Science Curriculum Map

At Guillemont, the science curriculum substantive learning is mapped out using the *Science National Curriculum.* This is supported by the *HIAS disciplinary skills tracker*, which supports the progression in disciplinary learning alongside the substantive learning across years 3 to 6. NATIONAL CURRICULUM-Purpose of study the National Curriculum has already been broken down by year group with progression embedded within it. The sequence in which the topics are presented in the National Curriculum is by subject (Biology, Chemistry, and Physics) rather than progression of knowledge.

Aims

The national curriculum for science aims to ensure that all pupils: develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

The units of the science curriculum map do not correlate directly with the half terms of the year. Suggested unit length is given in a recommended amount of weeks. These are recommendations but should be generally kept to. Excess weeks within the 39 teaching weeks of the year allow opportunities to engage with LTS or revisit ideas which may need to be covered again.

Guillemont Junior School Farnborough Science Curriculum Vision Statement

At Guillemont Junior School in Farnborough, our vision is to provide a quality and meaningful Science curriculum that enables our pupils to question, explore, and investigate the world around them. We aim to cultivate a lifelong interest in scientific inquiry by recognizing the impact of Science on modern life and its value in our community.

We create a learning environment where curiosity is celebrated, encouraging pupils to explore their ideas and interests. Farnborough's rich history in aviation and technology serves as an inspiring backdrop for scientific inquiry. Our curriculum includes projects and experiments related to the local environment and industries, making science both relevant and engaging. Through hands-on activities, experiments, and interactive learning tools, our pupils engage with science dynamically. For example, students might study the science behind flight at the Farnborough Air Sciences Trust Museum or explore ecological studies in local nature reserves. These activities help students see the practical applications of scientific knowledge in their community. Pupils are guided to identify areas for investigation by questioning the world around them. They learn to design and develop their own experiments, collect data, and analyse results, fostering independence and critical thinking. This approach builds on children's natural instincts for questioning, exploration, and discovery.

We aim to decrease the STEM gap by increasing children's Science Capital through a curriculum that emphasizes real-world connections and hands-on learning. Partnerships with local technology companies and research institutions provide students with exposure to cutting-edge science through guest lectures, workshops, and field trips. Participation in science fairs and competitions fosters creativity and a sense of accomplishment. Inquiry-based learning encourages students to ask questions and design experiments, developing critical thinking skills. Pupils explore a variety of scientists, from historical pioneers to modern-day innovators, including relatable figures like "scientist like me" role models, showing that they too can pursue a career in science. Additionally, we have partnered with Farnborough Sixth Form students who will run a STEM club alongside the science leader next academic year. Our dynamic curriculum aims to spark curiosity, engage students in meaningful exploration, and prepare them for future STEM opportunities. Every unit starts with a prior knowledge assessment. The 'Prior learning' content in each matrix includes all the topic statements from previous years that link to the topic the teachers are about to teach. This information should be used to plan initial activities to remind the pupils of that prior learning and help the teachers spot any gaps in learning and misconceptions they may have. Every unit starts with a big question to explore, followed by a vocabulary check. At the beginning of each lesson, children respond to retrieval questions from previous units and the previous lesson. Each unit concludes with a summative assessment to check the learning. Our vision is that every child will leave our school with the scientific understanding and inquiry skills necessary to foster their curiosity and analytical abilities as they progress into Key Stage 3 and beyond. By embedding these principles into our Science curriculum, we aim to empower our pupils with the knowledge, skills, and enthusiasm to become the scientists, engineers, and innovators of tomorrow. Our commitment is to provide an inclusive and inspiring Science education that opens doors to future opportunities and success, firmly rooted in the rich scientific heritage of Farnborough.

Year 3	Rocks(Chemistry)(Materials)					Animals, including humans-(Biology)				Forces and magnets(Physics)				Light(Physics) Energy pathways				Plants(Biology)	
National Curriculum statements for Working Scientifically	**Asking relevant questions and using different types of scientific enquiries to answer them**			**Setting up simple practical enquiries, comparative and fair tests**		**Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers**				**Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions**				**Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables**				**Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions**	
Disciplinary Knowledge	**Scientific hypotheses**	**Scientific models**	**Scientific theories**	Variables in science- change and measure	Control variables- (keep the same)	Observing	Taking accurate measurements	Awareness of scale and a range of units	Correct use of apparatus including	Safety in science	Table design and construction	Use of secondary sources	Classifying	Identify patterns and relationships	Table design and construction	Creating keys	Scientific drawing including labels	Creating bar charts from data	Oral presentations on findings	Written explanations
PBL Link	*Oceans*					*Healthy bodies*				*Stone age/ Iron age*									
Weeks	*6 weeks*					*6 weeks*				*7 weeks*				*7 weeks*				*9 weeks*	
BIG question: Assessment Opportunity 	**BIG question:** Why are there different rocks? What are rocks and soils like?					**BIG question:** How can animals move? What is in food? Why do animals have skeletons? What is a healthy diet and why is it important?				**BIG question:** How do moving objects slow down? What materials are attracted to magnets? How can we move magnets?				**BIG question:** What is a shadow?				**BIG question:** What do different parts of a plant do? Why do plants have flowers?	
Key questions 	•How are the soils different? • Which do you think has best drainage? • Which is more likely to lead to flooding? • How many soil types have we found? • Where might you find more? • How might the soil be different in different countries? • What rock is best for a kitchen chopping board? What might be the issues with various materials and what they must withstand? • What types of rocks are there? • How do rocks change? • What would grow best in your soil? • Why do you think worms are important to the creation of soil?					•Why do we need a skeleton? • What types of skeleton are there? • Are all skeletons the same? • Can something survive without a skeleton? • What happens if we break a bone? • How do we move? • Are bones that are bigger, stronger? • Why do we need joints? • Why do muscles get tired?				• What are magnetic materials? How can we find out? • Can I make a magnetic material non-magnetic? • How far away does a magnet have to be before it attracts a magnetic material? • How far away can the magnetic attraction between two magnets be experiences? • Is the repulsive force the same size? • How is the magnetic attraction of repulsion force affected by putting materials between the magnets? • Are bigger magnets stronger?				• A coin is lost, what would be the best way to find it? (Turn the lights out and see it shine? Use a torch to see it reflect?) • How does distance from a light source affect how bright it looks? • How does being in darkness affect your sense of hearing? • What colour would be the best to make a safety jacket from? • How does the colour of a material affect how reflective it is? • What would be the best material to make a blind for a baby's room? • How does thickness of a material affect how much light can pass through it?				• How do plants reproduce? • Do all flowers look the same? • How do insects know which flowers to pollinate? • Why do flowers smell? • What do seeds do? • Can a plant live without its leaves? • Do grass/trees make flowers? • What conditions are perfect for a seed to grow? • Where do weeds come from?	

	• How can we use composting to make our own soil? • Does it currently look like real soil? • How long do you think this process will take and why? • How are fossils created? • Why do fossils help us find out about historical events? • If you could fossilise an object what would it be?	• Can we 'break' muscles?	• How could you use magnets to measure the number of pages in a book?	• How many pieces of tracing paper are as translucent as a single piece of white paper? • How does the shape of a mirror affect how the light reflects? • How can we change the darkness, size and shape of a shadow?	• How does the space between seeds affect how well they grow? • Does seed size match plant size? • Do plants take in water through their roots? • How does water move through the plant? • How do plants make their food? • How does light affect plant growth? • How does a plant get carbon dioxide?
Famous Scientist (historical pioneers to modern-day innovators)	Florence Bascom Luis Alvarez Mary Anning (Discovery of Fossils) Inge Lehmann (Earth's Mantle)	Alice Ball Adelle Davis (20th Century Nutritionist) Marie Curie (Radiation / X-Rays)	Michael Faraday William Gilbert (Theories on Magnetism) Andre Marie Ampere (Founder of Electro-Magnetism)	Niels Bohr James Clerk Maxwell (Visible and Invisible Waves of Light)	Eva Crane Jan Ingenhousz (Photosynthesis) Joseph Banks (Botanist)
Vocabulary	Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil	Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, joints, support, protect, move, skull, ribs, spine, endoskeleton, exoskeleton, hydrostatic skeleton, vertebrates, invertebrates, muscles, contract, relax,	Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole	Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous	Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal)
Prior learning	**In Year 2 children should:** • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. Children may:	**In Year 2 children should:** • Know that animals, including humans, have offspring which grow into adults • Know the basic stages in a life cycle for animals, including humans. • Find out and describe the basic needs of	**In Year 2 children:** • May have an awareness of how to make things stop and start, using simple pushes and pulls. • They may know about floating and sinking.	**In Year 1 children should have:** • Observed changes across the four seasons • Observed and describe weather associated with the seasons and how day length varies. Children may: • have some knowledge of were light comes from. • have seen their shadows and may know they appear when it is sunny.	**In Year 2 Children should:** • Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need water, light and warmth to grow and stay healthy.

	• May have some understanding of a variety of different rocks in the natural world. • Some understanding of what soil is. (how to identify soil etc) • May have some knowledge of what a fossil is.	animals, including humans, for survival (water, food and air). • Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.		• Have some understanding of a reflection. • May understand they need light to be able to see things.	
Future learning	**In Year 4 children will:** • Compare and group materials together, according to whether they are solids, liquids or gases. • Observe that some materials change state when heated or cooled, and measure and research the temperature at which this happens in degrees Celsius. • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. **In Year 6 children will:** • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.	**In Year 4 children will**: • 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	**In Year 5 children will:** • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives. • Identify the effects of air resistance, water resistance and friction, which act between moving surfaces. • Recognise that some mechanisms, including levers, pulleys, and gears, allow a smaller force to have a greater effect. • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system • Describe the movement of the Moon relative to the Earth • Describe the Sun, Earth and Moon as approximately spherical bodies • Describe the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	**In Year 6 children will:** • Recognise that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. • Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.	**In Year 6 Children will:** • Recognise that living things have changed over time and that fossils provide information about living things • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents • Identify how animals and plants are adapted to suit their environment in different ways, and that adaptation can lead to evolution.
Possible misconceptions	**Possible 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	**Possible misconceptions** 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	**Possible misconceptions** Some children may think: • the bigger the magnet the stronger it is • all metals are magnetic.	**Possible misconceptions** 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	**Possible misconceptions** Some children may think: • plants eat food • food comes from the soil via the roots • flowers are merely decorative rather than a vital part of the life cycle in reproduction • plants only need sunlight to keep them

	coins, are fossils • a fossil is an actual piece of the extinct animal or plant • soil and compost are the same thing.	• snakes are similar to worms, so they must also be invertebrates • invertebrates have no form of skeleton.		shadow • shadows result from objects giving off darkness.	warm • roots suck in water which is then sucked up the stem.
Teaching ideas- **Disciplinary skills**	**Comparative tests**  How does adding different amounts of sand to soil affect how quickly water drains through it? Which soil absorbs the most water? **Identify and Classify**  Can you use the identification key to find out the name of each of the rocks in your collection? **Observation overtime**  How does tumbling change a rock over time? What happens when water keeps dripping on a sandcastle? **Pattern seeking**  Is there a pattern in where we find volcanos on planet Earth? **Research**  Who was Mary Anning and what did she discover?	**Comparative tests**  How does the angle that your elbow/knee is bent affect the circumference of your upper arm/thigh? How does the skull circumference of a girl compare with that of a boy? **Identify and Classify**  How do the skeletons of different animals compare? **Observation overtime**  How does our skeleton change over time? (from birth to death) **Pattern seeking**  Do male humans have larger skulls that female humans? **Research**  Why do different types of vitamins keep us healthy and which foods can we find them in?	**Comparative tests**  How does the mass of an object affect how much force is needed to make it move? Which magnet is strongest? Which surface is best to stop you slipping? **Identify and Classify**  Which materials are magnetic? **Observation overtime**  If we magnetise a pin, how long does it stay magnetised for? **Pattern seeking**  Do magnetic materials always conduct electricity? Does the size and shape of a magnet affect how strong it is? **Research**  How have our ideas about forces changed over time? How does a compass work?	**Comparative tests**  How does the distance between the shadow puppet and the screen affect the size of the shadow? Which pair of sunglasses will be best at protecting our eyes? **Identify and Classify**  How would you organise these light sources into natural and artificial sources? **Observation overtime**  When is our classroom darkest? Is the Sun the same brightness all day? **Pattern seeking**  Are you more likely to have bad eyesight and to wear glasses if you are older? **Research**  How does the Sun make light?	**Comparative tests**  How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals? Which conditions help seeds germinate faster? **Identify and Classify**  How many ways can you group our seed collection? **Observation overtime**  What happens to celery when it is left in a glass of coloured water? How do flowers in a vase change over time? **Pattern seeking**  What colour flowers do pollinating insects prefer? **Research**  What are all the different ways that seeds disperse?
Assessment - Possible Evidence	**Show understanding of a concept using scientific vocabulary correctly**	**Show understanding of a concept using scientific vocabulary correctly**	**Show understanding of a concept using scientific vocabulary correctly**	**Show understanding of a concept using scientific vocabulary correctly**	**Show understanding of a concept using scientific vocabulary correctly**

(gives you examples of ways that your pupils might show that they are **secure in the knowledge required**)	• Can name some types of rock and give physical features of each • Can explain how a fossil is formed • Can explain that soils are made from rocks and also contain living/dead matter **Apply knowledge in familiar related contexts, including a range of enquiries** • Can classify rocks in a range of different ways, using appropriate vocabulary • Can devise tests to explore the properties of rocks and use data to rank the rocks • Can link rocks changing over time with their properties e.g. soft rocks get worn away more easily • Can present in different ways their understanding of how fossils are formed e.g. in role play, comic strip, chronological report, stop-go animation etc. • Can identify plant/animal matter and rocks in samples of soil • Can devise a test to explore the water retention of soils	Can name the nutrients found in food • Can state that to be healthy we need to eat the right types of food to give us the correct amount of these nutrients **Apply knowledge in familiar related contexts, including a range of enquiries** • Can classify food into those that are high or low in particular nutrients • Can answer their questions about nutrients in food, based on their gathered evidence • Can talk about the nutrient content of their daily plan • Use their data to look for patterns (or lack of them) when answering their enquiry question • Can give similarities e.g. they all have joints to help the animal move, and differences between skeletons	Can give examples of forces in everyday life • Can give examples of objects moving differently on different surfaces • Can name a range of types of magnets and show how the poles attract and repel • Can draw diagrams using arrows to show the attraction and repulsion between the poles of magnets **Apply knowledge in familiar related contexts, including a range of enquiries** • Can use their results to describe how objects move on different surfaces • Can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface • Can use classification evidence to identify that some metals, but not all, are magnetic • Through their exploration, they can show how like poles repel and unlike poles attract, and name unmarked poles • Can use test data to rank magnets	Can describe how we see objects in light and can describe dark as the absence of light • Can state that it is dangerous to view the sun directly and state precautions used to view the sun, for example in eclipses • Can define transparent, translucent and opaque • Can describe how shadows are formed **Apply knowledge in familiar related contexts, including a range of enquiries** Can describe patterns in visibility of different objects in different lighting conditions and predict which will be more or less visible as conditions change • Can clearly explain, giving examples, that objects are not visible in complete darkness • Can describe and demonstrate how shadows are formed by blocking light • Can describe, demonstrate and make predictions about patterns in how shadows vary	• Can explain the function of the parts of a flowering plant • Can describe the life cycle of flowering plants, including pollination, seed formation, seed dispersal, and germination • Can give different methods of pollination and seed dispersal, including examples **Apply knowledge in familiar related contexts, including a range of enquiries** • Can explain observations made during investigations • Can look at the features of seeds to decide on their method of dispersal • Can draw and label a diagram of their created flowering plant to show its parts, their role and the method of pollination and seed dispersal
Linked Texts	The Pebble in My Pocket (Meredith Hooper) Stone Girl, Bone Girl (Laurence Anholt) The Street Beneath My Feet (Charlotte Guillain & Yuval Zommer)	The Story of Frog Belly Rat Bone (Timothy Basil Ering) Funnybones (Janet and Allan Ahlberg) I Will Never Not Ever Eat a Tomato (Lauren Child) Goldilocks and the Three Bears (Samantha Berger)	The Iron Man (Ted Hughes) Mrs Armitage: Queen of the Road (Quentin Blake) Mr Archimedes' Bath (Pamela Allen)	The Owl Who Was Afraid of the Dark (Jill Tomlinson) The Dark (Lemony Snicket) The Firework-Maker's Daughter (Philip Pullman)	The Hidden Forest (Jeannie Baker) George and Flora's Secret Garden (Jo Elworthy)

National Curriculum Statutory Requirement	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.	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.	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.	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.	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.
	Sticky Knowledge •There are different types of rock. • There are different types of soil. • Soils change over time. • Different plants grow in different soils. • Fossils tell us what has happened before. • Fossils provide evidence. • Palaeontologists use Fossils to find out about the past. • Fossils provide evidence that living things have changed over time.	**Sticky Knowledge** • Different animals are adapted to eat different foods. • Many animals have skeletons to support their bodies and protect vital organs. • Muscles are connected to bones and move them when they contract. • Movable joints connect bones.	**Sticky Knowledge** • Magnets exert attractive and repulsive forces on each other. • Magnets exert non-contact forces, which work through some materials. • Magnets exert attractive forces on some materials. • Magnet forces are affected by magnet strength, object mass, distance from object and object material.	**Sticky Knowledge** • There must be light for us to see. Without light it is dark. • We need light to see things even shiny things. • Transparent materials let light travel through them, and opaque materials don't let light through. • Beams of light bounce off some materials (reflection). • Shiny materials reflect light beams better than non-shiny materials. • Light comes from a source	**Sticky Knowledge** • Plants are producers, they make their own food. • Their leaves absorb sunlight and carbon dioxide • Plants have roots, which provide support and draw water from the soil • Flowering plants have specific adaptations which help it to carry out pollination, fertilisation and seed production • Seed dispersal improves a plants chances of successful reproduction • Seeds/bulbs require the right conditions to germinate and grow. • Seeds contain enough food for the plant's initial growth

Substantive Knowledge	**Rocks and soils** **Knowledge Block 1- The different types of rocks** • A rock is a solid material made up of minerals forming part of the surface of the Earth • Rocks are exposed on the surface at cliffs, hills and mountains but are also under the surface. • Some rocks, called ores contain metals • Some rocks are made of grains squashed together and can contain the remains of long-dead organisms, called fossils. This type of rock is called sedimentary rock, an example would be limestone, sandstone or mudstone • Some rocks are made of crystals that are locked tightly together. These are called igneous and metamorphic rocks; an example of igneous rock is granite, and an example of metamorphic rock is slate **Knowledge Block 2- The properties of rocks** • These three types of rocks all have different properties to each other, including porosity, hardness, reaction to chemicals • The properties of the rock depend on how the rock was formed, e.g. Some igneous rocks form from lava from volcanoes and cool very quickly leading to very small crystals **Knowledge Block 3- The structure of soils** • Soil is made up of small broken-down pieces of rock. • Soil contains a range of different size rock pieces, e.g., sand grains or stones. • Soil also contains humus (rotted plant material) • Soil made of very fine rock is called silt or clay.	**Animals Including Humans** **Digestion** **Knowledge Block 1- Food groups** o Animals need a variety of foods to help them grow and survive. The main food groups are: • Meat, dairy and pulses provide protein for muscles. • Grains and root vegetables provide carbohydrates for energy. • Fat for insulation and energy. • Fruit and vegetables for minerals, vitamins and fibre. These are essential to keep our bodies working well and protect us from illnesses. **Animals, skeletons and movement** **Knowledge Block 1- Skeletons protect vital organs.** • All vertebrates have internal skeletons that protect vital organs. • Invertebrates have exoskeletons that protect vital organs. **Knowledge Block 3- Skeletons support weight and movement** • Skeletons support the weight of land animals. • Stronger bones can support a greater mass. • Bones are connected (but can move relative to each other) at joints. • Muscles connect to bones and move them when they contract. • Stronger bones can anchor stronger muscles.	**Magnets** **Knowledge Block 1- What magnets do** • Magnets exert attractive forces on some metals **Knowledge Block 2- Magnets don't need to touch** • Magnetic forces work through other materials including air, so magnets don't need to be touching to exert their force. It is called a non-contact force **Knowledge Block 3- Magnets attract and repel** • Each end of a magnet is called a pole, opposite poles are called north and south. • Magnets exert attractive forces on each other when the poles facing each other are north and south (opposites). • Magnets exert repulsive forces on each other when the poles facing each other are the same. Knowledge Block 4- what affects magnetic strength The strength of magnetic forces is affected by: • The strength of the magnet. • The distance between the magnet and the object. • The material the object is made from.	**Light** **Knowledge Block 1- Light and sight** • There must be light for us to see. • Light comes from a source. • We need light to see things, even shiny things. • Light from the sun can be dangerous and that there are ways to protect their eyes **Knowledge Block 2- What light does when it hits materials** • If an object is transparent light will go through it and we will be able to see through it. • If an object is opaque, it will block the light and no light will get through. This is what forms shadows. • 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. • If an object is perfectly reflective, light will bounce back off it and we will see reflections of objects. • If the material is translucent, it will allow light through, but we won't be able to see through it.	**Plants and their food production** **Knowledge Block 1- Plants don't go to McDonalds** • Plants do not eat food so have to make their own. • This food provides then with energy, and materials to grow • To make the food (sugar) plants need water from the ground, carbon dioxide from the air and light from the sun. o The water is taken up through the roots from the soil o The carbon dioxide is taken in through the leaves • As well as food, plants also make oxygen which is given out back into the air through the leaves Plant reproduction **Knowledge Block 1-** **The reproductive parts of a flowering plant** • Flowering plants reproduce by the process of pollination • Pollination leads to the formation of a seed which can grow into a new plant • Flowering plants have evolved specific parts to carry out pollination and seed growth • Those parts are stamen where pollen is produced, stigma where pollen is collected, and the ovaries which contains the eggs that become a seed when the pollen travels down the stigma and meets the egg • Flowers have petals also are a range of colours, patterns, and smells to attract insects **Knowledge Block 2- All flowers are similar but different** • Plants and flowers look different because they pollinate in different ways.

					• There are two types of pollination Insect and wind • Insect pollinated flowers are usually bright coloured and strong scents • Wind pollinated flowers have less colourful petals and much less scent **Knowledge Block 3- Seed dispersal** • Plants have evolved many different ways to disperse their seeds • Seed dispersal increases the chances of seeds germinating and growing into a mature plant **Knowledge Block 4- What a seed does** • A seed contains a miniature, undeveloped version of the plant • They contain a food store for the first stage of growth (until the plant can make its own food) • They are surrounded with a protective coat.
LTS	Looking at how the pond grows and changes throughout the year.				

Year 4	**Animals, including humans(Biology)**			**Living things and their habitats(Biology)**					**States of matter (Chemistry)**				**Sound(Physics)**				**Electricity(Physics)**	
National Curriculum statements for Working Scientifically	**Asking relevant questions and using different types of scientific enquiries to answer them**			**Setting up simple practical enquiries, comparative and fair tests**		**Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers**			**Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions**				**Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables**				**Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions**	
Disciplinary Knowledge	**Scientific hypotheses**	**Scientific models**	**Scientific theories**	Variables in science- change and measure	Control variables- (keep the same)	Observing	Taking accurate measurements	Awareness of scale and a range of units	Correct use of apparatus including	Safety in science	Table design and construction	Use of secondary sources	Classifying	Identify patterns and relationships	Table design and construction	Creating keys	Scientific drawing including labels	Creating bar charts from data	Oral presentations on findings	Written explanations
PBL Links																				

Weeks	*6 weeks*	*5 weeks*	*6 weeks*	*7 weeks*	*7 weeks*
BIG question, Assessment opportunity 	**BIG question:** What happens to food when we eat it?	**BIG question:** What happens to living things when their habitats change? Are living things in danger?	**BIG question:** What happens when we heat solids? What happens to puddles after it rains? Where do ice cubes go when they disappear? Why does it rain and hail?	**BIG question:** How are sounds made? How can we make different sounds?	**BIG question:** What materials conduct electricity**?** What can we do with electricity?
Key questions 	• What different types of food are there? • Why do we need a variety of different foods? • Do all organisms eat the same things? • Why do some people need different diets? (weightlifter vs marathon runner) • Why are teeth important? • What happens to our food? • What is our digestive system? • How does our food turn into poo and wee?	• What food chains and webs are there in our local habitat? • How does energy move through the food chain? • How does removal of one species from an environment, affect others? (keystone species) • How does environmental change affect different organisms? • What are the most important things we could do to improve our outside area? (big hotels, pond, compost, wildflowers) • How does human activity affect our environment (ferries on the Solent? Farnborough Airport? KFC?)	• How does the amount of water added to flour affect its state? • How does the amount of detergent added to water affect how slippery it is? • How does the temperature affect how viscous a liquid is (use cooking oil)? • Place a peach in a glass of lemonade and watch it spin. Why does it behave that way, and can you prove it? • How does the material sprinkled on ice and snow affect how quickly it melts? • What chocolate would be best to smuggle? How does the type of chocolate affect its melting temperature? • What is the melting temperature of ice and how does it compare with the freezing temperature of water? • Is the melting temperature of wax the same as its freezing temperature?	How can you change the volume of a sound? • How does the size of an ear trumpet affect the volume of sound detected? • How does the type of material affect how well is blocks a sound? • How does thickness of material affect how well it blocks a sound? • Which materials vibrate better and produce louder sounds? Can we identify any patterns? • Which materials make the best string telephone components? (tin cans, paper cups, plastic cups, wire, cable, string, plastic or elastic – predict and test) • How does length of the tube (when making a straw oboe) affect the pitch and volume? • Can you predict the relative pitch of tuning forks from the patterns of ripples they make in the water?	• What would life be like without electricity? • What sorts of things use/need electricity? • What electricity do I use? • In which ways can we 'get' electricity? (mains/plugs/batteries/wireless) • How do we make electricity? • How do batteries work? • How quickly can batteries run out? Does this make a difference depending on number of components? • How does the number of batteries added to the circuit affect a device? • What materials can carry electricity? (conductors/insulators)
Famous Scientist (historical pioneers to modern-day innovators)	Alice Evans Ivan Pavlov (Digestive System Mechanisms) Joseph Lister (Discovered Antiseptics)	Jane Goodall Cindy Looy (Environmental Change and Extinction) Jaques Cousteau (Marine Biologist)	John Bardeen Anders Celsius (Celsius Temperature Scale) Daniel Fahrenheit (Fahrenheit Temperature Scale / Invention of the Thermometer)	Christian Doppler Guglielmo Marconi Aristotle (Sound Waves) Gailileo Galilei (Frequency and Pitch of Sound Waves) Alexander Graham Bell (Invented the Telephone)	Andre-Marie Ampere Benjamin Franklin Thomas Edison (First Working Lightbulb) Joseph Swan (Incandescent Light Bulb)

Vocabulary	Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain	Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation.	Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle	Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation Amplitude, volume, quiet, loud, ear, pitch, high, low, particles, instruments, wave.	Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol
Prior Learning	**In Year 3 children should:** • Identify that animals, including humans, need the right types and amount of nutrition, and they cannot make their own food; they get their nutrition from what they eat. • Know how nutrients, water and oxygen are transported within animals and humans. • Know about the importance of a nutritious, balanced diet. • Identify that humans and some other animals have skeletons and muscles for support, protection and movement	**In Year 2, children should:** • Explore and compare the difference between things that are living, dead and things that have never been alive. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. • Identify and name a variety of plants and animals in their habitats, including micro habitats. • Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name the different sources of food.	**In KS1 children should:** • Distinguish between an object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. • Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials based on their simple physical properties. • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	**In KS1 children:** • May have some understanding that objects make different sounds. • Some understanding that they use their ears to hear sounds. • Know about their different senses.	**In Early Years children:** • May have some understanding that objects need electricity to work. • May understand that a switch will turn something on or off.
Future Learning	**In Year 5 children will:** • Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird. • Know the differences between different life cycles.	**In Year 5:** • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. • Describe the life process of reproduction in some plants and animals.	**In Year 5 children will:** • Compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.	**In KS3 children will learn about:** • frequencies of sound waves measured in hertz (Hz), echoes, reflection and absorption of sound • sound needs a medium to travel, the speed of sound in air, in water, in solids	**In Year 6 children will:** • Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. • Compare and give reasons for variations in how components function, including the

	• Know the process of reproduction in plants. • Know the process of reproduction in animals		• 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 uses of everyday materials, including wood, metals and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	• sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal • auditory range of humans and animals.	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
Possible misconceptions	**Possible misconceptions** Some children may think: • arrows in a food chains mean 'eats' • 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 • your stomach is where your belly button is • food is digested only in the stomach • when you have a meal, your food goes down one tube and your drink down another	**Possible misconceptions** 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.	**Possible 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	**Possible misconceptions** Pitch and volume are frequently confused, as both can be described as high or low. 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.	**Possible misconceptions** 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

	• the food you eat becomes “poo” and the drink becomes “wee”.		water vapour (only the condensing water droplets can be seen)		
Teaching ideas- Disciplinary skills	**Comparative tests**  In our class, are omnivores taller than vegetarians? **Identify and Classify**  What are the names for all the organs involved in the digestive system? How can we organise teeth into groups? **Observation overtime**  How does an eggshell change when it is left in cola? **Pattern seeking**  Are foods that are high in energy always high in sugar? **Research**  How do dentists fix broken teeth?	**Comparative tests**  Does the amount of light affect how many woodlice move around? How does the average temperature of the pond water change in each season **Identify and Classify**  Can we use the classification keys to identify all the animals that we caught pond dipping? **Observation overtime**  How does the variety of invertebrates on the school field change over the year? **Pattern seeking**  How has the use of insecticides affected bee population? **Research**  Why are people cutting down the rainforests and what effect does that have?	**Comparative tests**  How does the mass of a block of ice affect how long it takes to melt? How does the surface area of water affect how long it takes to evaporate? Does seawater evaporate faster than fresh water? **Identify and Classify**  Can you group these materials and objects into solids, liquids, and gases? How would you sort these objects/materials based on their temperature? **Observation overtime**  Which material is best for keeping our hot chocolate warm? How does the level of water in a glass change when left on the windowsill? **Pattern seeking**  Is there a pattern in how long it takes different sized ice lollies to melt? How does evaporation rate change as you add more salt to your water? **Research** 	**Comparative tests**  How does the volume of a drum change as you move further away from it? How does the length of a guitar string/tuning fork affect the pitch of the sound? Are two ears better than one? **Identify and Classify**  Which material is best to use for muffling sound in ear defenders? **Observation overtime**  When is our classroom the quietest? **Pattern seeking**  Is there a link between how loud it is in school and the time of day? If there is a pattern, is it the same in every area of the school? **Research**  Do all animals have the same hearing range?	**Comparative tests**  How does the thickness of a conducting material affect how bright the lamp is? Which metal is the best conductor of electricity? **Identify and Classify**  How would you group these electrical devices based on where the electricity comes from? **Observation overtime**  How long does a battery light a torch for? **Pattern seeking**  Which room has the most electrical sockets in a house? **Research**  How has electricity changed the way we live? How does a light bulb work?

			What are hurricanes, and why do they happen?		
Possible Evidence (gives you examples of ways that your pupils might show that they are **secure in the knowledge required**)	**Show understanding of a concept using scientific vocabulary correctly** Can sequence the main parts of the digestive system • Can draw the main parts of the digestive system onto a human outline • Can describe what happens in each part of the digestive system • Can point to the three different types of teeth in their mouth and talk about their shape and what they are used for • Can name producers, predators and prey within a habitat **Apply knowledge in familiar related contexts, including a range of enquiries** • Can use diagrams or a model to describe the journey of food through the body explaining what happens in each part • Can record the teeth in their mouth (make a dental record) • Can explain the role of the different types of teeth • Can explain how the teeth in animal skulls show they are carnivores, herbivores or omnivores • Can create food chains based on research	**Show understanding of a concept using scientific vocabulary correctly** • Can name living things living in a range of habitats, giving the key features that helped them to identify them • Can give examples of how an environment may change both naturally and due to human impact **Apply knowledge in familiar related contexts, including a range of enquiries** • Can keep a careful record of living things found in different habitats throughout the year (diagrams, tally charts etc.) • Can use classification keys to identify unknown plants and animals • Can present their learning about changes to the environment in different ways e.g. campaign video, persuasive letter	**Show understanding of a concept using scientific vocabulary correctly** Can create a concept map, including arrows linking the key vocabulary • Can name properties of solids, liquids and gases • Can give everyday examples of melting and freezing • Can give everyday examples of evaporation and condensation • Can describe the water cycle **Apply knowledge in familiar related contexts, including a range of enquiries** • Can give reasons to justify why something is a solid liquid or gas • Can give examples of things that melt/freeze and how their melting points vary • From their observations, can give the melting points of some materials • Using their data, can explain what affects how quickly a solid melts • Can measure temperatures using a thermometer • Can explain why there is condensation on the inside the hot water cup but on the outside of the icy water cup • From their data, can explain how to speed up or slow down evaporation • Can present their learning about the water cycle in a range of ways e.g. diagrams, explanation text, story of a water droplet	**Show understanding of a concept using scientific vocabulary correctly** • Can name sound sources and state that sounds are produced by the vibration of the object • Can state that sounds travel through different mediums such as air, water, metal • Can give examples to demonstrate how the pitch of a sound are linked to the features of the object that produced it • Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder • Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases **Apply knowledge in familiar related contexts, including a range of enquiries** • Can explain what happens when you strike a drum or pluck a string and use a diagram to show how sounds travel from an object to the ear • Can demonstrate how to increase or decrease pitch and volume using musical instruments or other objects • Can use data to identify patterns in pitch and volume • Can explain how loudness can be reduced by moving further from the sound source or by using a sound insulating medium	**Show understanding of a concept using scientific vocabulary correctly** • Can name the components in a circuit • Can make electric circuits • Can control a circuit using a switch • Can name some metals that are conductors • Can name materials that are insulators **Apply knowledge in familiar related contexts, including a range of enquiries** • Can communicate structures of circuits using drawings which show how the components are connected • Use classification evidence to identify that metals are good conductors and non-metals are insulators • Can incorporate a switch into a circuit to turn it on and off • Can connect a range of different switches identifying the parts that are insulators and conductors • Can add a circuit with a switch to a DT project and can demonstrate how it works • Can give reasons for choice of materials for making different parts of a switch • Can describe how their switch works

Linked texts	Human Body Odyssey (Werner Holzwarth) Crocodiles Don't Brush Their Teeth (Colin Fancy) Wolves (Emily Gravett)	The Vanishing Rainforest (Richard Platt) The Morning I Met a Whale (Michael Morpurgo) Journey to the River Sea (Eva Ibbotson)	Once Upon a Raindrop: The Story of Water (James Carter) Sticks (Diane Alber)	Horrid Henry Rocks (Francesca Simon) Moonbird (Joyce Dunbar) The Pied Piper of Hamelin (Natalia Vasquez)	Until I Met Dudley (Roger McGough) Oscar and the Bird: A Book about Electricity (Geoff Waring) Electrical Wizard: How Nikola Tesla Lit Up the World (Elizabeth Rusch)
National Curriculum Statutory Requirement	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. *Prior knowledge Skeletons*	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.	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.
	Sticky knowledge • Animals have teeth to help them eat. • Different types of teeth do different jobs. • Food is broken down by the teeth and further in the stomach and intestines where nutrients go into the blood. • The blood takes nutrients around the body. • Nutrients produced by plants move to primary consumers then to secondary consumers through food chains.	**Sticky knowledge** • Living things can be divided into groups based upon their characteristics • Environmental change affects different habitats differently • Different organisms are affected differently by environmental change • Different food chains occur in different habitats • Human activity significantly affects the environment	**Sticky knowledge** • Solids, liquids and gases are described by observable properties. • Materials can be divided into solids, liquids and gases. • Heating causes solids to melt into liquids and liquids evaporate into gases. d) Cooling causes gases to condense into liquids and liquids to freeze into solids. • The temperature at which given substances change state are always the same.	**Sticky knowledge** • Sound travels from its source in all directions and we hear it when it travels to our ears. • Sound travel can be blocked. • Sound spreads out as it travels. • Changing the shape, size and material of an object will change the sound it produces. • Sound is produced when an object vibrates. • Sound moves through all materials by making them vibrate. • Changing the way an object vibrates changes its sound.	**Sticky knowledge** • A source of electricity (mains of battery) is needed for electrical devices to work. • Electricity sources push electricity round a circuit. • More batteries will push the electricity round the circuit faster. • Devices work harder when more electricity goes through them. • A complete circuit is needed for electricity to flow and devices to work. • Some materials allow electricity to flow easily and these are called conductors. Materials that don't

				• Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds. • Faster vibrations (higher frequencies) produce higher pitched sounds	allow electricity to flow easily are called insulators.
Substantive Knowledge	**Digestion** **Knowledge Block 1- Variation in animals' diet** • Different animals require different foods to survive. • Animals get their food from plants and other animals. This can be shown in a food chain. (From Year 2) • A food chain begins with a producer. This is often a green plant because plants can make their own food. (From Year 2) • A living this that eats other plants is called a consumer. (From Year 2) • Humans require a balanced diet to remain healthy but healthy diets vary depending upon the type of activity that humans do. • Humans have 2 sets of teeth in their lifetimes • Humans have three main types of teeth- incisors, canines and molars. • Incisors help to bite off and chew pieces of food. • Canines are used for tearing and ripping food. • Molars help to crush and grind food. **Knowledge Block 3- How humans digest food**	**Living things** **Knowledge Block 1**- Classifying living things • Living things can be divided into groups based upon their characteristics • Classification keys help group, identify and name living things • Animals can be classified as vertebrates (having a spine) or invertebrates (lacking a spine) • In any habitat there are food chains and webs where nutrients are passed from one organism to another when it is eaten • If the population of one organism in the chain or web is affected, it has a knock-on effect to all the others **Knowledge Block 2- Environmental change** • Environmental change affects different habitats differently • Human activity significantly affects the environment • Different organisms are affected differently by environmental change	**Solids, liquids and gases** **Knowledge Block 1- Properties of solids, liquids and gases** • Materials can be divided into solids, liquids and gases. • Solids hold their shape unless forced to change. • Liquids flow easily but stay in their container because of gravity. The more viscous a liquid the less runny it is. • Gases move everywhere and are not held in containers by gravity. **Knowledge Block 2- Changing state** • Heating causes solids to melt into liquids and liquids to evaporate to gases. • Cooling causes gases to condense to liquids and liquids to freeze to solids. **Knowledge Block 3- Melting, freezing, boiling and condensation temperatures** • Different substances change state at different temperatures but the temperatures at which given substances changes state is always the same. **Knowledge Block 4- All about the water cycle** • The temperature at which a substance melts from a solid to a liquid is the same at which it freezes from a liquid to a solid. • The temperature at which a substance boils from a liquid to a	**Sound** **Knowledge Block 1: Describing Sound** ● Sounds can be produced in a variety of ways. ● Sounds have the properties of pitch and volume. ● When a sound is produced it spreads out from its source in all directions **Knowledge Block 2: How sound is made and travels** ● Sound is caused by vibration (objects move rapidly back and forth or up and down) ● When objects vibrate it makes the objects in contact with it also vibrate. This includes the air. ● The vibration travels through the air and makes other objects it is in contact with vibrate including your ear drum. **Knowledge Block 3: Pitch and Volume changes** • Pitch and volume are caused by how the material vibrates • The pitch of a sound is caused by how fast an object vibrates. This is called the	**Electricity** **Knowledge Block 1- Electricity as a power source** • Lots of devices are powered by electricity • Electricity comes from a source There are two main sources- batteries and mains **Knowledge Block 2- What batteries do** • A battery pushes electricity to the device. • To be able to push electricity the battery must be connected to the device using wires • This is called a circuit **Knowledge Block 3- Making devices work harder** • If there are more batteries added to a circuit this provides a bigger push on the electricity • This will make the device work harder e.g., brighter bulbs, faster spinning motor, louder buzzer Knowledge Block 3- Insulators and conductors • Some materials will allow electricity to flow through them- Conductors

	• The nutrients in food have to get to every part of the body. The blood transports them. • The role of digestion is to get the nutrients in food to dissolve in the blood, if it doesn't dissolve it can't enter the blood and be transported.		gas is the same at which it condenses from a gas to a liquid. • Liquids evaporate slowly, even below their boiling temperatures. • The water cycle is the process by which water is continuously transferred between the surface of the earth and the atmosphere. • Liquid water evaporates into water vapor, condenses to form clouds, and precipitates back to earth in the form of rain and snow.	frequency of vibration. Higher the frequency, higher the pitch • Smaller objects or tighter strings tend to vibrate with a higher frequency • The volume of sound is caused by how big each vibration is. This is called the amplitude of vibration. The bigger the amplitude the higher the volume. • Sounds get fainter as the distance from the sound source increases	• Metals such as silver, gold and copper are good conductors. Water is also a conductor of electricity. • Other materials will not allow electricity to flow through them- Insulators • Plastic, wood, glass and rubber are good electrical insulators. That is why they are used to cover materials that carry electricity. • A switch opens and closes a circuit
LTS	Looking at the living things across the school and monitoring the changes				

Year 5	Earth and space(Physics)	Forces(Physics)	Properties and changes of materials(Chemistry)	Living things and their habitats(Biology)	Animals, including humans (Biology)
National Curriculum statements for Working Scientifically	**Planning different types of scientific enquiries to answer questions including recognising and controlling variables where necessary**	**Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings where appropriate**	**Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.**	**Using test results to make predictions to set up further comparative and fair tests**	**Reporting and presenting findings from enquiries, including conclusions, casual relationships and explanations of and degree of trust in results, in oral and written form such as displays and other presentations**
Disciplinary skills	Scientific hypotheses Developing Scientific models Distinguishing Pseudoscience from science Scientific theories Variables in science-change (independent) and measure (dependent) Control variables (keep the same) Making accurate observations Taking accurate measurements Awareness of scale and a range of units Correct use of a range of apparatus Safety in science Repeatability Awareness of sources of error in investigations Complex table design and construction Use of high quality and reliable secondary sources Classifying Create classification keys Identifying patterns in nature Scientific drawing including labels Creating bar charts from data Creating scatter graphs from data Ascertain the level of uncertainty in collected Evolution of scientific ideas and models The double-blind methodology The placebo effect Interpreting relationships from scatter graphs Validity of results Posing further questions based on data Improvements to procedures Reproducibility Oral presentations on findings Constructing a scientific conclusion linking collected evidence to substantive knowledge Illustrated presentations of research, techniques/methods and findings				
PBL links	*Space*	*Space*			
Weeks	*7 weeks*	*7 weeks*	*12 weeks*	*4 weeks*	*2 weeks*
BIG question: assessment opportunity 	**BIG question:** Why does the Moon appear to change shape? Sun, Earth & Moon: What is moving and how do we know?	**BIG question:** How do machines work? How and why do objects move?	**BIG question:** What is a mixture and how do I separate it into its parts? How can we separate a mixture of water, iron filings, salt and sand?	**BIG question:** How do living things make copies of themselves? Do all plants and animals reproduce in the same way?	**BIG question:** How do humans change as they get older?
Key Questions 	How does temperature/size/day length/year length change as you get closer/further to the sun? How does distance from a light source affect how much light hits an object? Does having more moons result in more light hitting a planet? How could you test this? How does speed/size of a meteorite affect the size of the moon crater formed? If the moon became heavier as a result of meteorite collisions what would happen to its position relative to Earth?	• What is a force? • How can a force act on an object? • How can we see forces? • How can we measure forces? • How does the saltiness (salinity) of water affect the water resistance? • How does the length of a piece of a paper helicopter's wings affect the time it takes to fall? • How does the changing the shape of a piece of plasticine affect water resistance? • How does adding holes to a parachute affect the time it takes to fall?	• What are mixtures? • What does dissolve mean? • Which of the following dissolve in water: sugar, bicarbonate of soda, oil, chocolate, coffees, dark vinegar and wax? • How does the amount of water used affect how much sugar will dissolve in it? • Which sweets dissolve in water? • How can we separate mixtures? • How can we clean our dirty water?	• What is a life cycle? What types of life cycles are there? • Are life cycles the same? • Do plants reproduce in the same ways as us? • How do plants spread their seeds?	

	If the mass of the Earth is 80x that of the moon, why is the gravity at the Earth's surface only 6x greater than at the surface of the moon? Why do we have day/night/months/years/seasons? Why does day length change? Why does shadow size change over the course of a day?	• How does the amount/depth of tread affect the friction between a shoe and a surface? • How can we use levers to lift heavy objects? • What is the most effective way to move an object? • How do see-saws work? • Can you create a pulley system to life a given load?			
Famous Scientist (historical pioneers to modern-day innovators)	Tycho Brahe Annie Jump Cannon James Croll Galileo Galilei Claudius Ptolemy and Nicolaus Copernicus (Heliocentric vs Geocentric Universe) Neil Armstrong (First man on the Moon) Helen Sharman (First British astronaut) Tim Peake (First British ESA astronaut	Leonardo da Vinci, Galileo Galilei (Gravity and Acceleration) Isaac Newton (Gravitation) Archimedes of Syracuse (Levers) John Walker (The Match)	James Chadwick Marie Curie Robert J. Oppenheimer	Jacques Cousteau James Brodie of Brodie (Reproduction of Plants by Spores) David Attenborough (Naturalist and Nature Documentary Broadcaster) Dr Steve Jones (Geneticist) Prof Robert Winston (Human Scientist)	Louis Pasteur
Vocabulary	Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets, solar system, day, night, rotate, orbit, axis, spherical, geocentric, heliocentric.	Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears Newton, Gears, Pulleys, force, push, pull, opposing, streamline, brake, mechanism, cog, machine.	Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material	Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings	Puberty – the vocabulary to describe sexual characteristics Foetus, Embryo, Womb, Gestation, Baby, Toddler, Teenager, Elderly, Growth, Development, Puberty, Hormone, Physical, Emotional,
Prior Learning	**In Key Stage 1 and in Year 3 children should:** • Understand changes in weather patterns and seasons. • Compare how things move on different surfaces.	**In Year 3 children should:** • Compare how things move on different surfaces. • Know how a simple pulley works and use making lifting an object simpler	**In KS1 children should:** • Distinguish between an object and the material from which it is made. • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.	**In Year 4 children should**: • Construct and interpret a variety of food chains, identifying producers, predators and prey	**In Year 4 children should:** • Describe the simple functions of the basic parts of

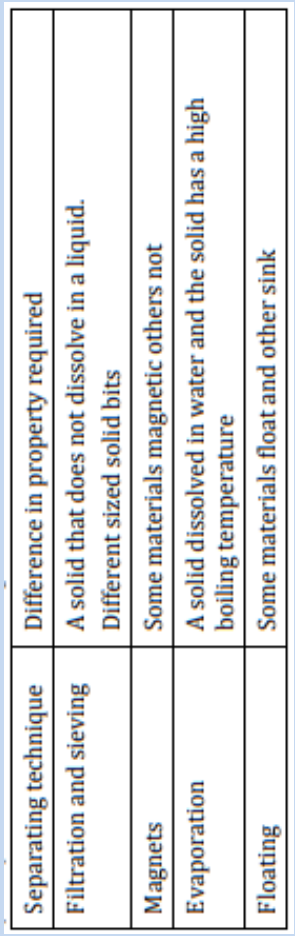
	• Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Describe magnets as having two poles. Predict whether two magnets with attract or repel each other, depending on which poles are facing	• Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract and repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials based on whether they are attracted to a magnet and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets with attract or repel each other, depending on which poles are facing.	• Describe the simple physical properties of a variety of everyday materials. • Compare and group together a variety of everyday materials based on their simple physical properties. • Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	• Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other. • Identify and name a variety of plants and animals in their habitats, including micro habitats.	the digestive system in humans. • Identify the different types of teeth in humans and their simple functions.
Future learning	**In KS3 children will learn about:** • Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only) • Our Sun as a star, other stars in our galaxy, other galaxies • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres the light year as a unit of astronomical distance	**In KS3 children will learn about:** • opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface • forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) • change depending on direction of force and its size.	**In Year 5 children will:** • Compare and group together everyday materials based on their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. • Give reasons based on evidence from comparative and fair tests, for the uses of everyday materials, including wood, metals and plastic. • Demonstrate that dissolving, mixing and changes of state are reversible changes. • Explain that some changes result in the formation of new materials, and this kind of change is usually not reversible, including changes associated with burning and the action of acid on bicarbonate of soda	**In Year 6:** • Classify living things into broad groups according to observable characteristics and based on similarities and differences. • Give reasons for classifying plants and animals based on specific characteristics.	**In Year 6:** • Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. • Describe the ways in which nutrients and water are transported within animals, including humans.
Possible misconceptions	**Possible misconceptions** 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	**Possible misconceptions** 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	**Possible 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.	**Possible misconceptions** Some children may think: • all plants start out as seeds • all plants have flowers • plants that grow from bulbs do not have seeds • only birds lay eggs.	**Possible misconceptions** Some children may think: • a baby grows in a mother's tummy • a baby is "made".

	at night • night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.	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.	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. The shape, but not the material, has been changed. 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		
Teaching Ideas	**Comparative tests**  How does the length of daylight hours change in each season? **Identify and Classify**  How could you organise all the objects in the solar system into groups? **Observation overtime**  Can you observe and identify all the phases in the cycle of the Moon? **Pattern seeking**  Is there a pattern between the size of a planet and the time it takes to travel around the Sun? **Research**  What unusual objects did Jocelyn Bell Burnell discover? How do astronomers know what stars are made of? How have our ideas about the solar system changed over time?	**Comparative tests**  How does the angle of launch affect how far a paper rocket will go? How does the surface area of an object affect the time it takes to sink? **Identify and Classify**  Can you label and name all the forces acting on the objects in each of these situations? **Observation overtime**  How long does a pendulum swing for before it stops? **Pattern seeking**  Do all objects fall through water in the same way? How does surface area of parachute affect the time it takes to fall? **Research**  How do submarines sink if they are full of air?	**Comparative tests**  How does the temperature of tea affect how long it takes for a sugar cube to dissolve? Which type of sugar dissolves the fastest? **Identify and Classify**  Can you group these materials based on whether they are transparent or not? **Observation overtime**  How does a container of saltwater change over time? How does a sugar cube change as it is put in a glass of water? **Pattern seeking**  Do all stretchy materials stretch in the same way? How does temperature affect how much solute we can dissolve? **Research**  What are micro plastics and why are they harming the planet?	**Comparative tests**  How does the level of salt affect how quickly brine shrimp hatch? **Identify and Classify**  Compare this collection of animals based on similarities and differences in their lifecycle. **Observation overtime**  How do brine shrimp change over their lifetime? How does a bean change as it germinates? **Pattern seeking**  Is there a relationship between number of petals and number of stamens? **Research**  What are the differences between the life cycle of an insect and a mammal?	**Comparative tests**  How does age affect a human's reaction time? Who grows the fastest, girls or boys? **Identify and Classify**  Can you identify all the stages in the human life cycle? **Observation overtime**  How do different animal embryos change? **Pattern seeking**  Is there a relationship between a mammal's size and its gestation period?

					Research  Why do people get grey/white hair when they get older?
Possible Evidence (gives you examples of ways that your pupils might show that they are **secure in the knowledge required**)	**Show understanding of a concept using scientific vocabulary correctly** • Can create a voice over for a video clip or animation • Can show, using diagrams, the movement of the Earth and Moon • Can explain the movement of the Earth and Moon • Can show using diagrams the rotation of the Earth and how this causes day and night • Can explain what causes day and night **Apply knowledge in familiar related contexts, including a range of enquiries** • Can use the model to explain how the Earth moves in relation to the Sun and the Moon moves in relation to the Earth • Can demonstrate and explain verbally how day and night occur • Can explain evidence gathered about the position of shadows in term of the movement of the Earth and show this using a model • Can explain how a sundial works • Can explain verbally, using a model, why we have time zones • Can describe the arguments and evidence used by scientists in the past	**Show understanding of a concept using scientific vocabulary correctly** • Can demonstrate the effect of gravity acting on an unsupported object • Can give examples of friction, water resistance and air resistance • Can give examples of when it is beneficial to have high or low friction, water resistance and air resistance • Can demonstrate how pulleys, levers and gears work **Apply knowledge in familiar related contexts, including a range of enquiries** • Can explain the results of their investigations in terms of the force, showing a good understanding that as the object tries to move through the water or air or across the surface the particles in the water, air or on the surface slow it down • Can demonstrate clearly the effects of using levers, pulleys and gears	**Show understanding of a concept using scientific vocabulary correctly** • Chemical reactions as the rearrangement of atoms. (KS3) • Representing chemical reactions using formulae and using equations. (KS3) • Combustion, thermal decomposition, oxidation and displacement reactions. (KS3) • Defining acids and alkalis in terms of neutralisation reactions. (KS3) • The pH scale for measuring acidity/alkalinity; and indicators. (KS3) **Apply knowledge in familiar related contexts, including a range of enquiries** • Can create a chart or table grouping/comparing everyday materials by different properties • Can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose • Can group solids based on their observations when mixing them with water • Can give reasons for choice of equipment and methods to separate a given solution or mixture such as salt or sand in water • Can explain the results from their investigations	**Show understanding of a concept using scientific vocabulary correctly** • Can draw the life cycle of a range of animals identifying similarities and differences between the life cycles • Can explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways **Apply knowledge in familiar related contexts, including a range of enquiries** • Can present their understanding of the life cycle of a range of animals in different ways e.g. drama, pictorially, chronological reports, creating a game • Can identify patterns in life cycles • Can compare two or more animal life cycles they have studied • Can explain how a range of plants reproduce asexually	**Show understanding of a concept using scientific vocabulary correctly** • Can explain the changes that takes place in boys and girls during puberty • Can explain how a baby changes physically as it grows, and also what it is able to do **Apply knowledge in familiar related contexts, including a range of enquiries** • Can present information about the changes occurring during puberty as an information leaflet for other Y5 children or answers to 'problem page questions'
Linked Texts	The Skies Above My Eyes (Charlotte Guillain & Yuval Zommer)	The Enormous Turnip (Katie Daynes) Leonardo's Dream	Itch (Simon Mayo) Kensuke's Kingdom	The Land of Neverbelieve (Norman Messenger) Mummy Laid an Egg	Hair in Funny Places (Babette Cole) Giant

	George's Secret Key to the Universe (Lucy and Stephen Hawking with Christophe Galfard) The Way Back Home (Oliver Jeffers)	(Hans de Beer) The Aerodynamics of Biscuits (Clare Helen Welsh)	(Michael Morpurgo) The BFG (Roald Dahl)	(Babette Cole)	(Kate Scott) You're Only Old Once! (Dr. Seuss)
National Curriculum Statutory Requirement	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.	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.	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.	Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird Describe the life process of reproduction in some plants and animals **Check the Updated Scarf overview** Look if an animal is a male /female? Describe the life process of reproduction in some plants and animals. Possible Link to Y5SRE SCARF 2023-24-PDL RSE G:\Shared drives\Guillemont - Staff Pool\2023-24\PDL\RSE	Describe the changes as humans develop to old age. Link to Y5SRE **Check the Updated Scarf overview** SCARF G:\Shared drives\Guillemont - Staff Pool\2023-24\PDL\RSE **HIAS ADVISE** Relationships Education, Relationships and Sex Education (RSE) and Health Education 66. The content set out in this guidance covers everything that primary schools should teach about relationships and health, including puberty. The national curriculum for science also includes subject content in related areas, such as the main external body parts, the human body as it grows from birth to old age (including puberty) and reproduction in some plants and animals. It will be for primary schools to determine whether they need to cover any additional content on sex education to meet the needs of their pupils. Many primary schools already choose to teach some aspects of sex education and will continue to do so,

					although it is not a requirement. 104. Relationships Education, RSE and Health Education complement several national curriculum subjects. Where schools are teaching the national curriculum, they should look for opportunities to draw links between the subjects and integrate teaching where appropriate. There continues to be no right of withdrawal from any part of the national curriculum.

	Sticky knowledge • Stars, planets and moons have so much mass they attract other things, including each other due to a force called gravity. Gravity works over distance. • Objects with larger masses exert bigger gravitational forces. • Objects like planets, moons and stars spin. • Smaller mass objects like planets orbit large mass objects like stars. • Stars produce vast amounts of heat and light. • All other objects are lumps of rock, metal or ice and can be seen because they reflect the light of stars.	**Sticky knowledge** • Air resistance and water resistance are forces against motion caused by objects having to move air and water out of their way. • Friction is a force against motion caused by two surfaces rubbing against each other. • Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move	**Sticky knowledge** • When two or more substances are mixed and remain present the mixture can be separated. • Some changes can be reversed, and some cannot. • Materials change state by heating and cooling. 	**Sticky knowledge** • Different animals mature at different rates and live to different ages. • Some organisms reproduce sexually where offspring inherit information from both parents. • Some organisms reproduce asexually by making a copy of a single parent. • Environmental change can affect how well an organism is suited to its environment. • Different types of organisms have different lifecycles.	**Sticky knowledge** • Different animals mature at different rates and live to different ages. • Puberty is something we all go through, a process which prepares our bodies for being adults, and reproduction • Hormones control these changes, which can be physical and/or emotional.

Separating technique	Difference in property required
Filtration and sieving	A solid that does not dissolve in a liquid. Different sized solid bits
Magnets	Some materials magnetic others not
Evaporation	A solid dissolved in water and the solid has a high boiling temperature
Floating	Some materials float and other sink

Substantive Knowledge	**Space and Gravity** **Knowledge Block 1: Our Solar system** • A Solar system is a collection of planets, which orbit (a curved path) a star. • There are huge number of stars in space and therefore a huge number of solar systems • Our solar system consists of 8 planets, many of those planets have moons which orbit around them. • Earth's moon is not a planet but is a satellite which orbits Earth. It is around a quarter of the size of Earth. • As the Moon orbits the Earth, the Sun lights up different parts of it, making it seem as if the Moon is changing shape. We call these the phases of the moon. • The Moon doesn't emit (give off) light itself, the 'moonlight' we see is actually the Sun's light reflected off the lunar surface. • Our solar system can be represented with a model (see diagram), but it isn't possible to draw it to scale. • The planets and moons are rotating (spinning) • The time it takes one planet to rotate is called a day. On Earth this is 24 hours • The time it takes a planet to complete one orbit around its star is called a year. On Earth this is 356.25 days • The solar system is with a massive collection of stars called the galaxy (called the Milky way) • The Milky way is one of billions of galaxies in the Universe. **Knowledge Block 2: What else is in the solar system?** • Stars are huge balls of gas that produce vast amounts of light and heat. • Asteroids are lumps of rock that orbit a star (there are millions in between Mars and Jupiter)	**Forces that oppose motion** **Knowledge Block 1: Water and air resistance.** • When objects move through air and water, they have to push it out of the way. The water and air push back with forces called water resistance and air resistance. The harder it is to push the material out of the way the greater the resistance. • Gases weigh less than liquids and so water resistance is greater than air resistance. **Knowledge Block 2: Friction** • Friction is a force against motion caused by two surfaces rubbing against each other. It occurs because no surfaces are perfectly smooth; they have bumps and undulations that can interlock when placed on top of each other. • To move one interlocking surface over another, one of three things must happen: • The surfaces must rise slightly • The bumps on the surface must bend • The bumps on the surface must break • All of these actions require a force, this is what causes friction **Knowledge Block 3: Managing Forces** • Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move. • The use of levers can reduce the force needed to move things. The object you are lifting is called the load, and the force you apply to the arm to make the object move is called the effort. • The use of pulleys can reduce the force needed to move things ***(These are particularly complex ideas. It might be better to teach them through a design technology project where children make toys using cogs, pulleys and lever)***	**Mixtures and separating them** **Knowledge Block 1- What mixtures are** • A substance is an object with the same properties throughout. • A mixture is when more than one substance is present in the same container **Knowledge Block 2- What dissolving is** • When a substance is added to a liquid the substance can disappear- this is called dissolving • A mixture of a substance that has dissolved in a liquid is called a solution • Not every substance can dissolve in water **Knowledge Block 3- Separating mixtures** • Mixtures can be separated if the substances have different properties • This is because the substances in the mixture are still present and are unchanged • There are different techniques for separating mixtures. - Filtration requires the substances be one that does not dissolve in a liquid to work. - Sieving requires the substances to be of different sizes to work - Magnets requires the substances to be some magnetic materials and some non-magnet materials to work. - Evaporation requires a solid substance dissolved in water and the solid has a higher boiling point in water to work. - Floating requires some substances to float and some substances to sink to work. **Making new substances** **Knowledge Block 1: Reversible and irreversible changes** • All matter, including gas, has mass. • Sometimes, mixed substances react to make a new substance. These changes are usually irreversible. • Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible. • Indicators that something new has been made are the properties of the material are different (colour, state, texture, hardness, smell, temperature) • If it is not possible to get the material back easily it is likely that it is not there anymore	**Knowledge Block 2- Life cycles** • Mammals, amphibians, insects and birds have different life cycles. • Lifecycles vary in time depending on the species of animal- it can be as short as just a few weeks for insects, to up to 200 years for sea urchins. Larger animals often have longer life cycles but not always. • All animal life cycles begin with growth and development followed by reproduction. • Some animals undergo a complete metamorphosis as they grow. Metamorphosis is a process where animals undergo an abrupt and obvious change in the structure of their body and their behaviour. • Some animals are eusocial. This means they live in colonies (groups) with one animal or group producing young and the others working to care for them.	

	• Comets are objects that are made of Ice, which melts when they get closer to the sun leaving a tail. **<u>Knowledge Block 3: Gravity and its effects</u>** • Gravity is force of attraction between two objects with mass (a quantity of matter) • The bigger the mass the bigger force it exerts • Gravity works over distance but gets weaker as distance increases • Stars, planets, moons have a very large amount of mass. They exert a gravitational attraction on each other • Differences in gravity result in smaller mass objects orbiting around lager mass objects, e.g., planets around stars and moons around planets		and something new has been made (irreversible change)		
LTS	Looking at how our bodies change				

Year 6	ANIMALS INCLUDING HUMANS(Biology)	LIVING THINGS AND THEIR HABITATS(Biology)	EVOLUTION AND INHERITANCE(Biology)	LIGHT(Physics) Energy pathways	ELECTRICITY(Physics)
National Curriculum statements for Working Scientifically	**Planning different types of scientific enquiries to answer questions including recognising and controlling variables where necessary**	**Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repat readings where appropriate**	**Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.**	**Identify scientific evidence that has been used to support or refute ideas or arguments** **Using test results to make predictions to set up further comparative and fair tests**	**Reporting and presenting findings from enquiries, including conclusions, casual relationships and explanations of and degree of trust in results, in oral and written form such as displays and other presentations**
Disciplinary skills	Scientific hypotheses Developing Scientific models Distinguishing Pseudoscience from Scientific theories Variables (science-change (independent) and measure Control variables- (keep the same) Making accurate observations Taking accurate measurements Awareness of scale and a range of units Correct use of a range of apparatus Safety in science Repeatability Awareness of sources of error in investigations Complex table design and construction Use of high quality and reliable secondary sources Classifying Create classification keys Identifying patterns in nature Scientific drawing including labels Creating bar charts from data Creating scatter graphs from data Ascertain the level of uncertainty in collected Evolution of scientific ideas and models The double-blind methodology The placebo effect Interpreting relationships from scatter graphs Validity of results Posing further questions based on data Improvements to procedures Reproducibility Oral presentations on findings Constructing a scientific conclusion linking collected evidence to substantive knowledge Illustrated presentations of research, techniques/methods and findings			
PBL links		*Rainforests*			*WW2 (alarms DT)*
Weeks	*5 weeks*	*4 weeks*	*7 weeks*	*7 weeks*	*6 weeks*
BIG question: assessment opportunity 	**BIG question:** What affects the health of humans? How do our choices affect how our bodies work? Why does my heart beat	**BIG question:** How are living things grouped together? In what ways can we sort living things?	**BIG question:** What happens to species over a long time? What is evolution, how does it happen and how do scientists know?	**BIG question:** How does light travel? Why does my shadow change length over the course of a day?	**BIG question:** How do humans use electricity? Can we vary the effects of electricity?
Key questions 	• Why do we need oxygen? • How do we breathe? • Do fish and plants breathe? • Do all living things need oxygen? • How does the size of a person's lungs affect their lung capacity? • Are there ways to increase/decrease our lung capacity? Is lung capacity fixed? • Why do we have blood? • How does our heart work? • How does size of muscle affect our pulse rate? • How does exercise effect our pulse rate?	• Why do we need to classify living things? • How do we classify? • What are the difficulties with classification? (penguins, whales, platypus) • How do animals change over time? • Why does variation exist? • What happens if animals of different species breed? (hybrids) • What happens to house plants outside? • What are microorganisms? • How can we prevent the spread of disease? • Why do animals and plants compete – and what for?	Why are we all different? • What is variation, and why is it important? • How did life begin on Earth? • How do we change? • What is evolution? • What evidence is there for evolution? • How does evolution happen? • What reasons do animals become extinct? • Polar Bears' habitat is rapidly changing, what possible futures do they face, and can we predict which is most likely? • How did Darwin come up with the theory? • Why was his theory not initially accepted?	• How does the size of an object affect the size of a shadow? • How does the distance between the light and the object change the size of a shadow? • How does the distance between the object and the size of the screen affect the size of a shadow? • How would a solar eclipse be different if: - The moon was a different size? - The earth span faster or slower? - The sun was larger or smaller? - If the earth and moon where the same size but further away in the solar system? • How does the amount of aluminium foil scrunched affect how much light is scatters?	• Do all batteries push as hard as each other? • What is electricity? • How does the voltage of a batters affect how much current is pushed? • How does the length of time I leave the current flowing for affect the brightness of the bulb? • How does number of bulbs affect the brightness of a bulb? • Are all types of wires as good as conducting electricity? • Why are wires insulated in plastic? Does type of material make a difference?

	• How might the circulatory system of an elephant, a hummingbird, or a polar bear differ? • Is the air you breathe out, the same as that you breathe in?			• How does the amount of polishing affect how well a piece of metal scatters light? • How perfect are our mirrors? Do some scatter light more than others? • What happens to light when it is shone through water? How is this affected by putting glitter, salt or talc in the water? • How does a periscope/microscope/telescope work?	• Does length of wire make a difference? • Does the type of circuit affect how the components work/long the battery lasts? • What renewable ways can we generate electricity? • How does current affect heat? • What are the dangers of a short circuit?
Famous Scientist (historical pioneers to modern-day innovators)	George Wald James Watson Justus von Liebig (Theories of Nutrition and Metabolism) Sir Richard Doll (Linking Smoking and Health Problems) Leonardo Da Vinci (Anatomy)	Alfred R Wallace Carl Linnaeus (Identifying, Naming and Classifying Organisms)	Francis Crick Mary Leakey Charles Darwin and Alfred Russel Wallace (Theory of Evolution by Natural Selection) Jane Goodall (Chimpanzees)	Albert Einstein Thomas Young (Wave Theory of Light) Ibn al-Haytham (Alhazen) (Light and our Eyes) Percy Shaw (The Cats Eye)	Thomas Edison Alessandro Volta (Electrical Battery) Nicola Tesla (Alternating Currents)
Vocabulary	Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle	Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering Variation Organisms Populations. Classification Characteristics Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. Classify, compare, bacteria, microorganism, organism, invertebrates, vertebrates, Linnaean.	Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils Fossils, Adaptation, Evolution, Characteristics, Reproduction, Genetics, Variation, Inherited, Environmental, Mutation, Competition, Survival of the Fittest, Evidence,	**As for Year 3** - Light, plus straight lines, light rays Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent. Reflect Absorb Emitted Scattered Refraction	Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage Electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor.
Prior Learning	**In Year 5 children should:** • Describe the changes as humans develop to old age.	**In Year 4, children should:** • Recognise that living things can be grouped in a variety of ways. • Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.	**From Key Stages 1 & 2, children should:** • Understand there is a variety of life on Earth • Know that some animal's differences are important to their survival	**In Year 3 children should:** • Recognise that they need light in order to see things and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that	**In Year 4, children should:** • Identify common appliances that run on electricity. • Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.

		Recognise that environments can change and that this can sometimes pose danger to living things.	• Know how animals and plants reproduce • Know how fossils form over time	there are ways to protect their eyes. • Recognise that shadows are formed when the light from a light source is blocked by a solid object. • Find patterns in the way that the sizes of shadows change.	• Identify whether a lamp will light in a simple series circuit, based on whether the lamp is part of a complete loop with a battery. • Recognise that a switch opens and closes the circuit and associate this with whether a lamp lights in a simple series circuit. Recognise some common conductors and insulators, and associate metals with being good conductors. • Know the difference between a conductor and an insulator, giving examples of each. • Safety when using electricity.
Future Learning	**In Key Stage 3 children will learn about:** • the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms. • the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) • calculations of energy requirements in a healthy daily diet • the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • the structure and functions of the gas exchange system in	**In Key Stage 3 children will learn about:** • the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere • the adaptations of leaves for photosynthesis. • the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • the importance of plant reproduction through insect pollination in human food security • how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.	**In Key Stage 3 children will learn about:** • heredity as the process by which genetic information is transmitted from one generation to the next • the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation • the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.	**In Key Stage 3, children will learn about:** • the similarities and differences between light waves and waves in matter • light waves travelling through a vacuum; speed of light • the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface Science • use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative), the human eye • light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras • colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in	**In Key Stage Three children will learn:** • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • Potential difference measured in volts, battery and bulb ratings, resistance measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative). • Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects • The idea of electric field, forces acting across the space between objects not in contact.

	humans, including adaptations to function • the effects of recreational drugs (including substance misuse) on behaviour, health and life processes.			absorption and diffuse reflection.	
Possible misconceptions	**Possible 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.	**Possible misconceptions** **Some children may think:** **• all micro-organisms are harmful** **• mushrooms are plants.**	**Possible misconceptions** 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.	**Possible misconceptions** Some children may think: • we see objects because light travels from our eyes to the object	**Possible misconceptions** Some children may think: • larger-sized batteries make bulbs brighter • a complete circuit uses up electricity • components in a circuit that are closer to the battery get more electricity**.**
Teaching ideas- Disciplinary skills	**Comparative tests**  How does the length of time we exercise for affect our heart rate? Can exercising regularly affect your lung capacity? Which type of exercise has the greatest effect on our heart rate? **Identify and Classify** 	**Comparative tests**  How does the temperature affect how much gas is produced by yeast? Which is the most common invertebrate on our school playing field? **Identify and Classify**  How would you make a classification key for vertebrates/invertebrates or microorganisms? **Observation overtime**	**Comparative tests**  What is the most common eye colour in our class? **Identify and Classify**  Compare the skeletons of apes, humans, and Neanderthals – how are they similar, and how are they different? Can you classify these observations into evidence for the idea of evolution, and evidence against?	**Comparative tests**  How does the angle that a light ray hits a plane mirror affect the angle at which it reflects off the surface? Which material is most reflective? **Identify and Classify**  Can you identify all the colours of light that make white light when mixed together? What	**Comparative tests**  How does the voltage of the batteries in a circuit affect the brightness of the lamp? How does the voltage of the batteries in a circuit affect the volume of the buzzer? Which make of battery lasts the longest? Which type of fruit makes the best fruity battery? **Identify and Classify**

	Which organs of the body make up the circulation system, and where are they found? **Observation overtime**  How does my heart rate change over the day? How much exercise do I do in a week? **Pattern seeking**  Is there a pattern between what we eat for breakfast and how fast we can run? **Research**  How have our ideas about disease and medicine changed over time?	 What happens to a piece of bread if you leave it on the windowsill for two weeks? **Pattern seeking**  Do all flowers have the same number of petals? **Research**  What do different types of microorganisms do? Are they always harmful?	**Observation overtime**  How has the skeleton of the horse changed over time? **Pattern seeking**  Is there a pattern between the size and shape of a bird's beak and the food it will eat? **Research**  What happened when Charles Darwin visited the Galapagos islands? What ideas did American geneticist Barbara McClintock have about genes that won her a Nobel Prize?	colours do you get if you mix different colours of light together? **Observation overtime**  Does the temperature of a light bulb go up the longer it is on? How does my shadow change over the day? **Pattern seeking**  Is there a pattern to how bright it is in school over the day? And, if there is a pattern, is it the same in every classroom? **Research**  Why do some people need to wear glasses to see clearly? How do our eyes adapt to different conditions?	 How would you group electrical components and appliances based on what electricity makes them do? **Observation overtime**  How does brightness of bulb change as the battery runs out? How can we measure how quickly a battery is used up? **Pattern seeking**  Does the temperature of a light bulb go up the longer it is on? **Research**  How has our understanding of electricity changed over time?
Possible Evidence (gives you examples of ways that your pupils might show that they are **secure in the knowledge required**)	**Show understanding of a concept using scientific vocabulary correctly** • Can draw a diagram of the circulatory system and label the parts and annotate it to show what the parts do • Produces a piece of writing that demonstrates the key knowledge e.g. explanation text, job description of the heart **Apply knowledge in familiar related contexts, including a range of enquiries** • Use the role play model to explain the main parts of	**Show understanding of a concept using scientific vocabulary correctly** • Can give examples of animals in the five vertebrate groups and some of the invertebrate groups • Can give the key characteristics of the five vertebrate groups and some invertebrate groups • Can compare the characteristics of animals in different groups **Apply knowledge in familiar related contexts, including a range of enquiries** • Can use classification materials to identify unknown plants and animals	**Show understanding of a concept using scientific vocabulary correctly** • Can explain the process of evolution • Can give examples of how plants and animals are suited to an environment • Can give examples of how an animal or plant has evolved over time e.g. penguin, peppered moth **Apply knowledge in familiar related contexts, including a range of enquiries** • Can identify characteristics that will make a plant or animal suited or not suited to a particular habitat • Can link the patterns seen in the model to real examples	**Show understanding of a concept using scientific vocabulary correctly** • Can describe, with diagrams or models as appropriate, how light travels in straight lines either from sources or reflected from other objects into our eyes • Can describe, with diagrams or models as appropriate, how light travels in straight lines past translucent or opaque objects to form a shadow of the same shape **Apply knowledge in familiar related contexts, including a range of enquiries**	**Show understanding of a concept using scientific vocabulary correctly** • Can make electric circuits and demonstrate how variation in the working of particular components, such as the brightness of bulbs, can be changed by increasing or decreasing the number of cells or using cells of different voltages • Can draw circuit diagrams of a range of simple series circuits using recognised symbols **Apply knowledge in familiar related contexts, including a range of enquiries**

	the circulatory system and their role • Can use subject knowledge about the heart whilst writing conclusions for investigations • Can explain both the positive and negative effects of diet, exercise, drugs and lifestyle on the body • Present information e.g. in a health leaflet describing impact of drugs and lifestyle on the body	• Can create classification keys for plants and animals • Can give a number of characteristics that explain why an animal belongs to a particular group	• Can explain why the dominant colour of the peppered moth changed over a very short period of time	• Can explain how evidence from enquiries shows that light travels in straight lines • Can predict and explain, with diagrams or models as appropriate, how the path of light rays can be directed by reflection to be seen, e.g. the reflection in car rear view mirrors or in a periscope • Can predict and explain, with diagrams or models as appropriate, how the shape of shadows can be varied	• Can incorporate a switch into a circuit to turn it on and off • Can change cells and components in a circuit to achieve a specific effect • Can communicate structures of circuits using circuit diagrams with recognised symbols • Can devise ways to measure brightness of bulbs, speed of motors, volume of a buzzer during a fair test • Can predict results and answer questions by drawing on evidence gathered
Linked texts	Pig-Heart Boy (Malorie Blackman) Skellig (David Almond) A Heart Pumping Adventure (Heather Manley)	Beetle Boy (M G Leonard) Insect Soup (Barry Louis Polisar) Fur and Feathers (Janet Halfmann)	One Smart Fish (Christopher Wormell) The Molliebird (Jules Pottle) Our Family Tree (Lisa Westberg Peters)	Letters from the Lighthouse (Emma Carroll) The Gruffalo's Child (Julia Donaldson) The King Who Banned the Dark (Emily Haworth-Booth)	Goodnight Mister Tom (Michelle Magorian) Blackout (John Rocco) Hitler's Canary (Sandi Toksvig)
National Curriculum Statutory Requirement	Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function Describe the ways in which nutrients and water are transported within animals, including humans.	Classify living things into broad groups according to observable characteristics and based on similarities and differences. Give reasons for classifying plants and animals based on specific characteristics.	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.	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.	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.

	Sticky knowledge The heart pumps blood around the body. • Oxygen is breathed into the lungs where it is absorbed by the blood. • Muscles need oxygen to release energy from food to do work. (Oxygen is taken into the blood in the lungs; the heart pumps the blood through blood vessels to the muscles; the muscles take oxygen and nutrients from the blood.)	**Sticky knowledge** • Variation exists within a population (and between offspring of some plants) – NB: this Key Idea is duplicated in Year 6 Evolution and Inheritance. • Organisms best suited to their environment are more likely to survive long enough to reproduce. • Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristic patterns. • Competition exists for resources and mates.	**Sticky knowledge** • Life cycles have evolved to help organisms survive to adulthood. • Over time the characteristics that are most suited to the environment become increasingly common. **NB: The following could be duplicated in Year 6 Living things and their habitats.** • Organisms best suited to their environment are more likely to survive long enough to reproduce. Organisms are best adapted to reproduce are more likely to do so. • Organisms reproduce and offspring have similar characteristic patterns. • Variation exists within a population (and between offspring of some plants) • Competition exists for resources and mates	**Sticky knowledge** Animals see light sources when light travels from the source into their eyes. • Animals see objects when light is reflected off that object and enters their eyes. • Light reflects off all objects (unless they are black). Non shiny surfaces scatter the light, so we do not see the beam. • Light travels in straight lines.	**Sticky knowledge** • Batteries are a store of energy. This energy pushes electricity round the circuit. When the battery's energy is gone it stops pushing. Voltage measures the 'push.' • The greater the current flowing through a device the harder it works. • Current is how much electricity is flowing round a circuit. • When current flows through wires heat is released. The greater the current, the more heat is released.
Substantive Knowledge	**Circulation** **Knowledge Block 1: Getting oxygen into the blood** • All animals need oxygen to survive. • Air is breathed into the lungs where the oxygen in the air is passed into the blood. • Every part of animals' bodies need oxygen, especially muscles. • Muscles need a supply of oxygen and sugar (glucose) to make them work, they are supplied by the blood. **Knowledge Block 2: The blood circulation model** • The heart is a vital organ pumps blood through the blood vessels. • Blood Vessels are the tubes that blood flows through. • The blood circulates around the body in a way that ensures all muscles in the body get a supply of oxygen and sugar. • The heart pumps blood to every muscle in the	**Knowledge Block 3: Classification of life** ● All living (and extinct) organisms are classified into groups based upon their physical features. ● This includes animals, plants, fungi, and microorganisms like bacteria. ● Within each of these broad groups, organisms are classified into small subgroups. Animals- invertebrates, mammals, birds, amphibians, reptiles and fish, Plants- flowering plants, ferns, conifers, moss. ● Bacteria are a group of organisms that are not visible to the naked eye but are very abundant and have distinct physical features we can only see under powerful microscopes.	**Fossils, geological time and classification** **Knowledge Block 1- What is evolution and how do we know it happened**? ● The Earth is very old. Around 4.2 billion years. We know this from dating rocks ● Life first appeared on Earth around 3.8 billion years ago. ● Life was, at first, very simple but over millions and millions of years life became more complex through the process of evolution **Knowledge Block 2- Evidence for evolution** ● There are many sources of evidence for evolution ● Fossils are one of the main sources of evidence for evolution. They show when new organisms appear and when they go extinct. ● Due to the nature of fossil formation and discovery, fossils only provide an incomplete record of evolution. ● Scientists use fossils along with other pieces of evidence (DNA, Embryology, comparative anatomy, artificial selection) to work out how organisms have evolved	**How light behaves** **Knowledge Block 1: How light travels** • When light is emitted from a light source, it travels in straight lines until it hits an object. This can be represented by an arrow. • Shadows form when light hits an opaque object. The area behind the object is in darkness because light can only travel in straight lines. • Shadows have the same shape as the objects that cast them. **Knowledge Block 2: How light behaves when it hits objects** ● When light hits a transparent object, it goes through it in a straight line so we can see a clear image through it. ● When light hits a translucent material, it goes through it but is scattered, this means light can pass through, but we can't see an image through it. ● When light hits a mirrored surface, it reflects off it in straight lines, so we can see an image in the reflective material.	**Controlling electrical circuits** **Knowledge Block 1: Pushing electrical current** • Current is the flow of electricity around a circuit. • The power supply in a circuit pushes the current round the circuit • The voltage of the power supply is a measure of this push • Voltage is measure in volts • Batteries have a limited store of energy and when this is gone, they can no longer push the current **Knowledge Block 2: Electrical current**

	body. The circulatory route must allow the blood to collect oxygen from the lungs, sugar from the intestines and visit muscles. • The blood then returns to the heart where it is pumped again. • Exercise helps the heart to work more efficiently. • Eating a healthy diet helps to keep the blood vessels from getting blocked. • Avoiding smoking and alcohol puts less stress on the whole system and keeps it healthier.		• Fossils form when dead organisms are rapidly buried or leave an imprint and are turned to stone over a long period of time. If they survive in the Earth, they then have to be found by a palaeontologist who will study them. **Classification and Evolution** **<u>Knowledge Block 1: Natural selection</u>** • Evolution is the change of physical form in a population over a long-time span • Natural selection is the process which controls that change. • In any population there is variation and competition for resources (food, water, mates). • Within that variation, organisms that have features which make them better adapted at securing food, water, and mates, are more likely to survive and produce offspring which have inherited those same successful features. Those that are not well adapted will eventually go extinct. • Over a long enough timeline all organisms in a population will have those successful features. • This is known as the Theory of Evolution by Natural Selection and was developed by Charles Darwin in 1859 Knowledge Block 2: How Charles Darwin discovered the process of Evolution by Natural selection • Before Darwin, Lamarck's Idea of acquired characteristics was proposed. (Giraffes stretch their necks in life, which made their children have longer necks). • Darwin as a young man travelled around the world on the HMS Beagle. On this 5-year voyage he saw lots of things and recorded down lots of evidence which allowed him to work out how organisms change over time by a different mechanism of Natural selection	• Sometimes when light hits a material it reflects off it in many different directions (it is scattered). In this case light will be reflected but no image will be seen in the material. • Shiny surfaces are better reflectors and rough surfaces scatter light more. Opaque objects don't allow any light to pass through them **Knowledge Block 3: How we see** • Animals see objects when light is reflected off the object and enters the eye through the pupil. • The pupil changes its size to allow enough, but not too much light into the eye. • Too much light damages the eye and too little results in poor quality images.	• Current is the flow of electricity through a **conductor** • When current passes through a device it makes it work • Increasing the voltage (the number of cells in the battery) increases the current. The larger the flow of current, the harder the device works **Knowledge Block 3: Electrical resistance** • All parts of a circuit offer **resistance** to electrical current including the wires. • Resistance is the slowing down of electrical current • The more devices added into a circuit the greater the resistance This means less current flows around the circuit
LTS	LTS- Looking at how our bodies change(carry on from year 5)				