Year 3

Year 3 Autumn 1		
Milestone LO: To identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. To identify that humans and some other animals have skeletons and muscles for support, protection and movement. Big Question: How does the skeleton and muscles help me to run?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Biology (animals, skeletons and movement)	Know that… • We are humans and that we need to fuel our bodies and keep healthy. Healthy means we are looking after our bodies to feel happy and strong. (revisiting from year 2) • Nutrition is focusing on the different nutrients different animals need. • Nutrients are substances that support our immune systems, maintain healthy bones and teeth and support growth. • Nutrition can differ between species. Animals and humans need the right amount and type of nutrition to survive. • Plants are able to make their own food using water and sunlight which gives them the right nutrients to grow. However, animals and humans are not able to make their own food. So, they have to get the right types and amount of nutrients from the food that they eat. • Humans require a balanced diet, including fruit and vegetables, fibre (starchy foods like potatoes, rice etc), dairy (milk, cheese, soya etc.), protein (meat, fish) or beans or eggs, fats (oils etc.) • Different animals require different diets (carnivore, herbivore, omnivore) • A herbivore is a consumer that only eats plants eg a caterpillar. (revisiting from year 1 and 2) • An omnivore eats both plants and animals. For example a bird. (revisiting from year 1 and 2) • A carnivore is an animal that mostly eats other animals. (revisiting from year 1 and 2) • the main body parts associated with the skeleton and muscles. • The skeleton is internal framework of our bodies. It facilitates movement (an act of motion), supports the body and protects internal organs (heart, lungs, liver). • Muscles are found all over our body. They control the movements we make and help us to move our bodies. • Some muscles will move when we think about them (even if we don't realise we are thinking about it) for example arm or leg. Other muscles will move on their own without us thinking about it for example your heart. • The muscles and the skeleton work together to help our bodies move. • The main body parts associated with skeletal and muscular system have special functions. • Animals without skeletons are: jellyfish, slugs, snails, octopuses, crabs, spiders, butterflies etc.	Know how… • Scientists can identify and classify (revisit year 1 and 2) animals with and without skeletons. • Scientists can ask relevant questions and use different types of scientific enquiries to answer them.

	• Different animals will move in different ways because they have different skeletons and muscles. A jellyfish with no skeleton will move differently to a tiger with a skeleton and muscles.	
Vocabulary	Nutrition Nutrients Herbivore Omnivore Carnivore Muscle Skeleton Movement	
Enrichment & wider development	Visit from a nutritionist.	

Year 3 Autumn 2		
Milestone LO: To observe how magnets attract or repel each other and attract some materials and not others. To compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. To describe magnets as having two poles. To predict whether two magnets will attract or repel each other, depending on which poles are facing. Big Question: A ring is made from silver. Will it be attracted to the magnet?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Physics (Magnets)	Know that… • Magnets are metals that attract other metals. • Every magnet is metal but not every metal is a magnet. • Magnets have two ends, called their north and south pole. • When two of the same poles (eg. south and south) are placed close together they repel (push apart) each other. When two different poles (eg. south and north) are close, they attract (pull together) each other. • Magnets only need to be near each other for them to repel and attract (they don't need to be touching). • Some magnets are stronger than others. Some will create bigger pushing or pulling forces. • If a magnet sticks to a material then that material is magnetic. • The material that is magnetic will also be a metal (eg. iron, nickel and cobalt). • Materials like cotton are not magnetic because a magnet will not stick to them. • There are some metals that are not magnetic. Not all metals are magnetic. Metals that are not magnetic (copper, aluminium (foil), gold, silver).	Know how… • Scientists can perform a simple and fair test to compare materials into magnetic and not magnetic. • Scientists can identify (revisiting from year 1 and 2) whether a material is magnetic. • Scientists can write conclusions and explanations on results of simple tests.
Vocabulary	Magnet Magnetic Repel Attract Metal Copper Aluminium Gold Silver	
Enrichment & wider development	Experiments within class.	

Year 3 Spring 1		
Milestone LO: To compare how things move on different surfaces. To notice that some forces need contact between two objects, but magnetic forces can act at a distance. Big Question: Will a toy car move quicker across some sandpaper or shiny wood? How do you know?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
	Know that… • We need forces to make things move. A force can be a push or a pull. We can make things move faster, slower or even stop if the size of the force changes. • Friction is a force between two different surfaces that slide against each other. • Different surfaces can also affect how forces act on moving things. • An object will move easier and faster on a smooth surface because it has less friction. • An object will find it harder and slower to move on a rough surface because it has more friction. • Friction can be useful for certain things like stopping us slipping over or a car skidding on the road. • Tyres are not smooth because the friction helps cars from skidding in the road. • The soles of your shoes are bumpy to create friction with the ground to help you from slipping over. • Surfaces like sandpaper, gravel and carpet will cause more friction and make it harder for an object to move. • Surfaces like ice and a shiny wooden floor will cause less friction and therefore make it easier for an object to move. • Objects need to have contact for friction to have an impact. Some forces don't need contact between the two objects to cause a reaction for example magnetism. • Magnetic forces can act without direct contact unlike other forces where direct contact is necessary eg. pushing a swing.	Know how… • Scientists to perform comparative tests to observe (look closely) how objects move on different surfaces. • Scientists can record data in a table. • Scientists can identify the differences and similarities related to how objects move on a surface.
Vocabulary	Surfaces Objects Smooth Friction Magnetic Forces	
Enrichment & wider development	Science museum	

Year 3 Spring 2		
Milestone LO: To recognise that they need light in order to see things and that dark is the absence of light. To recognise that light from the sun can be dangerous and that there are ways to protect their eyes. To notice that light is reflected from surfaces. To recognise that shadows are formed when the light from a light source is blocked by an opaque object and to find patterns in the way that the size of shadows change. Big Question: Will a drinking glass create a shadow? How do you know?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Physics- light	Know that… • We need light to see. Light can come from different sources (the sun, stars, torches, lamps, candles etc.) • Dark is when there is an absence (lack) of light. • Some sources (the sun and some indoor lights) of light are very bright and these can damage our eyes. We must not look directly at these lights and we must protect our eyes using sunglasses. You must never shine a light into someone's eye either. • Light can be reflected. A reflection involves a light source and a surface. The light travels towards the surface and bounces off of it. Most objects reflect a little bit of light but mirrors reflect lots of light. • When light is reflected by a surface it changes direction. It will bounce off the surface at the same angle that it hit it at. • Smooth and shiny surfaces (mirrors and polished metals) reflect light well. • Dull and dark surfaces (such as dark fabrics) do not reflect light well because they absorb (take in) it. • Light travels in a straight line. • If an object is transparent (see through- revisited from year 1). Light passes through these objects clearly. • Translucent (not completely clear) objects let through some light. • Opaque (not see through) objects let no light through. • When an opaque object is put in front of a light source it prevents the light from passing through. The absence (describe something that isn't there) of light creates a dark shape on the surface behind it. This is called a shadow. • If we move the position of the light source we can change the size of the shadow. • The closer the light source is to the opaque object the bigger the shadow will be because the object blocks more of the light. • The further away from the light source an object is the smaller the shadow will be because the object blocks less of the light. • When the light source is above the object the shadow will be directly below the object. • When the light source is to one side of the object the shadow will appear on the opposite side of the object and the shadow will be longer.	Know how… • Scientists will ask relevant questions about shadows and use scientific enquiry to answer them. • Scientists can perform and help set up a simple test to observe at how the shape of a shadow can change. Scientists will draw conclusions from the simple test and use this to predict further results.
Vocabulary	Light Shadow Reflection Translucent Transparent	

	Opaque
Enrichment & wider development	Hands on science- light workshop

Year 3 Summer 1		
Milestone LO: To compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. To describe in simple terms how fossils are formed when things that have lived are trapped within rock. To recognise that soils are made from rocks and organic matter. Big Question: I wonder how this dinosaur fossil was formed? Can you tell me?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Chemistry- Rocks and soil	Know that… • Rocks are made up of different minerals. Different combinations of minerals form rocks. • Different types of rock have different properties. • Some rocks are harder than others. • Hard rocks are granite, and marble • Soft rocks are chalk or sandstone. • Granite is a very hard rock so this makes it a good material for building as it doesn't wear away easily. • Marble has an attractive texture and colour. It can be cut and polished. It is used to make floor and wall tiles and sometimes statues. • Chalk is used to write on blackboards because it is soft. • Slate is not a soft rock but it is easy to split into thin sheets and is therefore used for roof tiles. • Some rocks are permeable (let water soak through) eg. chalk, sandstone, • Other rocks are impermeable (don't let water through) eg. slate, marble, granite. • A fossil is the preserved (to keep intact) remains or traces of a dead organism (an individual animal, plant or single-celled life form). • Fossils are formed (made) through a process with multiple stages called fossilisation, and this takes place over many, many years. • Fossilisation only happens in certain conditions. That's why not every organism that dies becomes a fossil. • It's very rare for living things to become fossilised. After most animals die, their bodies usually rot away and nothing is left behind. However, under certain special conditions, a fossil can form. • After an animal dies, the soft parts of its body decompose (break down). The hard parts, like the skeleton, are left behind. They become buried by small particles of rock called sediment (a naturally occurring material). • As more layers of sediment build up on top, the sediment around the skeleton begins to compact and turn to rock. • The bones then start to be dissolved by water that passes through the rock. • Minerals (naturally occurring resources) in the water replace the bone, leaving a rock replica of the original bone called a fossil.	Know how… • Scientists can gather, record and present data related to different types of rocks. • Set up simple practical enquires and comparative tests (revisiting from autumn 1). • Scientists can identify differences and similarities of different rocks properties.
Vocabulary	Rocks Minerals Granite Marble	

	Chalk Slate Fossil Fossilisation Decompose Sediment Dissolved
Enrichment & wider development	Go to the beach and look at different rocks and fossils. Have an expert come in with fossils.

Year 3 Summer 2		
Milestone LO: To identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. To explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. To investigate the way in which water is transported within plants. To explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. Big Question: how does water reach the leaves in plants?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Biology- Plants and their food production	Know that… • Plants are living things, but unlike animals, they can't move on their own. Plants are important. There are lots of different types of plants, like trees and grass. They grow all over the world. Some grow flowers and others grow fruit. (revisiting from year R, 1 and 2) • Plants have different parts that all have different functions • Roots take in the water and nutrients from the soil and they keep the plants upright and steady. • The stem facilitates movement of water and minerals (a natural resource) from the roots in the soil up the stem to the leaves and other parts of the plant. The stem of a tree is called a trunk and this often divides into smaller branches. • The leaves will turn sunlight into food. The leaves absorb (take in) the sun and carbon dioxide to make food for the plant. • A flower is the bloom or blossom of a plant (revisiting from year R). Flowers produce seeds from which new plants grow. • Plants require air, light, water, nutrients from the soil and room to grow and live. • The requirements for a plant to grow may vary from plant to plant. • Sunflowers require lots of sunlight whereas flowers that live in woodlands require less sunlight. • Mangrove plants need lots of water whereas cacti can live off a small about of water. • Olive trees have adapted to live in hot weather whereas pine trees grow in much colder places. • Plants need water to make their own food. This is called photosynthesis. It happens in plant leaves. Plants also need carbon dioxide from air and sunlight to make their food. • Plants absorb water from the soil through their roots. Plant roots have tiny hairs on them so they can absorb as much water as possible. The water enters through the roots and travels up the stem in tubes. These are easy to see in plants like celery. The water goes from the stem to the leaves. The stem holds out the leaves so the Sun can shine on them to make food. They also hold flowers out to attract insects. • Pollination: Lots of plants rely on insects like bees to reproduce. To make a seed, a flower needs to be pollinated. This means that pollen from one flower needs to travel to another. Bees are very important for carrying the pollen between flowers. • Seed formation: When pollen has moved from one flower to another, the flower that loses pollen will start to die. It no longer needs its colourful petals, scent or nectar. But before it dies, the flower will produce seeds. We use many of these seeds, like corn and	Know how… • Scientists can draw labelled diagrams of a plant. • Scientists can observe and identify (revisiting from year 1 and 2) the life cycle of a plant. • Scientists can ask relevant questions (revisiting from autumn 1 and spring 2) and use different types of scientific enquires to answer them. • Scientists can decide by themselves which scientific enquiry is best to answer the questions.

	oats, to make foods like bread and breakfast cereal. Some seeds are surrounded by fruit, such as apples, plums and pears which we grow and eat. • Seed dispersal: Plants spread their seeds in lots of different ways. This is called seed dispersal. Some seeds are transported by the wind and are shaped to float, glide or spin through the air.	
Vocabulary	Plant Flower Stem Leaves Nutrients Absorb	
Enrichment & wider development	Nature trail	

Year 4

Year 4 Autumn 1		
Milestone LO: To be able to describe the simple functions of the basic parts of the digestive system in humans. To identify the different types of teeth in humans and their simple functions. To be able to construct and interpret a variety of food chains, identifying producers, predators and prey. Big question: What happens to a biscuit after I eat it?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Biology- Animals including humans (digestive system and food chains)	Know that… • The digestive system helps to break down the food for the body to process and use. Without digestion, the food we eat would just come straight out in our poo. • Digestion happens in the digestive system. This is a series of organs (the name of different types of tissues working together to perform a job in the body) that break down the food so it can be absorbed (taken in) into our blood and travel around to where it is needed. • The main body parts associated with the digestive system (mouth, tongue, teeth, oesophagus, stomach and small and large intestine) • The mouth is where food enters the digestive system. This is where food is broken down by your teeth, mixed with saliva and swallowed. • The teeth are hard bony structures that are used to chew food. • The oesophagus is a muscular tube that cu=connects your mouth and your stomach. • Once you have swallowed your food, it travels down your oesophagus into your stomach. • The stomach is where the food is churned with stomach acid to kill any germs which may be on it. • Your body has two sets of intestines. Small intestines: where food is broken down and nutrients are absorbed into the blood. Large intestines: where water is absorbed into the blood. • Any food that can't be absorbed is then stored in your anus until you go to the toilet. • Humans have different types of teeth. There are three different types (molars, incisors and canines). • Molars - These are the teeth at the back of your mouth which are used for grinding up food. • Incisors - The teeth at the very front of your mouth that are used for cutting food. • Canines - The teeth at the sides of your mouth between the incisors and the molars. These are used for tearing up food • We have two sets of teeth during our lifetime. Aged around six months, our milk teeth develop. • Our milk teeth start to fall out around five years old. They are replaced by our adult teeth, which should last for the rest of our lives if well looked after. • Different animals have different teeth. • We need all three types of teeth because we are omnivores (eat animals and plants- revisited from year 1,2, and 3). • Herbivores (eat plants-revisit from year 1,2, and 3) they have more molar teeth for grinding up plants and they have less canines.	Know how… • Scientists will identify (revisiting from year 3) differences and similarities relating to the different types of teeth animals have for their diet. • Scientists can draw labelled diagrams of food chains (revisiting from year 3)

	• Carnivores (only eat animals- revisit from year1,2, and 3) they have more canines to help them kill their prey and tear it up. These teeth are strong and therefore will last longer. • Food provides animals and plants with energy. • All living things need to consume something like food for energy. Because of this, all living things are part of a food chain. • All living things need energy from food to grow, repair themselves and reproduce. • A food chain shows how energy is passed through plants and animals. • All food chains include a producer, consumer, predator and prey. • A producer has the ability to produce their own food, usually plants because they make their food from sunlight, water and air (revisit from year 2 spring 2) • A consumer are animals that eat food (either other animals or plants). (revisit from year 2 spring 2) • A predator is an animal that eats other animals and is normally at the top of the food chain. Predators hunt and eat prey. • Prey are the animals that are eaten by other animals. • If something is taken away from the food chain then the consumer after that animal will find it hard to hunt for food. • Humans are part of a food chain too. We are at the top of the food chain as there aren't many animals that want to eat us. • Food chains always start with a producer and end with a predator. • There are different food chains. Food chains can be longer than just producer, prey, predator. • Animals can be both prey and a predator (e.g. when a spider is sitting in its web waiting for to catch an inset it's a predator but if a lizard catches the spider then the spider is the lizard's prey.	
Vocabulary	Digestive system Absorb Organ Mouth Teeth Oesophagus Stomach Small intestine Large intestine Molars Incisors Canines Food chain Producer Predator Consumer Prey Energy	

Enrichment & wider development	Visit, video or zoom call from a dentist.

Year 4 Autumn 2		
Milestone LO: To compare and group materials together, according to whether they are solids, liquids or gases. 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 identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. Big question: What happens to water on the surface of the sea when it is warmed by the Sun?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Chemistry- states of matter	Know that… • There are three states of matter (solids, liquids and gases). • Solids stay in one place and can be held. Solids can keep their shape. They always take up the same amount of space. Solids can be cut or shaped. Even though they can be poured, sugar, salt and flour are all solids. Each grain of salt, for example, keeps the same shape and volume. • Liquids can flow or be poured easily. They are not easy to hold. Liquids change their shape depending on the container they are in. Even when liquids change their shape, they always take up the same amount of space. Their volume (amount of space a material takes up) stays the same. Liquids can be poured. • Gases are often invisible. They do not have a fixed shape. They spread out and change their shape and volume to fill up whatever container they are in. Gases can be squashed. Gases will escape from an unsealed container. • Materials can change state if they are heated or cooled. • When some solids are heated, they melt and turn into a liquid. For example, wax and ice melt when they are heated. The temperature that this happens at is called the melting point, and it is measured in degrees Celsius (°C). • The melting point of ice (solid water) is 0 degrees Celsius (0°C). Different materials have different melting points. Chocolate melts at around 35°C. • As ice heats up, it melts and turns into water. • When a liquid is cooled, it freezes and turns into a solid. For example, water freezes into ice in puddles on a very cold day. Freezing happens at the same temperature as the melting point. • When a liquid is heated it boils and turns into a gas. For example, if water is heated in a pan or in a kettle, it boils and turns into steam. • The temperature this happens at is called the boiling point. The boiling point of water is 100°C. • If you heat water slowly at a lower temperature than boiling point, then the water on the surface will evaporate (when a liquid changes to a gas). For example, the Sun may heat up water in a puddle and it will slowly evaporate. The puddle may evaporate quicker on a very hot day, if it was windy or the water was spread out thinly across the surface. • When a gas is cooled, it condenses (when a gas changes to a liquid), and changes into a liquid. For example, the steam from a boiling pan turns into condensation on a cold window in the kitchen. Condensing happens at the same temperature as the boiling point. • How evaporation and condensation is involved in the water cycle. • Water on Earth is always moving. It is constantly being recycled. This is called the water cycle. The water cycle is the journey water takes as it moves from the land to the sky and back again.	Know how… • Scientists can observe (revisiting from year 1 and 2) water as a solid, liquid and gas. They should ask relevant questions and answer them. • Scientists can perform fair tests to observe changes of state. Scientists can record and measure using thermometers to take accurate measurements using standard units. • Scientists can draw labelled diagrams of the water cycle (revisiting from year 3 and autumn 1).

	• The Sun heats up water in the sea, lakes, rivers and on land. The warm water turns into a gas which we call water vapour. This process is called evaporating. • This isn't boiling because the water is cooler than its boiling point (which is 100 degrees Celsius). Evaporating is a slower process than boiling. • As the water vapour rises, it gets colder and condenses. This makes tiny droplets of liquid water, which is what clouds are made from. The clouds are moved by the wind. As the droplets of water in the clouds get larger, they get heavier. Eventually they fall, usually as rain. • If the air is very cold, the water freezes as it falls and we call this hail or snow. • Water that falls on land travels through streams and rivers back to the sea. The cycle starts again.	
Vocabulary	Solid Liquid Gas Melting point Boiling point Evaporation Condensation Degrees Celsius Volume Water vapor	
Enrichment & wider development	Complete experiments in class.	

Year 4 Spring 1		
Milestone LO: To identify how sounds are made, associating some of them with something vibrating. To recognise that vibrations from sounds, travel through a medium to the ear. To find patterns between the pitch of a sound and features of the object that produced it. To find patterns between the volume of a sound and the strength of the vibrations that produced it. To recognise that sounds, get fainter as the distance from the sound source increases		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Physics- sound	Know that… • Sounds are made when objects vibrate. Soundwaves makes the air around the object vibrate and the air vibrations then travel to and enter your ear. You are not able to see these vibrations. • Sound waves can travel through a medium (a medium can be a solid, liquid or gas) to get to the ear. The ear is the correct shape for picking up sound vibrations and they travel through to the ear drum that alerts the brain. • Sound can travel through solids (such as metal, stone and wood), liquids (such as water) and gases (such as air). • The pitch of a sound is how high or low the sound is. A high sound has a high pitch and a low sound has a low pitch. For example, A tight drum skin gives a higher pitched sound than a loose drum skin. • For a low pitch sound the soundwave with wave will be more stretched out and less frequent. • For a high pitch sound the soundwave will be tighter together and be more frequent. • When playing an instrument with strings the pitch of each string can be different based on different features • For example, the tighter the string is the higher the pitch because the quicker the string vibrates. Also, the shorter it is the higher the pitch because it vibrates quicker. • The volume of a sound is how loud or quiet the sound is. It is the difference between a weak vibration and a strong vibration. A weak vibration will make a sound wave which doesn't travel very far. A strong vibration which will have lots of energy makes a powerful wave which travels far. • A nail hit hard with a hammer will make a strong vibration, which means it will make a loud sound. • A nail hit gently with a hammer will make a weak vibration, which means it will make a quiet sound. • The volume of a sound can also depend on the distance from the source. • As you get further away from the source of a sound the volume of the sound is quieter.	Know how… • Scientists can set up simple practical enquiries to explore the ways different sounds can be made (using different size saucepan lids or elastic bands with different thicknesses). • Scientists can record findings using simple scientific language.
Vocabulary	Sound Medium Solid Liquid Gas Pitch Volume Soundwave Vibration	

Enrichment & wider development	Link to music lessons. Winchester science museum- sound hearing and vibration venture

Year 4 Spring 2, Year 4 Summer 1		
Milestone LO: To identify common appliances that run on electricity. To be able to construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. To identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. To recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. To recognise some common conductors and insulators, and associate metals with being good conductors. Big question: I have a bulb, 4 wires and a motor can I make a complete circuit to light up the bulb? How do you know?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Physics- electricity	Know that… • Electricity is created by generators which can be powered by gas, coal, oil, wind or solar. • Electricity is dangerous, so be careful when using electrical appliances. • There are lots of appliances that run on electricity. Electricity is a type of energy. • Appliances can convert electrical energy into other types such as: light, heat, movement and sound. • Appliances that use electricity for example are mobile games to game consoles to lights to kettles etc. • A circuit is a closed loop that electricity can flow around. • A circuit has different components (a battery, bulbs, buzzers, wires, motors, cells and switches). • A circuit will only work if it is complete because electricity cannot jump across a gap. • The first component when building a circuit is a cell or a battery which is needed to power the circuit. The circuit will not work without the battery. The flow is pushed by the battery, through the wires to the other components in the circuit. This makes a complete electrical circuit. • Wires are added between other components to allow the electricity to flow through. • A switch can be used to turn a circuit on or off by breaking the circuit and so that the flow of electricity stops. The switch can be used anywhere in the circuit to stop the flow of electricity through a component. • A bulb that is connected in a circuit will glow when electricity passes through it. • A buzzer will make a sound when electricity passes through it. • A motor will move when electricity passes through it. • A bulb, buzzer or motor will not work if the circuit is not complete. The bulb will not light up if the circuit is not a complete loop with a battery. • If a switch is off then a bulb will not light up because the circuit is broken. • Conductivity can be how easily electricity or thermal (heat) energy is passed through a material. • A conductor is a material that lets electrical energy pass through it easily. • Many metals, such as copper, iron and steel, are good electrical conductors. That is why the parts of electrical objects that need to let electricity pass through are always made of metal. • Metal is used in plugs to allow electricity to transfer from the wall socket, through the plug, and into a device such as a radio or TV. • In a light bulb, the metal filament conducts electricity and causes the light bulb to light up.	Know how… • Scientists can step up simple practical (revisiting from spring 1) enquiries by make circuits with different components and make observations. • Scientists can draw labelled diagrams of a circuit (revisiting from year 3). • Scientists can ask relevant questions and use scientific enquires to answer them (revisiting from year 3).

	• An insulator is a material that does not allow electrical energy to pass through it. • Plastic, wood, glass and rubber are good electrical insulators. That is why they are used to cover materials that carry electricity. • The plastic covering that surrounds wires is an electrical insulator. It stops you from getting an electrical shock **Note:** pupils may use the terms current and voltage but they should not be introduced or defined formally at this stage.	
Vocabulary	Electricity Appliances Circuits Components Battery Cell Wires Motor Bulb Buzzer Switch Conductor Insulator	
Enrichment & wider development	Visit from an expert.	

Year 4 Summer 2		
Milestone LO: To be able to recognise that living things can be grouped in a variety of ways. To explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. To recognise that environments can change and that this can sometimes pose dangers to living things. Big question: How can humans impact the environment?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Biology- Living things and their habitats	Know that… • A living thing is something that is able to carry out life processes such as movement, respiration, growth etc. (revisiting from year 1, 2 and 3). • Living things can be divided into groups or 'classified' by looking at similarities and differences between the way they look and behave. • Classification is putting things into groups. • Living things can be grouped into micro-organisms, plants and animals. • Micro-organisms are living things that are too small to be seen with the naked eye. For example, bacteria, microscopic animals (dust mites) or algae. • Plants are living things that grow from soil and turn light from the sun into food. Plants normally have leaves, a stem, roots and some have flowers. • Animals are living things that need food and water to live. However, unlike plants they do not make their own food, eat other animals or plants. • Animals could be classified these three groups but also, they could be subdivided into other groups. (children need a brief understanding of this) • Plants could be divided into flowering pants and non-flowering plants. • Animals can be divided into two main groups- vertebrate sand invertebrates. • Vertebrates are animals that have a backbone (a spine) for example fishes, amphibians (frogs), birds etc. • Invertebrates are animals without a backbone (no spine) for example jellyfish, worms, spiders etc. • An environment is all the physical surroundings on earth. The environment includes everything that is living and non-living. • All living things depend on the environment to provide them with food to eat, water to drink, air to breathe, and the space to grow and move. • On earth there are different types of environments. For example, rainforests, deserts, cities and oceans. Animals are adapted to live in certain environments (revisiting from year 2). • Different factors can change the environment throughout the year. For example, all environments change through the different seasons. These are changes that we expect most of the time. • However other things that can change an environment could be, an earthquake, hurricanes, volcanic eruptions, or wildfires. These are natural causes. • Some things that we do as humans could change the environment such as burning fossil fuels to power our homes, cutting down rainforests etc. • These changes in environments can pose dangers to living things.	Know how… • Scientists should use the local environment throughout the year to raise and answer questions to help them identify plants and animals in their habitat (revisiting from year 3 and autumn 1 and spring 2/summer 1). • Scientists can make simple guides or keys to explore and identify local plants and animals. • Scientists should use and develop keys and other information to classify and describe living things.

	• With the environments changing the animals may not be adapted to the new surroundings and they are not having the time to adapt putting them in danger. • Human impact on environment can be positive and negative. • Positive impact is the positive effects of nature reserves, ecologically planned parks or garden ponds because these environments are providing animals with everything they need to survive (water, and food). • The negative impact of humans are population and development, litter or deforestation. • Deforestation is when trees are cut down across a wide area which is then permanently cleared for another use. • Trees make oxygen for the earth and they provide shelter for animals. So, cutting the trees down will mean animals have nowhere to live. • Urbanisation (development and population) building more houses and roads. • When we build another road, or housing estate, pave our back • garden or make a driveway, we are taking away food sources from a hedgehog's environment, because worms, slugs and snails don't live on roads or concrete. When we put fences • between each garden, we cut off hedgehogs' chance to move around and look for food or find a mate. • Litter that we drop or is washed up on shores is dangerous for animals because they may eat it.	
Vocabulary	Living things Classification Micro-organisms Plants Animals Subdivided Vertebrate Invertebrate Environment Natural causes Human impact Population Deforestation Urbanisation	
Enrichment & wider development	Explore different environments around school or outside school grounds.	

Year 5

Year 5 Autumn 1		
Milestone LO: To compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal) and response to magnets. To give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Big Question- Why is plastic the best material for the handle of a saucepan to be made from?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Physics- properties and changes of materials	Know that… • A material is a substance (a thing that something is made from). Everything is made of materials (revisit from year 2 autumn 1). • Suitability means having the properties which are right for a specific purpose (revisit from year 2 autumn 1). • Certain materials are more suitable to make objects for particular uses (revisit year 2 autumn 1). • All materials have different properties (characteristics that allow us to differentiate between materials). Properties describe how a material behaves, and explain why it is well suited for a particular use. • Some properties of materials are their hardness, solubility, transparency, conductivity, and response to magnets. • Hardness is the resistance of a material to deformation. If a material is hard you cannot easily scratch it (lots of metals are hard materials). • Solubility means the material is able to be dissolved (particles are broken down so tiny you can't see them anymore) in specific liquid (usually water). • Transparency means that light is able to pass completely through it and you can see clearly through it. The opposite of transparent is opaque (not able to see through) (revisit from year 1). • Conductivity can be how easily electricity or thermal (heat) energy is passed through a material (revisiting from year 4) • Materials that are not good conductors are called insulators. These materials either keep heat or electricity on the inside or outside of the material. • Electrical conductivity is how easily electricity can be passed through a material (revisited from year 4). Some materials can easily pass electricity through it this makes it a good conductor (e.g. metal and graphite). Poor conductors of electricity are plastic and glass. • Thermal conductivity is how easily heat is passed through a material. A good thermal conductor is metal because heat passes easily through it. Fabric is a bad heat conductor. • Materials respond in different ways to magnets. Some materials are magnetic (means they are attracted to a magnet) (revisit from year 3). Specific metals like iron and steel are magnetic because they are attracted to a magnet. Most other metals are not magnetic. • Different materials are used for different purposes because of their properties. • Metals are good for cutlery, saucepans, coins etc. because they are hard and good conductors.	• Scientists can record data in a table. • Scientists can report and present findings from enquiries on properties of materials (line graphs).

	• Plastics are good at making bags, bottles and toys because they are not hard so can be shaped easily and they don't conduct heat or electricity. • Glass is good for windows or glasses because it is transparent. • Fabrics are used to make clothes because it is not hard it is flexible. It is also not a good conductor it insulates heat so is good for winter coats.	
Vocabulary	Properties Materials Hardness Conductivity Insulates Transparency Opaque Solubility Thermal Electricity Dissolved Magnetic	
Enrichment & wider development	Complete experiments in class.	

Year 5 Autumn 2		
Milestone LO: To know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. To use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. To be able to demonstrate that dissolving, mixing and changes of state are reversible changes. To explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. Big Question- If I burn wood can I change it back? Why or why not?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Chemistry- Changes of materials	Know that… • There are three states of matter (solids, liquids and gases) (revisiting from year 4 autumn 2). • A material is a substance (a thing that something is made from). Everything is made of materials (revisit from year 2 autumn 1 and year 5 autumn 1). • Some materials can dissolve in a liquid. • Some substances dissolve when you mix them with water (e.g. sugar, jelly or salt). It looks like it has disappeared but it is still there. It has mixed with the water to form a transparent (see through) liquid which we call a solution. • A substance that can dissolve in water is soluble. • Some substances don't dissolve in water these are insoluble substances. They will sink to the bottom of the liquid (e.g. sand or flour). • Dissolving, mixing and changes of state are reversible changes. • We can recover a substance that has dissolved in a solution by evaporation (the process of warm water turning to a gas which we call water vapour- revisiting from year 4 autumn 2). • When the liquid evaporates the solid dissolved substance is left as a residue. • Evaporation is a way of separating some mixtures (solids dissolved in a liquid). • If two solids are mixed together we can use the method of sieving to separate the two if one substance is bigger than the other then one will not fall through the holes in the sieve whilst the other one does. • If a solid and liquid mixes and the solid is insoluble (has not dissolved) then these can be separated by filtering. The mixture needs to be passed through filter paper, only the liquid will pass through the tiny holes in the filter paper. The solid particles that are too big to be passed through will sit on the surface of the filter paper. • A change of state is also reversible for example when ice (solid water) is melted it turns to water however this can be reversed by freezing the water which turns it back into a solid (revisiting from year 4 autumn 2). • The same happens with evaporation and condensation. When a liquid boils it evaporates but when it cools it condensates and turns back into a liquid. (revisiting from year 4 autumn 2). • However, some changes result in the formation of new materials and this kind of change is normally irreversible (not able to be turned back into its original form). This is mostly chemical reactions. • Heating can cause an irreversible change. For example, you heat a raw egg to cook it. The cooked egg cannot be changed back to a raw egg again. • Mixing some substances can cause an irreversible change. For example, when vinegar (an acid) and bicarbonate of soda are mixed, the mixture changes and lots of bubbles of	• Scientists can perform comparative and fair tests, and then present findings with explanations or and a degree of trust in results. • Scientists can report casual relationships and explanations between changes in materials (in oral or written form). • Scientists can use line graphs to record data.

	carbon dioxide are made (a chemical reaction). These bubbles and the liquid mixture left behind cannot be turned back into vinegar and bicarbonate of soda again. • Burning is also an irreversible change. When you burn wood, you get ash and smoke. You cannot change the ash and smoke back to wood again. The same happens when you burn paper. • These are irreversible because a new substance is formed at the end of the chemical reaction.	
Vocabulary	Substance Liquid Solid Gas Solution Soluble insoluble Dissolving Separating Sieving Filtering Evaporating Chemical Mixture Acid Irreversible	
Enrichment & wider development	Complete experiments in class.	

Year 5 Spring 1		
Milestone LO: To explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. To identify the effects of air resistance, water resistance and friction, that act between moving surfaces. To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. Big Question- Who will swim faster a fish or a jellyfish?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
	Know that… • Forces are just pushes and pulls in a particular direction. • Forces are shown by arrows in diagrams. The direction of the arrow shows the direction in which the force is acting. The bigger the arrow, the bigger the force. • Gravity is the force by which a planet or other body draws objects toward its centre. • The force of gravity also exists on the Moon but it is not as strong as it is on Earth. This is because the Moon is much smaller than our planet. • Objects that are unsupported will fall towards the earth because of gravity acting on the falling object pulling it towards the centre of the earth. • If we didn't have gravity we would all be floating but gravity is pulling us to the centre of the earth. • Isaac Newton studied maths and physics. He discovered gravity. Newton also wanted to know what keeps the Moon in its orbit, or path, around Earth. He thought that only an attraction, or pull, between Earth and the Moon could explain it. This pull was called gravity. Newton's work showed how gravity controls the motion of the planets around the sun as well as the motion of the Moon. • Forces also act between moving objects (air resistance, water resistance and friction). • Friction is a force that slows objects down and it can occur when an object moves through water or air. • Friction is a force between two surfaces that are sliding, or trying to slide, across each other. For example, when you try to push a book along the floor, friction makes this difficult. • Friction always works in the direction opposite to the direction in which the object is moving, or trying to move. Friction always slows a moving object down. • The amount of friction depends on the materials from which the two surfaces are made. The rougher the surface, the more friction is produced. Friction also produces heat. If you rub your hands together quickly, you will feel them get warmer. • Friction can be a useful force because it prevents our shoes slipping on the pavement when we walk and stops car tyres skidding on the road. When you walk, friction is caused between the tread on shoes and the ground. This friction acts to grip the ground and prevents sliding. • Air resistance is a type of friction between air and another material. • Objects with a large surface area (the total space that an object takes up) create more air resistance so they move more slowly though air. For example, a parachute has a large surface area so that you can float slowly down. • A plane is a long thin shape so that it has less air resistance and is able to move more easily through the air.	• Scientists will use scientific equipment with increasing accuracy and precision, taking repeat readings when appropriate. • Scientists can plan different scientific enquiries to answer questions including recognising and controlling variables where necessary. • Scientists can record date in bar graphs (revisiting from year 4).

	• Water resistance is the type of friction between air and another material. If you go swimming there is a friction between your skin and the water.	
Vocabulary	Gravity Forces Friction Air resistance Water resistance	
Enrichment & wider development	Science museum. Experiments in class.	

Year 5 Spring 2		
Milestone LO: To describe the movement of the Earth, and other planets, relative to the Sun in the solar system. To describe the movement of the Moon relative to the Earth. To describe the Sun, Earth and Moon as approximately spherical bodies. To use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. Big Question- Does Australia have winter in December? How do you know?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Physics- Earth and space	Know that… • The planet we live on is earth. • The Sun is the star at the centre of our solar system and it's orbited by eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Without the Sun, life on Earth would not be possible as it provides heat and light for our planet. • The Sun gives out heat and light and makes life possible on Earth. The heat and light from the Sun is felt and seen on Earth. • It takes Earth just one year to orbit the Sun. It is a hot sphere of gas. As well as orbiting the Sun, the Earth rotates on it's axis at 1000 miles an hour, completing one full rotation in 24 hours. • A moon is a celestial body that orbits a planet. Earth has one moon but Jupiter has four large moons and numerous small ones. • The Moon is a lot smaller and closer to Earth than the Sun. the moon is a rocky body probably with a metallic core. • The Moon orbits the Earth. This takes 28 days or one lunar month. • The Moon reflects light from the Sun and that is why we can see it. It is not a source of light but acts like a mirror. • As it orbits the Earth, we see the Moon from different angles each night. It appears to change shape as we see different parts of the surface lit up. These shapes are called the phases of the Moon. • As the Earth rotates on its axis, it rotates towards and away from the Sun and this is how we get night and day. • When the Earth rotates on its axis, half the Earth is facing the Sun which means it is daytime. The other half facing away from the Sun is in darkness so it is night time. • Due to the Earth's rotation, the Sun always rises in the East and sets in the West. • As well as the earth rotating on its axis (in 24hrs) it also takes one year to move around the sun. • The earth moving around the sun and the tilt not changing explains why in winter the days are shorter. • In June the northern hemisphere is tilted towards the sun so that makes it summer time because it is closer to the sun and exposed to the sun for a longer period of time. • Whereas in June the southern hemisphere is tilted away from the sun meaning they have shorter days in the sun because it is further from the sun. this is winter. • As the earth moves around the un this changes. Later in the year the earth is tilted the opposite way so in December the northern hemisphere experiences winter and the southern hemisphere experiences summer.	• Scientists can identify scientific evidence that has been used to support or refute ideas or arguments.
Vocabulary	Earth Sun	

	Moon Planets Orbit Axis Rotates Day time Night time
Enrichment & wider development	Planetarium

Year 5 Summer 1

Milestone LO: To describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. To describe the life process of reproduction in some plants and animals.

Big Question- Does the lifecycle of every animal start as an egg?

Concepts	Substantive Knowledge	Disciplinary Knowledge
	Know that… • A lifecycle is the different stages of life for all living things, including humans. • There are normally four major events in a lifecycle: birth, growth, reproduction (producing babies), death. • All animals change during their lifetime but this can happen at different speeds and can look different. Some animals will only change a little bit and may just get bigger and change shape. Other animals can change completely (for example a caterpillar to a butterfly). • The human life cycle is very slow. • All animals go through a lifecycle. • Most amphibians go through metamorphosis (the young look very different to from their parents and go through huge changes as they grow into adults). For example: frogs start as frogsprawn, then become tadpoles (small with tails), then the tadpoles grow legs, then it becomes a froglet, then it becomes a fully-grown frog. • Some insects undergo complete metamorphosis (4 stages: egg, larva, pupa and adult) and some go through incomplete metamorphosis (3 stages: egg, nymph, adult). • Complete metamorphosis: eggs laid, larva (the egg hatched into larva this could be a caterpillar, maggots or grubs), pupa (the pupa is usually where a hard case is formed around the larva), metamorphosis (changes into adult), adult (breaks out of pupa matures and lays more eggs). • Incomplete metamorphosis: egg, nymph (egg hatches into nymph, this varies based on species, looks like a small adult), adult (nymph grows into adult, sometimes shredding skin, females lay more eggs). • Lifecycle of a bird: egg, hatchling (chick breaks free from egg), nestling (chick stays in nest and relies on parent for food), fledgling (grows feathers and learns to fly), juvenile (can fly and begins to live independently), subadult (reaches maturity but not full adult), adult (fully grown and can begin to lay eggs). • Mammals lifecycle: embryo (grows inside mother), young (main period of growth), adult (independent from parent). • Reproduction means to have babies or offspring. This can be sexual or asexual. • To reproduce, animals need a male and a female. Together they can create offspring when they mate. This is called mating and is sexual reproduction. • After mating females get pregnant. If they are insects, or fish, or birds, or reptiles, they lay eggs. Mammals are unusual though we don't lay eggs. Our females keep their babies inside their own bodies, until they have developed enough to survive in the world. • During sexual reproduction a sperm from the male joins with an egg from the female. This is called fertilisation. • Some animals will produce lots of eggs because many of them won't grow into adults.	• Scientists should study and raise different kinds of questions about their local environment throughout the year. • Scientists should identify patterns that might be found in the natural environment.

	• Plants can reproduce sexually and asexually. • Sexual reproduction in plants happens in a cycle-like pattern. Flowers come from seeds, and they create seeds too. All flowering plants go through the following life cycle. Germination is the process by which a plant begins to grow from a seed. Roots form under the soil. The stem, leaves and flower emerge above the soil. Pollen produced by a flower is carried by insects or blown by the wind to another flower. This process is called pollination. When the pollen reaches another flower, it travels to the ovary where it fertilises the egg cells to make seeds. This process is called fertilisation. These seeds are scattered by animals or the wind. This process is called dispersal. Some of the seeds will grow into new plants. • Only one parent is needed in asexual reproduction and the offspring are exact copies. • Some plants can also reproduce without an egg cell being fertilised to produce a seed. Instead, these plants produce an identical copy of themselves. This type of reproduction is known as asexual reproduction. • Plants can reproduce asexually in a number of different ways. Some plants produce bulbs, like daffodils and snowdrops. Others, like potatoes produce tubers. These sit under the soil and develop into new plants the next year.	
Vocabulary	Lifecycle Birth Growth Reproduction Amphibians Metamorphosis Mammals Insects Birds Sexual reproduction Asexual reproduction Plants Animals Fertilisation Pollination	
Enrichment & wider development	Animal expert into school.	

Year 5 Summer 2		
Milestone LO: To describe the changes as humans develop to old age. Big Question- Name and explain the 6 stages of the human life cycle.		
Concepts	Substantive Knowledge	Disciplinary Knowledge

	Know that…
	• As humans age we develop and change. Our bodies change how they look and how they feel.
	• There are six stages in the human life cycle:
	  ○ 1. Foetus At this time, a baby is growing inside its mum's womb.
	  ○ 2. Baby: A baby is born after spending nine months inside the womb.
	  ○ 3. Childhood. At this stage, you learn to walk and talk.
	  ○ 4. Adolescence: Children become teenagers.
	  ○ 5. Adulthood: Your body is fully developed.
	  ○ 6. Old age: The last stage in the life cycle of a human
	• In childhood, children learn to walk and talk. At this age, children also learn to read, write and understand numbers.
	• In adulthood, humans height and muscles are fully developed.
	• Old age in adulthood is believed to begin at about 65yrs. During old age hair can become grey and hearing and vision can deteriorate. During old age, bones can shrink in size, and muscles generally lose strength and flexibility.
	• Adolescents go through lots of changes during puberty. Like changing body shape and growing hair in new places.
	• Puberty can be between the ages 8-13 for girls and 9-14 for boys. Everyone is different so adolescents can go through these stages at different times.
	• As well as their bodies changing adolescents, minds change too. They develop more independence and a better understanding of how others feel.
	• The changes that happen during puberty prepare the body to reproduce. By the end of puberty, human bodies are able to reproduce and have babies.
	• During puberty for girls, their bodies change shape: they get taller, their hips grow wider and their breasts grow. Girls grow more hair during puberty under their arms and between their legs. In addition, their hair and skin gets more oily, this can lead to more spots on their skin (called acne).
	• Girls will also start their periods during puberty. Periods happen because of changes in the womb. Around once a month, women's bodies prepare for growing a baby inside their womb. During this time the soft lining of the womb gets thicker. If a woman isn't pregnant this lining isn't needed so it falls away and comes out of the woman's vagina as blood.
	• Boys go through similar changes to girls during puberty but not exactly the same.
	• Boy's hair and skin also gets oiler during puberty. They will also get more body hair under their arms and between their legs. Unlike girls boys begin to grow facial hair.
	• During puberty boys bodies also change but in a different way to girls. Boys shoulders grow wider and their chest grows broader. Boys voices will get deeper.
		• Scientists should draw a timeline and use scientific language to indicate the stages of growth and development of humans.
		• Scientists can research the gestation periods of other animals and comparing them with humans.

Vocabulary	Foetus Baby	

	Childhood Adolescence Adult Old age Puberty Changes Growth
Enrichment & wider development	

Year 6

Year 6 Autumn 1		
Milestone LO: To describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. To give reasons for classifying plants and animals based on specific characteristics. Big Question- How can we classify a slug? Give reasons.		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Biology- living things are their habitats	Know that… • Living things can be divided into groups or 'classified' by looking at similarities and differences between the way they look and behave. (revisiting from year 4) • Classification is putting things into groups. (revisiting from year 4) • Animals are divided into two main groups- vertebrate sand invertebrates. (revisiting from year 4) • Vertebrates are animals that have a backbone (a spine) (revisiting from year 4) • Invertebrates are animals without a backbone (no spine) (revisiting from year 4). • Broad groups such as micro-organisms, plants and animals can be subdivided. • Vertebrates can be subdivided into fish, amphibians, reptiles, birds and mammals. • Invertebrates can be subdivided into insects, spiders, snails and worms. • Know why each one is placed in a particular group based on its characteristics. • Most invertebrates have a soft body with no spine. However, some invertebrates like a spider have a hard body but still no spine. • All mammals have hair, have lungs to breathe air, mothers give birth to live young and they are warm blooded (animals that maintain a constant body temperature). • Fish are animals that live underwater, have scales, fins, no legs, lay soft eggs and gills (to help them breathe underwater). • Amphibians are happy on land or water. They lay eggs near or in water. Amphibians are born in water with gills and they develop lungs which means they can breathe air and live on land. Most have four legs and some have no legs. • Reptiles have dry scaly skin, most lay eggs but some give birth to live young, have lungs to breathe air and are cold blooded (animals whose body temperature varies with that of the environment). • Birds have a backbone, no teeth, a sharp beak, have two wings (but not all can fly), have two legs, have feathers, they lay eggs and are warm blooded. • Carl Linnaeus is a Swedish biologist. He came up with a way of classifying animals. • Carl used his new classification system, called taxonomy. He uses observation and recording of data to make conclusions of different groups to classify organisms into. • Carl Linnaeus wrote a book on his classification system.	• Scientists can observe and classify into groups (revisiting rom year 1,2,3,4). • Scientists can give reason (revisiting from autumn 1) for their classifications. • Scientists should make their own decisions about what observations to make.
Vocabulary	Classification Vertebrates Invertebrates Micro-organisms Mammals	

	Fish Birds Amphibians Reptiles
Enrichment & wider development	Animals brought into to school or children go somewhere to see animals.

Year 6 Autumn 2		
Milestone LO: To recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. To recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. To identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. Big Question- Why do we not look exactly like our parents?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Biology- evolution and inheritance	Know that… • Living things have changed over the years and some will be different now to when they were alive years ago. • Fossils show us species that once inhabited (lived on) earth. • Fossils are the preserved remains or traces of dead organisms. They show us how living things and the environment have changed since the time they were alive. • Fossils have been found in rocks of all ages, going back billions of years. However, most of the species found in the fossil record have died out or become extinct (when there are no individuals of that species left alive) (revisiting from year 3). • Fossils can be found in surprising places and they can tell us about the past. We call all of the fossils we have found the fossil record. This record shows us how living things have changed from simple life forms billions of years ago. • Not all fossils have been found and some may have been destroyed so there are gaps in the fossil record. • Not every organism will turn into a fossil only organisms that die in specific conditions will go on to become a fossil. The fossilisation process is rare. (revisiting from year 3). • Stages of fossilisation: an animal or plant is buried in sand or mud, the soft parts including muscles rot away leaving the hard parts behind, layers of sediment (a naturally occurring material) build up, sediment is compacted (squashed) into rock, water in the rock dissolves the bones, and then minerals in the water are deposited. When a rock is dug up the fossil is found. (revisiting from year 3). • Inheritance is when living things pass on characteristics to their offspring (baby). An offspring will look like their parents but not exactly the same. A puppy may have the same colour fur as its mum but its face may look like its dads. • There are some key characteristics that we inherit from our birth parents. These include your eye colour, skin colour, shape of your ears and whether you can roll your tongue or not. • We don't inherit everything from our parents. For example, things like hairstyles, scars and ear piercings are not passed on. • Identical twins are often very similar to look at. If you have a brother or sister and aren't an identical twin you are still likely to be very similar, but you are probably not identical. This is because different offspring from the same parents don't inherit the same mix of characteristics. These differences are called variation. • Adaptation is a word used to describe the fact that an animal's (or plant's) features are suited to its habitat and to the type of food that it eats.	• Scientists can be planned different types of enquiries to answer questions, including recognising and controlling variables (revisiting rom year 5). • Scientists can talk about how scientific ideas have developed over time.

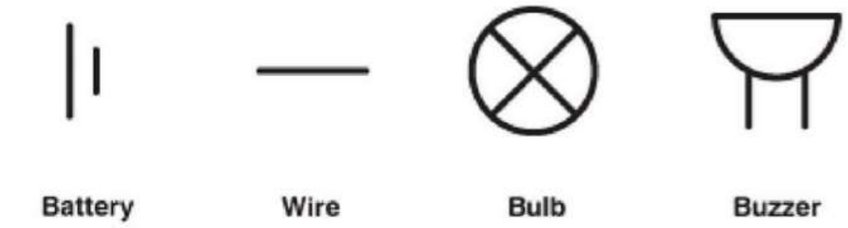
	• Over time, all living things such as plants and animals have changed or adjusted in different ways to suit their environment to help them survive. These special features are called adaptations. • Some animals are very specialised and are only adapted to live in one particular habitat e.g. otter. Some animals are more general and can live in lots of different habitats e.g. red fox. • A squirrel spends lots of time up trees therefore they have short front legs and longer hind legs to help them leap easily from tree to tree. They also have long tails to help them balance on branches. • Bats are the only mammals that are able to fly. The wings are made of a double layer of elastic skin, the forearm and fingers being adapted to provide a framework. • Evolution is the process by which small changes in organisms occur over long periods of time and new species are formed. • Evolution explains how the living things on our planet today have slowly developed from simpler life forms that lived millions of years ago. • Charles Darwin was the first person to explain how evolution happens. • Charles Darwin observed that although individuals in a species shared similarities, they were not exact copies of each other; there were small differences or variations between them. • He also noticed that everything in the natural world was competing to survive. The winners had better chance of survival. Some adapted and adjusted their characteristics to give them a better chance of survival. • For example if they were stronger, faster, more clever, or more attractive than others in their species were. They were more likely to survive and therefore more likely to reproduce and pass their characteristic on to their offspring through inheritance. • Likewise, individuals that were poorly adapted to their environment were less likely to survive and so there characteristics were less likely to be inherited because they wouldn't survive long enough to reproduce. • Over time, the characteristics that help survival become more common and a species gradually changes. If there are many small changes over the years eventually, these changes could add up to a new species evolving. • In 1959, Charles Darwin published his scientific theory of natural selection in a book called 'On the Origin of Species'. • This theory explained how every living thing is connected to a family tree that stretches back billions of years ago to the beginning of life on earth. Every species evolved from another.	
Vocabulary	Fossils Preserved Sediment compacted Deposited Inheritance Offspring Adaption Habitat	

	Evolution Characteristics Survival Species
Enrichment & wider development	Nature trail. Trip to a beach or fossil centre.

Year 6 Spring 1

Milestone LO: To associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. To compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. To use recognised symbols when representing a simple circuit in a diagram.

Big Question- if I put 3 bulbs in a circuit will this make them brighter? Give reasons.

Concepts	Substantive Knowledge	Disciplinary Knowledge
Physics- electricity	Know that… • Electricity is created by generators, which can be powered by gas, coal, oil, wind or solar. Electricity is dangerous, so be careful when using electrical appliances. A circuit is a closed loop that electricity can flow around. A circuit has different components (a battery, bulbs, buzzers, wires, motors, cells and switches). (revisiting from year 4 spring 1 and summer 2) • Current is the flow of electricity down a wire. • Voltage (V) is the 'push' which makes the electricity flow around a circuit. Circuits with lots of components need more voltage because they need more electrical energy pushed to them. • The current is the same everywhere in a series circuit therefore, it doesn't matter where you put the bulb in the circuit the brightness will always be the same. • However, the more batteries or cells used in a circuit, will create a higher voltage which means bulbs will be brighter and buzzers will be louder. • If you add multiple bulbs or buzzers they will be quieter and dimmer because it will reduce the electrical flow in the circuit. • A switch breaks the circuit and the flow of electricity stops. The switch can be used anywhere in the circuit to stop the flow of electricity through a component. • If a switch is on then the circuit is complete and electricity can flow around. However, if the switch is off there is a gap in the circuit and therefore the current is stopped. • If the current is stop none the bulbs and buzzers will not work. • To recognise these symbols.  	• Scientists should draw complex scientific diagrams using recognised symbols. • Scientists should use scatter graphs to record data. • Scientists should use bar graphs and line graphs to record data (revisiting from year 5) • Scientists should choose how to record data from a choice of familiar approaches. • Scientists should look for casual relationships in their data and identify evidence that refutes or supports their ideas (revisiting rom year 5).

Vocabulary	Circuit Electricity Current Voltage Battery Cell Wire Bulb Buzzer Motor Switch Flow Component
Enrichment & wider development	Experiments in class.

Year 6 Spring 2		
Milestone LO: To recognise that light appears to travel in straight lines. To use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. To explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. To use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. Big Question- What is the best position for a review mirror in a car?		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Physics- light	Know that… • We need light to see. Light can come from different sources (the sun, stars, torches, lamps, candles etc.) (revisiting from year 3). • Dark is when there is an absence (lack) of light (revisiting from year 3). • Some sources (the sun and some indoor lights) of light are very bright and these can damage our eyes. We must not look directly at these lights and we must protect our eyes using sunglasses. You must never shine a light into someone's eye either (revisiting from year 3). • Light can be reflected. A reflection involves a light source and a surface. The light travels towards the surface and bounces off of it. Most objects reflect a little bit of light but mirrors reflect lots of light (revisiting from year 3). • When light is reflected by a surface it changes direction. It will bounce off the surface at the same angle that it hit it at (revisiting from year 3). • Smooth and shiny surfaces (mirrors and polished metals) reflect light well (revisiting from year 3). • Dull and dark surfaces (such as dark fabrics) do not reflect light well because they absorb (take in) it (revisiting from year 3). • Light travels in a straight line (revisiting from year 3) • Light travels as a wave. • Light is a form of energy. When we say light, we mean the energy that we can detect with our eyes. When light enters our eyes, our brain interprets this into images we can 'see'. • We can see objects because either they give out light or they reflect light into our eyes. When light hits an object, it is reflected by that object and travels in straight lines to our eyes. Light travels in straight lines so when light hits an object it will be reflected at an angle. • If an object is transparent (see through- revisited from year 1). Light passes through these objects clearly (revisiting from year 3). • Translucent (not completely clear) objects let through some light (revisiting from year 3). • Opaque (not see through) objects let no light through (revisiting from year 3). • When an opaque object is put in front of a light source it prevents the light from passing through. The absence (describe something that isn't there) of light creates a dark shape on the surface behind it. This is called a shadow (revisiting from year 3). • Shadows are the same shape as the object that is casting it because light travels in straight lines. A shadow is the exact same shape as the object causing the shadow. • Shadow will also be the same shape as the object however if we move the position of the light source we can change the size of the shadow (revisiting from year 3).	• Scientists should use test results to make predictions to set up further comparative and fair tests.

	• The closer to the light source an object is, the bigger the shadow will be. This is because the object blocks more of the light. • The further away from the light source an object is, the smaller the shadow will be. This is because the object blocks less of the light. • When the light source moves directly above an object, the shadow will be directly below the object. • When the light source is to one side of the object, the shadow will appear on the opposite side and the shadow will be longer.	
Vocabulary	Lights Shadows Opaque Transparent Translucent Reflection Straight line Angles Energy	
Enrichment & wider development	In class experiments.	

Year 6 Summer 1		
Milestone LO: To identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. To describe the ways in which nutrients and water are transported within animals, including humans. Big Question- How important is our heart? Give reasons.		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Biology- animals including humans (circulation)	Know that… • The circulatory system is made up of three parts: the heart, blood vessels and the blood itself. • The heart keeps all the blood in your circulatory system flowing. The heart is a very strong muscle and plays an important part in being healthy. It keeps all the blood in your circulatory system flowing. • The blood travels through a network of blood vessels to everywhere in your body. It carries useful materials like oxygen, water and nutrients and removes waste products like carbon dioxide. • Blood vessels are a series of tubes inside your body. They move blood to and from your heart. • The circulatory system transports water and nutrients around the body. Not all animals have the same system though. • All mammals have a circulatory system that involves the heart, blood and blood vessels. • The circulatory system transports water and nutrients around the body. Not all animals have the same system though. • The heart first pumps blood to your lungs. Here, the blood picks up oxygen from the air that you have breathed in. The blood (carrying oxygen) then travels back to your heart. The heart gives the blood a second push. This time, it's sent all around the body to the various organs and tissues. The blood travels back to the heart and it all begins again. • The blood goes through the heart twice in this loop, so we call it a double circulatory system. This needs to be very efficient because mammals require lots of energy to live. As blood stays within the blood vessels they have a closed system. • Fish have gills instead of lungs. Oxygen in water moves into their blood via their gills. Their circulatory system has the same three parts as a mammal but they are in a different order: heart-gills- rest of body. This only passes through the heart once, this is called a single circulatory system. Fish also have a closed system so their blood stays in their vessels. • Insects have a different system from mammals and fish. They don't have lungs or gills (to pick up oxygen) but have lots of tiny tubes that run into their bodies. They don't have a closed system of blood vessels so their blood moves freely around their organs. This is called an open circulatory system.	• Scientists can report and present findings from enquires including conclusions, casual relationships and explanations or=f and a degree of trust in results, in oral and written forms (revisiting from year 5).
Vocabulary	Circulatory system Heart Blood Blood vessels Oxygen Nutrients	

	Transports Organs Tissues
Enrichment & wider development	

Year 6 Summer 2		
Milestone LO: To recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Big Question- Explain how you can look after your body. Give reasons.		
Concepts	Substantive Knowledge	Disciplinary Knowledge
Biology- animals including humans (healthy bodies)	Know that… • The body needs a balanced diet, exercise and enough sleep. • It's important to eat a varied and balanced diet to stay healthy. You need to drink plenty of water and eat at least five portions of fruit and vegetables every day. • A balance involves and eating the right amount of foods from the different food groups: • Carbohydrates give us energy. They are found in foods such as bread, potatoes and pasta. • Proteins help our bodies to repair themselves. They are found in foods such as fish, meat, beans, nuts, seeds, eggs and cheese. • Fats help store energy for our bodies. They are found in foods such as butter, cheese, nuts and fried food. • Fibre is important for helping us digest our foods. It's found in fruit and vegetables. • You also need to make sure you exercise regularly to keep your heart, lungs and muscles strong and healthy. • Our muscles make our bones move during physical activity. When a muscle tightens it pulls the bones attached to it into a new position. • When we do more physical activity, our muscles become stronger and they can work harder. Our bones grow stronger too because physical activity puts pressure on them. • It's also important to get plenty of sleep to make sure your body has time to recover and recharge. • As we are more active, we get fitter. Our lungs get better at taking in oxygen from the air. Our hearts get stronger and better at pumping oxygen to our muscles through our blood. • Drugs can cause damage to our brains, heart and other important organs. While using drugs, people are also less able to do well in school, sports, and other activities. It's often harder to think clearly and make good decisions.	• Scientists can use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas.
Vocabulary	Balanced diet Exercise Sleep Carbohydrates Protein Fats Fibre Heart Lungs Muscles Active	
Enrichment & wider development	Visit from health professional.	