauna that have adapted to life in the tundra (Arctic hare, polar bear) hot desert (cactus, camel, Saharan silver ant, cape ground squirrel) temperate forest (deciduous and coniferous trees, red squirrels, hedgehogs, brown long-eared bats southern wood ants) coral reefs (soft coral, pistol shrimp & goby fish, reef sharks) (Y5)	As a scientist I recognise that things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. As a scientist I recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. As a scientist I can identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution	Hereditary is the process by which genetic variation is transmitted from one generation to the next (KS3) Chromosomes are made of DNA. Small sections of DNA are called genes. We inherit genes from our parents and this is how genetic variation is transmitted from one generation to the next.(KS3) Variation between individuals of the same species is either continuous or discontinuous, this variation means that some individuals will compete more successfully and are more likely to survive, this drives a process known as natural selection. In this process advantageous versions of genes are passed onto offspring (KS3) Changes to the environment can lead to individuals of some species or even entire species less well adapted to their environment. This can lead to extinction. Biodiversity is important and we need to maintain it (KS3)

Disciplinary Knowledge	A&E: Identify scientific evidence that has been used to support or refute ideas (Y4) R&P: Use a Venn diagram to classify items into two or three sets based on properties (Y1) A&P: Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations (Y5)	**Sort variations within species in a Venn diagram, based on whether they are genetic, environmental or a mixture of both Identify how evidence of fossils has been used to support the theory of evolution.** (Horse fossil record as evidence of the horse developing from a small animal with four toes to a large animal with a hoof). A&P: Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations	
Vocabulary	Variation species environmental genetic genomes advantageous disadvantageous organism natural selection adaptations evolve fossils		
Mission Advocate SJA	UNICEF advocate for the rights of every child to have a loving home – what can we do to help those in need?		

Year 6 Summer 2: Physical and Chemical Changes Duration: ½ term

Big Idea: Energy

	Prior Knowledge	New Knowledge to be explicitly taught (Including 3 Keys)	Future Knowledge How knowledge will be built upon
Substantive Knowledge	Digestion in the human body can be chemical and mechanical (Y4) Physical properties are properties that we can measure or observe in the classroom. They include electrical conductivity; melting and boiling points; thermal conductivity; being malleable; windproof; hard/soft; and magnetic (Y4) Chemical properties are properties that scientists need specialist equipment to measure. They include flammability and toxicity (Y4) A mixture is two or more substances, e.g. air, steel (Y5) Mixtures can be made of two gases (e.g. air), two solids (e.g. steel), two liquids (e.g. squash and water), or a liquid and a solid (e.g. salt water) (Y5) A solvent is a liquid that is used to dissolve other substances (Y5) A reversible change is a change that can be undone, where the original substances can be recovered (Y5) An irreversible change is a change that cannot be undone, where the original substances cannot be recovered (Y5)	• A mixture is two or more substances that are mixed but not chemically joined together • A chemical change is a change where a new substance is formed. • A chemical change has usually taken place if: gas bubbles appear; a new solid appears; it changes colour; or smells different • A physical change is where the substance changes its properties, but it does not become a different substance • Some chemical changes are irreversible, (e.g. cook an egg, rusting iron), but some can be reversed • Most physical changes are reversible (e.g. water to ice), but some are not (e.g. crack an egg, turn wood into sawdust) • Reversible and irreversible chemical changes can be written as word equations	In an chemical reaction mass is conserved (KS3) In a chemical reaction there is a rearrangement of atoms. (KS3) Chemical reactions can be represented using formulae and equations (KS3) Examples of types of chemical reactions include combustion, thermal decomposition, oxidation neutralisation and displacement (KS3) Reactions of acids with metals produces a salt and hydrogen (KS3) Reactions of acids with alkalis produces a salt and water (KS3) Reactions can be endothermic or exothermic (KS3)
Disciplinary Knowledge	A&P: Scientists group objects or living things based on their properties (Y1) A&P: Make a prediction based on substantive knowledge (Y2) A&P: Scientists identify potential hazards in their experiments and plan ways to reduce them (Y2) R&P: Use a Carroll diagram to classify items based on properties (Y1) R&P: Use a classification key to identify an object. Draw a dichotomous classification key to help others identify an object (Y4)	**Use a Carroll diagram to classify changes as physical/chemical and reversible/irreversible** **Create and use a classification key to help identify whether a change is chemical/physical and reversible/irreversible** **Carry out changes and identify whether the change created is physical/chemical and reversible/irreversible**	

	R&P: Present information in a written format		
Vocabulary	Mixture substance chemical change physical change reversible change irreversible changes		
Mission Advocate SJA	We are preparing for a change as we move to secondary schools, how can we ensure we continue to live out our values during this period of change?		