Curriculum Progression- Science

Substansive Knowledge only. Disaplinary Skills on a separate document

		Year 3				
Topic Knowledge	**Science unit**	**Rocks and Soils** **Physics**: Materials have different properties. **Chemistry**: What things are made of and how they are changed.	**Light** **Physics:** How we see, hear and communicate (senses) **Physics:** Materials have different properties.	**Forces and Magnets** **Physics:** How forces make things happen	**Plants** **Biology:** Similarities and difference in living things. **Biology:** Growing and reproducing.	**Animals incl Humans** **Biology:** Similarities and difference in living things. **Biology:** Growing and reproducing. **Biology:** Staying healthy
	Link to school values	**Together we Embrace Difference** Rocks and soils are all different and allow different parts of our planet to flourish because of it.	**Together we are Problem Solvers** Solve problems related to light and shadows.	**Together we are Safe** To take part in practical lessons safely	**Together we are Problem Solvers** Solve problems related to plants and growth.	**Together we embrace difference** There are differences in the food that different animals need and the way their bodies are designed.
	New Key Vocabulary	Properties, observable characteristics, permeable, impermeable, fossil, sediment, sedimentary, durability, hardness, Venn Diagram	Light energy, light source, reflect, transparent, translucent, opaque, shadow, reflect, UV rays	Force, Venn diagram, magnetic force, magnet, poles, attract, repel	Nutrients, pollination, seed formation, seed dispersal, photosynthesis, reproduction	Nutrition, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, vertebrate, invertebrate
	End points	• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. ● Recognise that soils are made from rocks and organic matter.	● Recognise that they need light in order to see things, and that dark is the absence of light. ● Notice that light is reflected from surfaces. ● Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. ● Recognise that shadows are formed when the light from a light source is blocked by an opaque object. ● Find patterns in the way that the size of shadows change.	• Compare how things move on different surfaces. • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract or repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets will attract or repel each other, depending on which poles are facing.	• Identify and describe the functions of different parts of flowering plants: roots; stem/trunk; leaves; and flowers. • Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. • Investigate the way in which water is transported within plants. • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	• 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. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement.
	Crucial knowledge (**Bold** indicates knowledge that must be known to meet the 2018 Teacher Assessments for the End of KS2 assessment)	• **Rock is a naturally occurring material.** • **There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft.** • **They have different sizes of grain or crystal.** • **They may be permeable or impermeable (absorb water or not).** • Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). • There are different types of soil (clay, chalk, sandy, peat) which have different properties. • Some sedimentary rocks contain fossils. • **Fossils are formed when plants or animals are buried by sediment. Over millions of years, the sediment hardens into rock, preserving the shape of the original plant or animal.**	• Light is a form of energy. • We see objects because our eyes can sense light. • Dark is the absence of light. • We cannot see anything in complete darkness. • Some objects are sources of light. • All surfaces reflect light but shiny surfaces reflect lighter much better. • The UV light from the sun can damage our eyes and therefore we should not look directly at the sun and should protect our eyes. • **Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface, blocking some of the light.** • **The size of the shadow depends on the position of the light source and the object.**	• **A force is a push or a pull.** • When an object moves on a surface, the texture of the surface and the object affect how it moves – making it easier or harder to move on different surfaces. • A magnet attracts magnetic materials. • Some, but not all, metals are magnetic (iron and nickel). • Magnets have two poles – a north pole and a south pole. • **Two like poles will push away from each other – repel.** • **Two unlike poles will pull together – attract.** • **For some forces to act, there must be contact.** • **Some forces can act at a distance meaning the magnet does not need to touch the object that it attracts.** • **Magnetism is an example of a force that works at a distance.**	• **The roots absorb water and nutrients from the soil and anchor the plant in place.** • **The stem transports water and nutrients/minerals around the plant** • **The stem holds the leaves and flowers up in the air to help them to function effectively.** • **The leaves produce the plant's food/energy.** • **Some plants produce flowers** • **Pollen is transferred between flowers to form seeds (reproduce)** • **Different plants require different conditions for germination and growth but always need water, sunlight, warmth, air and space.**	• Unlike plants, animals need to eat in order to get the nutrients they need. • Food contains a range of different nutrients that are needed by the body to stay healthy. • A piece of food will often provide a range of nutrients. • Humans, and some other animals, have skeletons that provide support for the body and protection to important internal organs (e.g. heart and brain). • Humans, and some animals, have muscles which enable their skeletons to move.

Substantive Concepts		**Materials** Year 3 understanding Materials are what objects are made of. Materials all have different properties which means they are suitable for different purposes. We can compare and group rocks and soils based on their appearance and physical properties.	**Energy** Year 3 understanding Energy is what makes things happen. It gives us the power to move, grow, and stay warm. Energy can come from many places such as food (animals) and sunlight (plants). **Senses** Year 3 understanding We need light in order to see. Light is reflected from surfaces. **Light** Year 3 understanding As the previous box plus: Shadows are formed when light is blocked by an opaque object.	**Force** Year 3 understanding A force is a push or a pull that can make something move, stop, change direction, or change shape. Some surfaces are easier to move over than others due to a force called friction. Magnetism is a force that works at a distance. **Materials** Year 3 understanding Materials are what objects are made of. Materials all have different properties which means they are suitable for different purposes. We can compare and group rocks and soils based on their appearance and physical properties. The physical properties of some metals are that they are magnetic. Some metals and all other materials are not magnetic.	**Living Things** Year 3 understanding Plants are living things. **Growing and reproducing** Year 3 understanding The structure of a plant enables it to grow effectively. Plants need water, sunlight, warmth, air and space to germinate and grow. The amounts of each vary from plant to plant. Flowers produce seeds which will grow into new plants (reproduction).	**Living Things** Year 3 understanding Plants are living things. Animals are also living things. Some animals have a skeleton that provides support for the body and protects important internal organs. Muscles allow the skeleton to move. **Growing and reproducing** Year 3 understanding Plants need water, sunlight, warmth, air and space to germinate and grow. The amounts of each vary from plant to plant. Flowers produce seeds which will grow into new plants (reproduction). Animals also need nutrients to grow healthily. **Staying healthy** Year 3 understanding Animals get their nutrient from the food they eat. Different foods contain different types and amounts of nutrient. Animals need to eat the right combinations of foods to stay healthy.
Misconceptions		Some children may think: • rocks are all hard in nature • rock-like, man-made substances such as concrete or brick are rocks • materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural' • certain found artefacts, like old bits of pottery or coins, are fossils • a fossil is an actual piece of the extinct animal or plant • soil and compost are the same thing.	Some children may think: • we can still see even where there is an absence of any light • our eyes 'get used to' the dark • the moon and reflective surfaces are light sources • a transparent object is a light source • shadows contain details of the object, such as facial features on their own shadow • shadows result from objects giving off darkness.	Some children may think: • the bigger the magnet the stronger it is • all metals are magnetic.	Some children may think: • plants eat food • food comes from the soil via the roots • plants only need sunlight to keep them warm • roots suck in water which is then sucked up the stem.	Some children may think: • certain whole food groups like fats are 'bad' for you • certain specific foods, like cheese are also 'bad' for you • diet and fruit drinks are 'good' for you • snakes are similar to worms, so they must also be invertebrates • invertebrates have no form of skeleton.

		Year 4				
Topic Knowledge	**Science unit**	**States of Matter** **Physics**: What properties materials have. **Chemistry**: What things are made of and how they are changed.	**Sound** **Physics:** How do we see, hear and communicate (sense) **Physics:** Materials have different properties	**Electricity** **Physics:** How do we see, hear and communicate? **Physics:** How does electricity work?	**Living Things and their Habitats** **Biology:** Similarities and difference in living things. **Biology:** Environments for living Things (habitats)	**Animals Including Humans** **Biology:** Similarities and difference in living things.
	Link to school values	**Together we are safe – (due to heating and cooling materials)**	**Together we are safe** Our ears are delicate and we most work safely to protect them.	**Together we are safe** Electricity can be dangerous – we must use it carefully	**Together we Embrace Difference** We can group and classify living things based on their similarities and differences.	**Together we Safe** We can look after our bodies more effectively if we understand how tey work.
	New Key Vocabulary	Solid, liquid, gas, evaporate/tion, condense/ation, boiling, The Water Cycle	Sound, source, vibrate, vibration, medium, pitch, volume	Electricity, electrical appliance/device, mains electricity, electrical circuit, component, cell, battery, connect/connections, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal	classification keys, environment, habitat, human impact, food chains, producer, predator, prey, in/vertebrates	Inscisors, canines, molars, digestive system, oesophagus, stomach, large intestine, small intestine, rectum, anus
	End points	• Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	• Identify how sounds are made, associating some of them with something vibrating. • Recognise that vibrations from sounds travel through a medium to the ear. • Find patterns between the pitch of a sound and features of the object that produced it. • Find patterns between the volume of a sound and the strength of the vibrations that produced it. • Recognise that sounds get fainter as the distance from the sound source increases.	• Identify common appliances that run on electricity. • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. • Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. •Recognise some common conductors and insulators, and associate metals with being good conductors.	• Recognise that living things can be grouped in a variety of ways. • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. • Recognise that environments can change and that this can sometimes pose dangers to living things.	• describe the simple functions of the basic parts of the digestive system in humans • identify the different types of teeth in humans and their simple functions • construct and interpret a variety of food chains, identifying producers, predators and prey
	Crucial knowledge (**Bold** indicates knowledge that must be known to meet the 2018 Teacher Assessments for the End of KS2 assessment)	• **A solid is made up of particles held together tightly with strong bonds which means they can be held, keep its shape and has a fixed volume.** • **A liquid is made up of particles that are held together but not as tightly as a solid. This means they have a fixed volume but changes in shape to fit the container.** • **A liquid can be poured and keeps a level, horizontal surface.** • **A gas fills all available space; it has no fixed shape or volume.** • **Melting is a state change from solid to liquid.** • **Freezing is a state change from liquid to solid.** • **Boiling is a change of state from liquid to gas.** • **Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid.** • **Condensation is the change back from a gas to a liquid caused by cooling.** • **Changing state happens at different temperatures for different materials.** • **The water cycles involves changes of state include evaporation and condensation.**	• **A sound produces vibrations which travel through a medium (a solid, liquid or gas) from the source to our ears.** • The volume of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. • **Sounds decrease in volume as you move away from the source.** • Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. • **Smaller (shorter, thinner) objects usually produce higher pitched sounds.**	• Many household devices and appliances run on electricity. • Some plug in to the mains and others run on batteries. • **An electrical circuit consists of a cell or battery connected to a component using wires.** • **If there is a break in the circuit or a loose connection, the component will not work.** • **A switch can be added to the circuit to turn the component on and off.** • Metals are good conductors so they can be used as wires in a circuit. • **An electrical conductor is a material that lets electricity flow through it easily.** • Non-metallic solids are insulators. • **An electrical insulator is a material that electricity cannot pass through easily.**	• Living things can be grouped (classified) in different ways according to their features. • **A simple food chain can identify and name different sources of food.** • **Scientists use producer, predator and prey to construct and interpret a variety of food chains.** • Living things live in a habitat which provides an environment to which they are suited. • Environments may change naturally, through human activity or season by season. • **Changes in environments will have an impact on the plants and animals that live there.**	• **Digestion starts when the teeth start to break down the food and mix it with saliva.** • **The food is swallowed and passes through the oesophagus in the stomach.** • **In the stomach, food is mixed with chemicals that break it down further into a sludge.** • **Food passes into the small intestine where nutrients are removed for use elsewhere in the body.** • **The food then passes into the large intestine where water is removed for use elsewhere in the body.** • **What's left is then stored in the rectum until it leaves the body through the anus when you go to the toilet.** • **Humans have 4 types of teeth: incisors for cutting; canines for tearing; and molars and premolars for grinding and chewing.**

Substantive Concepts	**Key Concepts**	**Materials** Year 4 definition Materials are what objects are made of. Materials all have different properties which means they are suitable for different purposes. We can compare and group rocks and soils based on their appearance and physical properties. We can compare and group together materials according to whether they are a solid, liquid or gas. We can change the state of some materials by heating or cooling them.	**Senses** Year 4 understanding We need light in order to see. Light is reflected from surfaces. Sound is made by vibrations that travel through a medium to our ears. Alteration in these vibrations can change the volume or pitch of the sounds we hear. **Materials** Year 4 definition Building on the previous Y4 topic: sounds can travel through solids, liquids and gases. The physical properties of an object affect the sound made (especially the pitch).	**Energy** Year 4 understanding Energy is what makes things happen. It gives us the power to move, grow, and stay warm. Energy can come from many places such as food (animals) and sunlight (plants). Electrical energy is a form of energy. **Materials** Year 4 understanding Materials are what objects are made of. Materials all have different properties which means they are suitable for different purposes. We can compare and group rocks and soils based on their appearance and physical properties. The physical properties of some metals are that they are magnetic and can connect electrity. Some metals and all other materials are not magnetic and are electrical insulators.	**Living Things** Year 4 understanding Plants are living things. Scientists use classification keys to help group, identify and name living things based on their physical characteristics. We can represent the food that animal eat in a food chain. **Habitats** Year 4 understanding Habitats can be changed by nature, human interaction and/or by seasons. This can either help or harm the living things in this habitat.	**Staying healthy** – Year 4 understanding Animals get their nutrient from the food they eat. Different foods contain different types and amounts of nutrient. Animals need to eat the right combinations of foods to stay healthy. The food we eat travels through our digestive system. The nutrients from the food are absorbed from the digestive system for use in the rest of the body.
Misconceptions		Some children may think: • 'solid' is another word for hard or opaque • solids are hard and cannot break or change shape easily and are often in one piece • substances made of very small particles like sugar or sand cannot be solids • particles in liquids are further apart than in solids and they take up more space • when air is pumped into balloons, they become lighter • water in different forms – steam, water, ice – are all different substances • all liquids boil at the same temperature as water (100 degrees) • melting, as a change of state, is the same as dissolving • steam is visible water vapour (only the condensing water droplets can be seen)	Some children may think: • sound is only heard by the listener • sound only travels in one direction from the source • sound can't travel through solids and liquids • high sounds are load and low sounds are quiet.	Some children may think: • the bigger the magnet the stronger it is • all metals are magnetic.	Some children may think: • the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain • there is always plenty of food for wild animals • animals are only land-living creatures • animals and plants can adapt to their habitats, however they change • all changes to habitats are negative.	Some children might think that: • Food goes into your lungs if you talk while eating. • The stomach is where all food is absorbed. • Only bones are inside our bodies.

		Year 5				
Topic Knowledge	**Science unit**	**Properties and Changes of Materials** **Physics**: What properties materials have. **Chemistry**: What things are made of and how they are changed.	**Forces** **Physics**: How forces make things happen.	**Earth, Sun and Moon:** **Physics:** How forces make things happen/How the earth fits into the universe	**Living things and their habitats:** **Biology:** Similarities and difference in living things. **Biology:** Growing and reproducing	**Animals including Humans:** **Biology:** Growing and reproducing
	Link to school values	**Together we Are Safe** We carry out investigations carefully and safely.	**Together we Are Safe** We carry out investigations carefully and safely.	**Together we Embrace Difference** There are similarities and difference in how objects move and interact in space.	**Together we Embrace Difference** Different living things reproduce in different ways.	**Together we Embrace Difference** Different living things grow and develop in different ways and at different ages
	New Key Vocabulary	Thermal conductor, thermal insulator, soluble, insoluble, solution, absorbent, filtering, sieving, dissolving, reversible, irreversible	Contact force, non-contact force, gravity, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears	Earth, Sun, Moon, spherical, solar system, rotates, star, orbit, planets, axis	Life-cycle, sexual, asexual, bulbs, tubers, runners, offspring, reproduction, metamorphosis,	adolescent, puberty, pubic hair, hormones, genitals, sperm testicles, penis, erection, ejaculation, wet dreams, ovaries, breasts, discharge, menstruation, period, vagina, the menstrual cycle
	End points	• Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. ● Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	● Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. ● Identify the effects of air resistance, water resistance and friction that act between moving surfaces. ● Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	● Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. ● Describe the movement of the Moon relative to the Earth. ● Describe the Sun, Earth and Moon as approximately spherical bodies. ● Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.	• Describe the life process of reproduction in some plants and animals. • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.	• Describe the changes as humans develop to old age.
	Crucial knowledge (**Bold** indicates knowledge that must be known to meet the 2018 Teacher Assessments for the End of KS2 assessment)	• **Properties include hardness, transparency, absorbency, electrical and thermal conductivity and attraction to magnets.** • **The use of different materials for different uses is dependent on these properties.** • **Some materials will dissolve in a liquid and form a solution while others are insoluble** • **Mixtures can be separated by filtering, sieving and evaporation.** • **Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.**	• **Gravity is a force that acts at a distance.** • **Everything is pulled to the Earth by gravity. This causes unsupported objects to fall.** • **Air resistance, water resistance and friction are contact forces that act between moving surfaces.** • **A mechanism, such as a level, pulley or gear, is a device that allows a small force to be increased to a larger force.**	• The Sun is a star and a natural light source. • **The sun at the centre of our solar system.** • **There are 8 planets, including Earth, and these travel around the Sun in fixed orbits.** • **The Earth rotates on its axis every 24 hours.** • **As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night).** • **As the Earth rotates, the Sun appears to move across the sky.** • **The Moon orbits the Earth.** • **The Sun, Earth and Moon are approximately spherical.**	• **As part of their life cycle, plants and animals reproduce.** • Most animals reproduce sexually. This involves male cells (sperm/pollen) join female cells (eggs/ovules) • **Animals, including humans, have offspring which grow into adults.** • **In mammals, these offspring will be born live and then grow into adults.** • **Birds, reptiles, amphibians and fish lay eggs which hatch. The young will then grow to adults.** • **Some amphibians and insects undergo a further change before becoming adults. This is called a metamorphosis.** • **Plants reproduce both sexually and asexually.** • **Sexual reproduction in plants occurs through pollination, usually involving wind or insects.**	• When babies are young, they grow rapidly, depend on parents and gain new skills rapidly. • During puberty, a child's body changes and develops to enable the adult to reproduce. • Puberty affects everyone slightly differently. Typically, puberty usually happens between ages 10 and 14 for girls, and ages 12 and 16 for boys • As we age, parts of our body do not work as well as they once did. • During puberty, girls will start their periods as part of their menstrual cycle. • The menstrual cycle involves mature eggs being released from the ovaries and making its way to the uterus. If the egg is not fertilised, the uterus lining is shed in the menstrual flow (period).

Substantive Concepts	**Key Concepts**	**Materials** Year 5 understanding Materials are what objects are made of. Materials all have different properties which means they are suitable for different purposes. We can compare and group rocks and soils based on their appearance and physical properties. We can compare and group together materials according to whether they are a solid, liquid or gas. We can change the state of some materials by heating or cooling them. We can justify the use of materials for different purposes, compare and group materials based on their hardness, solubility, transparency, absorbency, conductivity (electrical and thermal), and response to magnets.	**Force** Year 5 Understanding A force is a push or a pull that can make something move, stop, change direction, or change shape. Some surfaces are easier to move over than others due to a force called friction. Magnetism is a force that works at a distance – a non-contact force. Gravity is the name of the force that pulls objects towards the centre of the earth. This is a non-contact force. Friction is a force that acts in the opposite direction to the direction of movement. Friction is a contact force. It is caused when two surfaces rub against each other. Friction between a solid and a gas is called air resistance while friction between a solid and a liquid is called water resistance. **Materials –** see previous box Forces have different names based on if they are solids, liquid or gases.	**Force** Year 5 Understanding As in previous box plus: All objects have a gravitational pull. The bigger the object, the greater the pull. The earth's gravitational pull, pulls objects toward the centre of the earth and keeps the moon in orbit. The sun's gravitational pull keeps all the planets in orbit around it. It is the forces of gravity that created the planets and moons and that makes them spherical. **Seasonal Change:** Year 5 understanding The Earth's rotation creates day and night and the apparent movement of the sun across the sky. **Senses** Year 5 understanding We need light in order to see. Light is reflected from surfaces. The movement of the earth and moon in the sky, and the reflection of sunlight from the moon, make the moon appear to change shape over the course of a month.	**Growing and reproducing** Year 5 understanding Plants need water, sunlight, warmth, air and space to germinate and grow. The amounts of each vary from plant to plant. Flowers produce seeds which will grow into new plants (reproduction). Reproduction is part of a plant's life-cycle. For plants that reproduce sexually, flowers are needed to create seeds. Pollen must be transferred to the female part of the plant for a seed to grow. For plants that reproduce asexually, bulbs, runners and tubers create cloned offspring.	**Growing and reproducing** Year 5 understanding Plants need water, sunlight, warmth, air and space to germinate and grow. The amounts of each vary from plant to plant. Flowers produce seeds which will grow into new plants (reproduction). Reproduction is part of a plant's life-cycle. For plants that reproduce sexually, flowers are needed to create seeds. Pollen must be transferred to the female part of the plant for a seed to grow. For plants that reproduce asexually, bulbs, runners and tubers create cloned offspring. Humans change as they grow to old age. Bodies change from child's bodies to adult bodies during puberty which means they can reproduce. Humans need eggs to be fertilised by sperm in order to reproduce.
Misconceptions		Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. **Some children may think:** • thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change.	Some children may think: • the heavier the object the faster it falls, because it has more gravity acting on it • forces always act in pairs which are equal and opposite • smooth surfaces have no friction • objects always travel better on smooth surfaces • a moving object has a force which is pushing it forwards and it stops when the pushing force wears out • a non-moving object has no forces acting on it • heavy objects sink and light objects float.	Some children may think: • the Earth is flat • the Sun is a planet • the Sun rotates around the Earth • the Sun moves across the sky during the day • the Sun rises in the morning and sets in the evening • the Moon appears only at night • night is caused by the Moon	Some children may think: • Only birds lay eggs. • all plants start out as seeds • all plants have flowers • plants that grow from bulbs do not have seeds	Some children may think: • a baby grows in a mother's tummy • a baby is "made"

		Year 6				
Topic Knowledge	**Science unit**	**Animals Inc. Humans** **Biology:** What are living things and what are they made of? **Biology:** How do living things stay healthy?	**Light** **Physics:** How do we see, hear and communicate (sense) **Physics:** Materials have different properties	**Electricity** **Physics:** How does electricity work? **Physics:** Materials have different properties	**Evolution and Inheritance:** **Biology:** Similarities and difference in living things. **Biology:** What are living things?	**Living things and their habitats:** **Biology:** Similarities and difference in living things. **Biology:** What are living things?
	Link to school values	**Together we are Safe** What we need to do to keep our bodies healthy and safe.	**Together we are Problem Solvers** Solve problems related to light and how it travels.	**Together we are safe** Electricity can be dangerous – we must use it carefully	**Together we Embrace Difference** Our similarities and differences are inherited from our parents and will lead you variation and evolution.	**Together we Embrace Difference** There are similarities and difference between all living things and we classify based on these.
	New Key Vocabulary	Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, circulatory system, exercise, drugs, lifestyle	Reflection, refraction, light spectrum, rainbow	Circuit diagram, electrical symbol, voltage, electrons	Offspring, inherit/ance, variation, adaptation	Micro-organisms, non-flowering plants, characteristics, organism
	End points	• Identify and name the main parts of the human circulatory system, and describe the functions of the heart (pump blood), blood vessels (carry blood) and blood (carry oxygen, carbon dioxide, nutrients, water). • Recognise (through a range of investigation) the impact of diet, exercise, drugs and lifestyle on the way their bodies function. • Describe the ways in which nutrients and water are transported within animals, including humans. (Oxygen, nutrients and water are carried in the blood to the parts of the body that they are needed. Carbon dioxide is carried by the blood back to the heart before being pumped back to the lungs.)	• Recognise that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. • They could extend their experience of light by looking a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water, and coloured filters	• Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. • Use recognised symbols when representing a simple circuit in a diagram.	• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	• 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. • Give reasons for classifying plants and animals based on specific characteristics.
	Crucial knowledge (**Bold** indicates knowledge that must be known to meet the 2018 Teacher Assessments for the End of KS2 assessment)	**The heart pumps blood in the blood vessels around to the lungs.** **Oxygen is absorbed into the blood stream and carbon dioxide is removed. The blood travels back to the heart and is then pumped around therest of the body.** **Nutrients, water and oxygen are transported in the blood to the muscles and other parts of the body where they are needed.** As water, nutrients and oxygen are used, they produce carbon dioxide and other waste products. Carbon dioxide is carried by the blood back to the heart and then the cycle starts again as it is transported back to the lungs to be removed from the body. This is the human circulatory system. Diet, exercise, drugs and lifestyle have an impact on the way our bodies function. They can affect how well out heart and lungs work, how likely we are to suffer from conditions such as diabetes, how clearly we think, and generally how fit and well we feel.	• **Light appears to travel in straight lines** • **We see objects when light travels from them (either directly or reflected) into our eyes.** • **Objects that block light (are not fully transparent) will cause shadows.** • **Because light travels in straight lines, the shape of the shadow will be the same as the outline shape of the object.**	• **Adding more cells to a complete circuit will make a bulb brighter, a motor spin faster or a buzzer make a louder sound.** • **If you use a battery with a higher voltage, the same thing happens.** • **Adding more bulbs to a circuit will make each bulb less bright.** • **Using more motors or buzzers, each motor will spin more slowly and each buzzer will be quieter.** • **Turning a switch off (open) breaks a circuit so the circuit is not complete and electricity cannot flow. Any bulbs, motors or buzzers will then turn off as well.** • **You can use recognised circuit symbols to draw simple circuit diagrams**	• All living things have offspring of the same kind (cats and baby cats/ acorns grow into oak trees) • Offspring inherit characteristics from their biological parents but are not identical to their parents and vary from each other. • Plants and animals have characteristics that make them suited (adapted) to their environment. • If the environment changes rapidly, some variations of a species may not suit the new environment and will die. • If the environment changes slowly, animals and plants with adaptations that are best suited to the changes survive to reproduce and pass their characteristics on to their offspring. • Over a very long period of time (millions of years), the variation of adaptations may be so different to how they were originally that a new species is created. This is evolution. • Fossils give us evidence of what lived on the Earth millions of year ago and provide scientists with evidence for evolution.	• Plants and animals are two main groups for classification but there are other livings things that do not fit into these groups. • Micro-organisms are living things that are neither plants nor animals and are too small to see with the naked eye. • Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). • Vertebrates can be divided into five small groups: fish; amphibians; reptiles; birds; and mammals. Each group has common characteristics which scientists use for classifying. • Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms. • Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants.

Substantive Concepts	**Key Concepts**	**Staying healthy** – Year 6 understanding Animals get their nutrient from the food they eat. Different foods contain different types and amounts of nutrient. Animals need to eat the right combinations of foods to stay healthy. The food we eat travels through our digestive system. The nutrients from the food are absorbed from the digestive system and into our blood stream for use in the rest of the body. Our heart needs to stay healthy is order to pump our blood through our bodies. Eaten too much unhealthy food or taking certain drugs (or drugs in excess) can stop our bodies from working properly and even contribute towards illnesses.	**Energy** Year 6 understanding Energy is what makes things happen. It gives us the power to move, grow, and stay warm. Energy can come from many places such as food (animals) and sunlight (plants). Electrical energy is a form of energy.Light energy travels in a straight line. **Senses** Year 6 understanding We need light in order to see. Light is reflected from surfaces. Sound is made by vibrations that travel through a medium to our ears. Alteration in these vibrations can change the volume or pitch of the sounds we hear. We see objects by the light travelling from a light source, reflecting off the object and the light entering our eyes. **Light** Year 6 definition As the previous box plus: Shadows are formed when light is blocked by an opaque object. Light travels in a straight line which explains why shadows have the same shape as the object that cast them.	**Energy** Year 4 understanding Energy is what makes things happen. It gives us the power to move, grow, and stay warm. Energy can come from many places such as food (animals) and sunlight (plants). Electrical energy is a form of energy. Light energy travels in a straight line. Voltage is the push from the cells that makes electrictrical energy (electrons) travel around a circuit.	**Growing and reproducing** Year 6 understanding Plants need water, sunlight, warmth, air and space to germinate and grow. The amounts of each vary from plant to plant. Flowers produce seeds which will grow into new plants (reproduction). Reproduction is part of a plant's life-cycle. For plants that reproduce sexually, flowers are needed to create seeds. Pollen must be transferred to the female part of the plant for a seed to grow. For plants that reproduce asexually, bulbs, runners and tubers create cloned offspring. Plants and animals produce offspring of their own kind. Offspring inherit characteristics from their parents. Despite inheriting characteristics from their parents, offspring are not identical to their parents and vary from one another.	**Living Things** Year 6 understanding Plants are living things. Scientists use classification keys to help group, identify and name living things based on their physical characteristics. We can represent the food that animal eat in a food chain. Living things come in broad categories including plants, animals and micro-organism. Scientist use a range of characteristics in order to classify all living things.
Misconceptions		Some children may think: • your heart is on the left side of your chest • the heart makes blood • the blood travels in one loop from the heart to the lungs and around the body • when we exercise, our heart beats faster to work the muscles more • some blood in our bodies is blue and some blood is red • we just eat food for energy • all fat is bad for you • all dairy is good for you • protein is good for you, so you can eat as much as you want • foods only contain fat if you can see it • all drugs are bad for you.	Some children may think: • we see objects because light travels from our eyes to the object.	Some children may think: • electricity flows to bulbs, not through them • electricity flows out of both ends of a battery • electricity works by simply coming out of one end of a battery into the component.	Some children may think: • adaptation occurs during an animal's lifetime: giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life • offspring most resemble their parents of the same sex, so that sons look like fathers • all characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited • cavemen and dinosaurs were alive at the same time.	Some children may think: · all micro-organisms are harmful · mushrooms are plants.