SCIENCE

INTENDED CURRICULUM

Our planning of the science curriculum develops **disciplinary** and **substantive knowledge** and is underpinned by **scientific laws and theories.**

Disciplinary Knowledge

Primary Science Teaching Trust

Comparative / fair testing
Changing one variable to see its effect on another, whilst keeping all others the same.

Research
Using secondary sources of information to answer scientific questions.

Observation over time
Observing changes that occur over a period of time ranging from minutes to months.

Pattern-seeking
Identifying patterns and looking for relationships in enquiries where variables are difficult to control.

Identifying, grouping and classifying
Making observations to name, sort and organise items.

Problem-solving
Applying prior scientific knowledge to find answers to problems.

Substantive Knowledge

Biology

Living things and their environment (Animals, humans, plants, habitats)

Reproduction, inheritance and evolution (Evolution, inheritance, life processes, life cycles)

Chemistry

States of matter (Solids, liquids, gases)

Materials (properties and changes including reversible/irreversible changes)

Physics

Energy (Light, sound, electricity)

Forces (Friction, air resistance, gravity, magnets)

Earth Science

Earth and space (Seasons, day and night, solar system)

Rocks and fossils

Nursery

UNDERSTANDING THE WORLD □ Natural World (Links to KS1: Science)

Educational Programme: Understanding the world involves guiding children to make sense of their physical world and their community. The frequency and range of children's personal experiences increases their knowledge and sense of the world around them – from visiting parks, libraries and museums to meeting important members of society such as police officers, nurses and firefighters. In addition, listening to a broad selection of stories, non-fiction, rhymes and poems will foster their understanding of our culturally, socially, technologically and ecologically diverse world. As well as building important knowledge, this extends their familiarity with words that support understanding across domains. Enriching and widening children's vocabulary will support later reading comprehension.

Autumn		Spring		Summer	
Autumn 1 It's Good to be Me	**Autumn 2** Let's Explore	**Spring 1** Splashing About	**Spring 2** Animals in Hot Countries	**Summer 1** My Garden	**Summer 2** Near and Far
Living Things: Animals and Plants ○ Name & identify body parts- facials features, arms, legs, fingers and toes ○ Know the names of different body parts & what they do		**Living Things: Animals and Plants** ○ Find out about animals that live in different countries/climates ○ Talk about the habitats of some wild animals ○ Find out about animals that live in different countries/climates		**Living Things: Animals and Plants** ○ Know the names of wild animals including some babies ○ Begin to understand the need to respect and care for the natural environment and all living things. ○ Know the names of farm animals including babies ○ Know the names of the basic parts of a plant & tree	
Materials ○ Use some senses in hands-on exploration of natural materials ○ Explore natural materials indoors and outdoors		**Materials** ○ Know why some objects float & sink ○ Explore materials with different properties and talk about the and changes that they notice.		**Materials** ○ Know the different properties of material e.g. *wood, plastic, metal* ○ Use a magnifying glass and talk about/describe what they see/notice	
Different Processes ○ Using images sequence the change from baby to child ○ Know about the different seasons & the effect they have on plants, tress & creatures		**Different Processes** ○ Understand the key features of the life cycle of a plant and an animal – chick (living eggs) ○ Know some correct terms to describe the life-cycle of a butterfly		**Different Processes** ○ Know the effects of exercise on the body e.g. *heart beats faster, get hotter* ○ Know that most plants start growing from a seed or bulb ○ Know all plants need water & light to grow & survive ○ Know how to care for plants	

Children to be exposed to key vocabulary daily in provision. High quality text to be chosen for story times that allow for questioning opportunities relating to key events. □ The outdoor classroom will be used as a key feature in our science learning through the natural world. □ Trips to the farm and the zoo will be used to enhance children experiences of animals and class experience of hatching our own chicks

Reception

UNDERSTANDING THE WORLD □ Natural World (Links to KS1: Science)

Educational Programme: Understanding the world involves guiding children to make sense of their physical world and their community. The frequency and range of children's personal experiences increases their knowledge and sense of the world around them – from visiting parks, libraries and museums to meeting important members of society such as police officers, nurses and firefighters. In addition, listening to a broad selection of stories, non-fiction, rhymes and poems will foster their understanding of our culturally, socially, technologically and ecologically diverse world. As well as building important knowledge, this extends their familiarity with words that support understanding across domains. Enriching and widening children's vocabulary will support later reading comprehension.

Early Learning Goals:

ELG - Understanding the World- The Natural World: Explore the natural world around them, making observations and drawing pictures of animals and plants ■ Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class ■ Understand some important processes and changes in the natural world around them, including the seasons

Autumn		Spring		Summer	
Autumn 1 Super Me & Super You	**Autumn 2** Time for Change	**Spring 1** Animals in Winter	**Spring 2** Wonderful Water/Rainforest	**Summer 1** Growing	Summer 2 Near and Far
Living Things: Animals and Plants ○ Name own body parts using the text Funny Bones as a support. All above + shoulders, ribs, backbone, knees, elbow ○ Piece back together the parts of the body and locate upon request. ○ Describe key function of the skeletal system ○ Describe what changes occur as they change from a baby to an adult		**Living Things: Animals and Plants** ○ Shows some understanding that good practices with regard to exercise, eating, drinking water, sleeping & hygiene can contribute to good health ○ Describe what they see, hear & feel ○ Identify different parts of their body & animals Be able to show care and concern for living things ○ Identify similarities and differences between animals		**Living Things: Animals and Plants** ○ Know all plants need water, light and warmth to grow and survive ○ Know a seed produces roots to allow water to get into the plant and shoots to produce leaves to collects the sunlight ○ Extend vocabulary: blossom, buds, bulb, evergreen, deciduous	
Materials ○ Explore collections of materials with similar and/ or different properties.		**Materials** ○ Talk about the differences between materials and changes that they notice ○ Characteristics of liquids & solids e.g., cooking eggs, melting chocolate		**Materials** ○ Classify a set of objects by their materials- Wood, plastic, fabric, and glass. ○ Name the characteristics of materials ○ Describe the most suitable materials for building and give explanations as to why	

Different Processes ○ Name the 4 seasons ○ Talk about similarities and differences between each season ○ Name the characteristics of each season ○ Begin to talk about the effect of exercise and food on their health. Healthy Eating – sorting foods	**Different Processes** ○ Brush own teeth and talk about the importance of good oral health. ○ Know the effects of heating and cooling on ingredients such as melting and freezing	**Different Processes** ○ Know the effects exercise has on their bodies ○ Use correct terms e.g., chrysalis, pupa when observing life cycle of butterfly & ladybirds ○ From food to fork'. Understand where food comes from and experience growing their own vegetables, harvesting, preparing, and eating.
Children to be exposed to key vocabulary daily in provision. □ High quality text to be chosen for story times that allow for questioning opportunities relating to key events. □ The outdoor classroom will be used as a key feature in our science learning through the natural world. □Trips to the farm and the zoo will be used to enhance children experiences of animals and class experiences of caring for our own caterpillars/butterflies.		

Year 1

Topic	Substantive Knowledge (end points)	Disciplinary Knowledge & Working Scientifically
Seasonal Changes	• Know the sun provides Earth with warmth and light. • Know in autumn the leaves of many trees change colour, the temperature grows colder, plants stop making food and animals prepare for the months ahead. • Know in winter, it is usually the coldest time of the year and in some places, it brings freezing temperatures, snow, and ice. • Know in spring, dormant plants, begin to grow again, new seedlings sprout out of the ground, plants grow new leaves and hibernating animals awake. • Know in summer that it has long, usually sunny days and is the hottest season. • Know that the movement of Earth in space gives us day and night. • Know it takes the Earth a day to go around on its axis. • Know that in the UK (United Kingdom), the day length is longest in the summer and shortest in the winter. • Know that the moon goes around the Earth.	 • When appropriate, measure using standard units where all the numbers are marked on the scale (link to Maths) • Record data in simple prepared tables, pictorially or by taking photographs • Identify the question to investigate from a scenario or choose a question from a range provided • Which is the best material suitable for a particular purpose?
Plants	• Know flowering plants, consist of leaves, flowers (blossom on trees), petal, roots, bulb or seed, trunk, or stem.	

	• Know wild plants, grow without human intervention, and garden plants are grown by human intervention. • Know the wildflowers – dandelion, forget-me-not, thistles, daisy, poppy. • Know the garden flowers – e.g. rose, buttercup, tulip. • Name deciduous trees – e.g. ash, oak, beech, silver birch, alder. • Know deciduous trees shed their leaves in winter to conserve energy. • Know evergreen trees, keep their leaves throughout the year. • Name evergreen trees pine, spruce, cedar.	• Do bigger seeds grow into bigger plants?  • Ask one or two simple questions linked to a topic • What are the most common British plants and where can we find them? • How have the materials we use changed over time? (link to History)  • Be able to ask a Yes/No questions to aid sorting • Identify the headings for the two groups (it is..., it is not…)
Animals including Humans	• Know the animal kingdom is classified into fish, amphibians, reptiles, birds, and mammals. • Know a carnivore feeds on other animals, examples are fox, shark, crocodile, frog, owl. • Know an herbivore feeds on plants, examples are cows, pigeon, tortoise, parrotfish. • Know an omnivore feeds on both animals and plants, examples are lizards, bears, yellow-legged frog, crow, goldfish. • Know five of the senses are associated with the following: hands-touch; nose-smell; mouth-taste; eyes-see and ears-hear. • Name examples of fish: trout, salmon, cod, plaice. • Name examples of amphibians: frog, newt, toad.	

	• Name examples of reptiles: lizard, snake, turtle, alligator. • Name examples of birds: sparrow, blackbird, robin, chicken. • Name examples of mammals: humans, dog, rat, bear. • Know animals can be warm or cold blooded.	• Be able to compare on obvious, observable features e.g. size, shape, colour, texture etc.
Everyday Materials	• Know objects are things we can see or touch and can be made from one or more materials. • Know a material is the matter from which a thing is or can be made from, • Know a natural material is any product that comes from plants, animals, or the ground. • Know examples of natural materials are water, wood, rock, cotton, iron, oil, leather. • Know manufactured materials are materials that have been produced by humans. • Know examples of manufactured materials are plastic, metal, glass, brick, paper, fabric, foil. • Know that everything is made up of materials. • Know materials can be grouped according to their properties. • Know varied materials, have different properties. • Name different properties: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent.	 • Record data in simple, prepared tables and tally charts • Is there a pattern in the types of materials that are used to make objects in a school?  • Observe the weather over time and how it changes

		 • Talk about the number of objects in each group i.e. which has more or less • Be able to answer their questions using simple sentences using their observations or measurements

Experiences	**SMSC**	**British Values**	**WPAT Values**
Chester Zoo – animal classifications. Growing plants from seeds and bulbs. Gardening club. Exploring local environment for changes through the seasons.	Moral – all children have the right to clean water and food	Respect and Tolerance – animals and people have different diets (herbivore/vegetarian or vegan) Democracy – take turns when grouping vertebrates	Honesty – through discussion be honest about the amount of exercise they do Responsibility – we are responsible for the living things within our school and local environment

Year 2

Topic	Substantive Knowledge (end points)	Disciplinary Knowledge & Working Scientifically
Use of Everyday Materials	• Know that materials are picked for a specific purpose because of their properties. • Know glass is made by melting sand and other minerals together at extremely hot temperatures. It is normally transparent and can be made into different shapes. Thick glass can be strong, but thin glass breaks easily. • Know different fabrics, have different properties. They can be stretchy (a pair of tights), insulating (a woollen coat) or absorbent (a towel). • Know pans made from metal are strong, hard, and shiny materials that can be hammered into different shapes without breaking. They are good conductors of heat and electricity. • Know plastics are materials made from chemicals. They are strong and waterproof, can be made into any shape by applying heat, are good insulators and do not conduct heat or electricity. • Know furniture made from wood comes from trees. It is strong, flexible, and long-lasting and an insulator of heat and electricity. • Know fabrics are used to make clothes as they are flexible, warm and do not wear out easily.	 • Record data in simple prepared tables, pictorially or by taking photographs • Identify the question to investigate from a scenario or choose a question from a range provided  • Ask one or two simple questions linked to a topic

	• Know the same object can be made using varied materials e.g., spoons can be made from wood, metal, plastic. • Know some shapes of objects can be changed by squashing, bending, twisting, or stretching.	• How does a cactus survive in a desert with no water? • Choose and research an animal to find its food and water source  • Be able to ask a Yes/No questions to aid sorting • Identify the headings for the two groups (it is …, it is not...) • Be able to compare on obvious, observable features e.g. size, shape, colour, texture etc. • Which offspring belongs to which animal? • How would you group things to show which are living, dead, or have never been alive?
Plants	• Know seeds and bulbs have a store of food inside them. • Know plants, need light, water, air, nutrients, and space. • Know that seeds and bulbs do not need light to germinate but need warmth. • Know the process to grow into mature plants includes growing roots, shoot appears through soil, plant takes nutrients from the soil and continues to grow. • Know types of seed: sunflower apple, tomato, pea. • Know types of bulbs: daffodil, tulip, bluebells, onions, garlic. • Know that plants need water, light, warmth, and space to stay healthy.	
Animals including Humans	• Know all animals, need food, water, air, and shelter. • Know animals, need to stay fit by eating sensibly and taking regular exercise. • Know all animals, need to eat a balanced diet. • Know the food groups are carbohydrates, proteins, fats, fruits and vegetables and dairy. • Know all animals, have offspring which then grow into adults.	

	• Know some offspring are different from their adults e.g., caterpillar-butterfly, tadpole-frog. • Know the four stages in a life are: birth, growth, reproduction and death. • Know animals also need exercise and sleep to keep a body healthy. • Know humans should be hygienic to help stop the spread of germs.	 • Ask a question that is looking for a pattern based on observations • Record data in simple, prepared tables and tally charts • Which habitat do minibeasts prefer on our school grounds?  • Ask a question about what might happen in the future based on an observation • How does a tadpole change over time?
Living Things & Their Habitat	• Know the difference between living (grow), dead (no longer alive) and never been alive (does not grow). • Know the 5 things all living things need – food, water, shelter, warmth, and space. • Name different habitats for plants and give an example – grassland (ryegrass, wild oats), forest (ferns, foxgloves), pots (tomatoes, peas), desert (prickly pear, aloe vera, cactus), river (pondweed, waterweed), and tundra (arctic moss, arctic poppy). • Name habitats for animals and give examples – grassland (elephant, zebra, lion), desert (camel, scorpion), river (turtle, fish, crab), tundra (polar bear, snowy owl), and forest (squirrel, deer, bird). • Know what a microhabitat is - a small, specialized habitat within a larger habitat – decomposing log (earthworm, centipede, beetle), temporary pool of water (water mites), and under rocks (worm, ant, cricket).	

	• Know animals obtain food from other animals and plants. • Know how to explain a simple food chain and name various sources of food (grass, snail, bird).	 • Talk about the number of objects in each group i.e. which has more or less • Be able to answer their questions using simple sentences using their observations or measurements
Energy	• Know examples of common appliances that run on mains electricity are television, fridge/freezer, microwave, washing machine, lights. • Know that everyday appliances use electricity; these include things that light up, heat up, produce sound, or move. • Know examples of objects that use batteries are torches, mobile phones, calculators. • Know a force is a push or a pull. • Know that pushing or pulling things can make objects start or stop moving. • Know that sometimes pushes and pulls change the shape of objects. • Know that there are many different sources of sounds. • Know how to make observations of sounds by listening carefully. • Know that light sources give out light and the sun is a light source. • Know that light is essential for seeing things. • Know that sources of light show up best at night-time.	

Experiences	**SMSC**	**British Values**	**WPAT Values**

Chester Zoo – habitats. Growing plants from seeds and bulbs. Gardening club. Exploring local environment for physical and human features. Local walk.	Moral – it is our planet, and we should look after it Spiritual – sense of enjoyment and fascination of growing things	Respect – the children are taught about some differences between the plants that we grow in Britain and in other countries Individual liberty - children are encouraged to grow a plant of their choice	Responsibility – the children look after the plants

Year 3

Topic	Substantive Knowledge (end points)	Disciplinary Knowledge & Working Scientifically
Rocks	• Know there are three main types of rocks and give an example – sedimentary (chalk, limestone, shale, sandstone), metamorphic (slate, marble, quartzite, anthracite) and igneous (basalt, granite, pumice, obsidian). • Know that rocks can be group based on physical properties and can give examples – hard/soft, permeable/impermeable or durability. • Know that fossils are formed by a plant or animal dying in a watery environment, the plant or animal is buried in mud and silt, soft tissues quickly decompose leaving the hard bones or shells behind, over time sediment builds over the top and hardens into rock. • Know that soil is made from rocks and organic matter – clay, sandy, loamy, peaty, chalky, silty. • Know that soil can help plants grow.	 • Decide what to change and what to measure or observe • Take repeat readings where necessary • Prepare own tables to record data • Present data in bar charts • How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals?
Light	• Know that light is a form of energy. • Know that the eyes take in light so we can see. • Know that you cannot see anything when there is no light. • Know light sources give out light. • Know natural light sources are sun, stars, candle flame, fire.	

	• Know artificial light sources are light bulbs, florescent lighting, computer screens. • Know some objects seem bright but are reflecting light from elsewhere, for example the Moon, mirrors, and shiny objects. • Know that light from the Sun is very strong and can damage your eyes. • Know the eyes can be protected by wearing dark glasses. • Know to never look directly at the sun. • Know that light can pass through materials that are transparent like glass. • Know that some light passes through materials that are translucent like frosted glass. • Know that light cannot pass through opaque materials. • Know that when light is blocked by an opaque object, a shadow is formed. • Know that the size of the shadow changes depending on the position of the light source. • Know that the closer the light source to the object the larger the shadow will be.	 • Choose a source from a range provided • Present what they learnt verbally or using labelled diagrams • What are all the different ways that seeds disperse? • Why do different types of vitamins keep us healthy and which foods can we find them in?  • Suggest improvement and new questions arising from the investigation.?
Animals including Humans	• Know the right food is important for a healthy body. • Know animals including humans, get their nutrients from what they eat. • Know all animals, including humans, need the right amount of nutrients from the food they eat.	

	• Know carbohydrates and fats provide energy, proteins help with growth and repair, vitamins and minerals keep cells healthy, fibre helps food move through the gut and 70% of the body is water. • Know the skeleton does three jobs: protecting the body parts, supporting the body, and letting the body move. • Know bones have joints so the skeleton can bend. • Know muscles and joints allow movement. • Know muscles are soft tissues that are joined to bones and always work in pairs.	• How do the skeletons of different animals compare? • How would you organise these light sources into natural and artificial sources?  • Decide what to measure or observe • Measure using standard units where not all the numbers are marked on the scale.
Plants	• Know the flower is needed for reproduction. • Know the leaves are needed for nutrition (leaves use sunlight to change carbon dioxide and water into food – photosynthesis). • Know the stem holds the plant up towards the light and carries water and minerals from the roots to the rest of the plant. • Know the root anchors the plant and root hairs soak up water and minerals from the soil. • Know water travels up a plant after being absorbed from the soil. • Know that each flowering plant has a male (stamen) and female (carpel) part. • Know the stamen contains pollen grains. • Know the carpel contains the eggs. • Know flowers are pollinated by insects or wind and pollen carried to stigma of another plant.	 • Decide what to measure or observe • Measure using standard units where not all the

	• Know that when pollen and egg join – a seed is made. • Know the ovary becomes a fruit which contains the seeds e.g. acorn is the fruit of the oak tree. • Know seeds are dispersed by wind, water, animals or by explosion.	numbers are marked on the scale. • Does the size and shape of a magnet affect how strong it is?  • Refer directly to their evidence when answering their question • Where appropriate provide oral or written explanations for their findings • Use results from an investigation to make a prediction about a further result
Forces & Magnets	• Know a force can, make things slow down or speed up. • Know when an object moves on a surface, the texture of the surface and the object affect how it moves. • Know moving objects slow down quickly on rough surfaces. • Know moving objects do not slow down much on smooth surfaces. • Know that for some forces to act, there must be contact e.g., a hand opening a door, the wind pushing the trees. • Know that magnets do not need to touch objects for a force to occur. • Know most magnets have a North pole (N) and a South Pole (S). • Know a North and South Pole attract and like poles repel. • Know monopole magnets only have one pole. • Know only some materials are attracted to magnets – steel and iron.	

Experiences	**SMSC**	**British Values**	**WPAT Values**

Chester Zoo – dispersal of seeds. Rock workshop – Warrington Museum. Local walk looking at use of socks.	Moral – to be aware of the negative effects of humans on the planet. Social – we discuss the different uses of electricity.	Democracy – turn-taking and collaboration when creating shadows. Individual liberty – through discussion listen to others' preferences towards flowering plants. Respect – not everyone has a garden where they live.	Humility – working as a team when creating shadow experiments. Resilience – keep going when shadows move and alter in experiments. Responsibility – looking after plants that they are growing and the living things within the allotment. Honesty – through discussion about who gardens and has space to garden.

Year 4

Topic	Substantive Knowledge (end points)	Disciplinary Knowledge & Working Scientifically
Animals including Humans	• Know that the digestive system breaks down food. • Know the digestive system consists of mouth, tongue, oesophagus, stomach, small intestine, and large intestine. • Know teeth are used to chew the food and break it up into bits. • Know the tongue helps to chew the food and swallow it. • Know that the oesophagus transports food to the stomach. • Know that in the stomach the food is churned up and broken down further. • Know in the small intestine the nutrients from the food are absorbed into the blood which transports them around the body. • Know in the large intestine water is absorbed into the body. • Know the four front teeth in both the upper and lower jaws are called incisors and are used to cut food. • Know there are four canines in the mouth which tear food and form the corners of the mouth. • Know the premolars are designed to crush and grind food.	 • Decide what to change and what to measure or observe • Take repeat readings where necessary • Prepare own tables to record data • Present data in bar charts  • Choose a source from a range provided • Present what they learnt verbally or using labelled diagrams

	• Know the molars, have broader and flatter surfaces and grind food. • Know energy passes along the food chain. • Know all food chains, start with a plant which is a producer as it makes its own food. • Know that animals that eat plants are primary consumers. • Know that primary consumers may be eaten by secondary consumers or predators.	 • Sort objects and living things into groups using intersecting Venn and Carroll Diagrams • Spot patterns in the data particularly two criteria with no examples e.g. there are no living things with wings and no legs • Suggest improvement and new questions arising from the investigation. • Can you group these materials and objects into solids, liquids, and gases?
Living Things & Their Habitat	• Know examples of how living things can be grouped – invertebrates (no backbone) vertebrates (have a backbone) and plants can be classified into flowering and non-flowering plants. • Know how to use a classification key to help group, identify and name a variety of living things – e.g. Can it fly, does it crawl, does it belong in… • Know how to identify invertebrates (annelids, sponges, echinoderms, insects, molluscs, crustaceans, arachnids) and vertebrates (amphibians, birds, fish, mammals, and reptiles). • Know how environments can change and how it can potentially pose a danger to living things -global warming, litter, oil spill, chemical pollution, deforestation, and land development. • Know environments can change and have a positive effect – nature reserves, parks and gardens, community gardens and ponds.	

States of Matter	• Know that materials can be solids, liquids, or gases (the three states of matter). • Know the shape and volume of a solid does not change unless a bit is broken off. • Know the shape of a liquid can change, depending on the container it is in, but its volume does not change. • Know that most gases are invisible. • Know the gas in a container completely fills the container so has the same shape and volume of the container it is in. • Know liquids, change into gases when they are heated – this is evaporation. • Know liquids, change into solids when they are cooled – this is freezing. • Know gases, change into liquids when they are cooled – this is called condensation. • Know solids, change into liquids when they are heated – this is called melting e.g. heating sand at elevated temperatures produces liquid glass. • Know the rate of evaporation depends on the temperature. • Know evaporation is slow when it is cold and fast when it is hot • Know the water on Earth is constantly recycling using evaporation and condensation. • Know the heat from the sun makes the water from the sea, lakes and rivers evaporate into water vapour.	 • 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?  • Present data in time graphs • Decide how often to take a measurement. • Use dataloggers to measure over time

	• Know that as the water vapour rises, it cools and condenses to form clouds, then falls as rain.	 • Refer directly to their evidence when answering their question • Where appropriate provide oral or written explanations for their findings • Use results from an investigation to make a prediction about a further result
Electricity	• Know the basic parts of a simple circuit – cells, wires, bulbs, switches, buzzers. • Know why a lamp in a simple circuit will (circuit is a complete loop) or will not light (break in the circuit). • Know that a switch open (will not light a bulb – circuit incomplete), switch closed (will light a bulb – circuit complete). • Know that conductors easily allow electric to pass through and insulators do not let electricity pass through easily. • Know that an example of a good conductor is aluminium, copper, gold, water, people, and good insulators are rubber, plastics, wood, and paper.	
Sound	• Know that sounds are made by continuous vibrations and the vibrations sends waves into the ear. • Know that sound can travel through varied materials and give examples – solid (metal, stone, wood), liquid (water) and gas (air). • Know that the louder the sound (the stronger the vibrations) and sounds become fainter as the distance increases. • Know that high pitch means fast vibrations and low pitch is slower vibrations.	

Experiences	**SMSC**	**British Values**	**WPAT Values**

Chester Zoo – living things and their habitats.	Moral – making the right choices to aid a healthy digestive system and eating the right nutrients for the body to function at its best.	Individual liberty – to create a circuit made up of components of their choosing. Democracy – turn-taking and collaboration when creating circuits and sounds.	Humility – working as a team when creating circuits experiments. Resilience – keep going when your circuit does not work first time. Responsibility is taught through keeping the body healthy discussions. Honesty is taught through discussions of looking after the body.

Year 5

Topic	Substantive Knowledge (end points)	Disciplinary Knowledge & Working Scientifically
Living Things & Their Habitat	• Know that there are distinct types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals. • Know that sexual reproduction in plants involves pollen from one flower fertilising the egg of another to produce a seed. • Know asexual reproduction in plants happens without pollen or an egg - the new plant grows from cuttings from the parent plant. • Know the life cycle of a mammal - live young born and get milk from mothers, grow from babies to adults, reproduce. • Know the life cycle of an amphibian - egg in jelly laid in water, develops tail and legs, grows lungs to breathe and leaves water, takes 2 years to grow to adult size. • Know the life cycle of an insect - eggs laid by the female insect, eggs hatch and larva are born, when the larva moults for the last time, a pupa is formed. • Know some insects only have 3 stages: born as an egg, hatches as a nymph and changes into an adult. • Know the life cycle of a bird - egg hatches and is fed by the parents, juvenile leaves the nest when flight feathers are grown, adult attracts mate to reproduce.	 • Recognise and control variables where necessary • Prepare own tables to record data, including columns for taking repeat readings • Explain their degree of trust in their results e.g. precision in taking measurements, variables that may not have been controlled, and accuracy of results • How are Jovian and Terrestrial planets different?

	• Know the life cycle of an reptile - egg hatches, able to feed itself but stays with mother for at least a year, juvenile, adult. • Know the naturalist David Attenborough and the animal behaviourist Jane Goodall. • Know amphibians and insects go through metamorphosis.	 • Be able to talk about their degree of trust in the sources they used • Present what they learnt in a range of ways • Why do people get grey/white hair when they get older? • How are Jovian and Terrestrial planets different?
Properties & Changes of Materials	• Know that heat travels from warmer materials to colder ones. • Know that some materials let heat pass through them easily; these are thermal conductors (metals and sedimentary rocks). • Know some materials do not let heat pass through them; these are called thermal insulators (plastic, cork, wood, and fabrics). • Know that thermal insulators are good for keeping heat out as well as in. • Know soluble materials dissolve in water • Know if a material does not dissolve, it is insoluble. • Know dissolving a solid in water makes a solution. • Know there are three ways to separate mixtures: sieving, filtering, and evaporation. • Know sieving is when you pass a mixture of solids of varied sizes through mesh. • Know filtering is when you pass a mixture of a solid and liquid through a mesh.	 • Be able to answer their question, describing causal relationships • Choose an appropriate form of presentation, including graphs

	• Know evaporation separates soluble solids from water; the water evaporates and leaves the solid behind. • Know in a reversible change a material turns into something that looks and feels different but is not changed forever – it can be changed back. • Know all changes of state are reversible • Know mixing and dissolving are reversible changes. • Know in an irreversible change a completely new material is formed and cannot be changed back. • Know some things, react when you mix them (vinegar and bicarbonate of soda) to make new materials.	• Can you label and name all the forces acting on the objects in each of these situations?  • Is there a pattern between the distance a planet is from the Sun and the time it takes to travel around the Sun? • Is there a relationship between a mammal's size and its gestation period?
Forces	• Know that friction is the force between surfaces that are touching. • Know rough surfaces, create lots of friction. • Know smooth surfaces do not create much friction. • Know friction produces heat. • Know air resistance is the force that slows down moving objects as they move through air. • Know objects, need to be streamlined to travel faster through the air and to travel slower through the air, you need a large surface area. • Know water resistance is the force that slows down moving objects as they move through water. • Know if you want to travel more quickly through water, the shape needs to be streamlined e.g. Dolphin has a streamlined body.	

	• Know that buoyancy is an object's ability to float in water or air. • Know that the force of gravity pulls objects towards the centre of the Earth regardless of where you are on the planet. • Know that Sir Isaac Newton (a British scientist) devised the laws of gravity. • Know that the size of the gravitational force is more or less the same all over the Earth. • Know that levers, gears, and pulleys are simple mechanisms that enable a small force to have a greater effect. • Know a lever is made from a long pole and pivot (fulcrum) examples are scissors, a wheelbarrow, and a stapler. • Know a pulley is a rope running through a wheel, examples are window blinds, a flagpole and a well. • Know gears are wheels with teeth that fit together. When one wheel is turned, the other wheel turns too but in the opposite direction. • Know that a smaller gear will turn faster than a larger one.	 • Be able to answer their questions, describing the change over time • How does my shadow change over the day?  • Refer directly to their evidence when answering their question • Where appropriate provide oral or written explanations for their findings • Use results from an investigation to make a prediction about a further result
Animals including Humans	• Know prenatal development has a germinal phase, an embryonic phase, and a foetal phase. • Know animals have different gestation periods. • Know the stages in a human's life, include infancy, childhood, adolescent, adulthood, and old age.	

	• Know cell decline is part of becoming old • Know vision and hearing decline as animals get older. • Know animals have different lifespans • know the changes that take place in children during puberty. • Know a girl's hormonal changes cause the ovaries to release eggs and the monthly menstrual cycle is triggered. • Know a boy's muscles become more developed and facial and body hair begins to grow during puberty.	
Earth & Space	• Know that our solar system consists of our star, the Sun, and everything bound to it by gravity – the planets Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. • Know that dwarf planets such as Pluto; dozens of moons; and millions of asteroids, comets, and meteoroids are also within our solar system. • Know Mercury, Venus, Earth and Mars are terrestrial planets. • Know Jupiter and Saturn are giant gas planets and Uranus and Neptune are giant ice planets. • Know that the Earth is a sphere, spins on an axis as it travels round the sun, when one sides faces the sun the other faces space. • Know that the side facing the sun is bathed in light and heat (daytime) and the side facing space is cooler and darker (night).	

	• Know that a day on Earth last 24 hours – how long it takes to orbit the sun. • Know that the Earth's tilt on its axis is what causes the 4 seasons. Sometimes it points towards the sun and other times it points away from the sun. • Know that the moon moves around the Earth in an approximately circular orbit, once around the Earth in approximately 27.3 days. • Know that as the moon orbits the earth its position changes, relative to the stars.	

Experiences	**SMSC**	**British Values**	**WPAT Values**
Jodrell Bank Observatory. School nurse to discuss changes during puberty.	Spiritual – by showing willingness to reflect on their experiences within their family. Social – working with other pupils when completing experiments. Culture – understanding the importance of Isaac Newton's role in developing the principles of modern physics.	Individual liberty - through discussion children talk about their experiences within their family life. Mutual respect and tolerance – through listening to others' opinions when working with materials.	Humility is taught when working as a team during experimentation.

Year 6

Topic	Substantive Knowledge (end points)	Disciplinary Knowledge & Working Scientifically
Living Things & Their Habitat	• Know Carl Linnaeus as a pioneer of classification. • Know to classify flowering plants into grasses, shrubs, cereals, and deciduous trees. • Know to classify non-flowering plants into algae, mosses, ferns, and coniferous trees. • Know to classify animals which are vertebrates – have backbones - (birds, fish, reptiles, mammals, amphibians). • Know to classify animals which are invertebrates – no backbones- into molluscs, annelids, arachnids, crustaceans, sponges, echinoderms, and insects. • Know micro-organisms can be classified into bacteria, viruses, fungi, algae, and protozoa.	 • Recognise and control variables where necessary • Use test results to make predictions for further Investigations • Prepare own tables to record data, including columns within spreadsheets • Explain their degree of trust in their results e.g. precision in taking measurements, variables that may not have been controlled, and accuracy of results and conclude effectively
Evolution & Inheritance	• Know humans can live all over the world because they can wear clothes and build houses suited to different conditions. • Know most plants and animals can only live in certain environments. • Know animals and plants are adapted to their habitat. • Know living things can develop adaptations to suit the place they live. • know that the living things that are best adapted to their habitat are more likely to survive.	

	• Know that over time, increasingly the animals and plants will end up with features that make them well-adapted to their habitat. • Know that animals and plants produce offspring that look like their parents. • Know parent plants or animals pass on characteristics. • Know when living things change over time – this is evolution. • Know Charles Darwin's (an English naturalist) scientific theory of evolution by natural selection became the foundation of modern evolutionary studies. • Know an example of evolution is Darwin's finches – beaks adapted over time based on food source – slow evolution. • Know another example of evolution is the peppered moth – rapid evolution. • know that fossils show how living things have changed – how they have evolved.	• How does beak shape (adaptation) show survival of the fittest? • Which beak shape is most advantageous for survival? • How do environmental changes influence adaptation? • How does exercise affect the body in the short term? • Which exercise will raise heart rate the most? • Will girls be fitter than boys? • Will 10-year-olds be fitter than 11-year-olds?
Animals including Humans	• Know the circulatory system is made up of blood, blood vessels and the heart. • Know blood moves food, waste oxygen and waste products around the body. • Know there are three kinds of blood vessels: capillaries, veins, and arteries. • Know arteries, carry oxygenated blood away from the heart to the body.	 • Be able to find reliable information to create a

	• Know veins, carry de-oxygenated blood back to the heart. • Know exercise strengthens the muscles, develops the lungs, helps body coordination, uses up food for energy and can prevent the body getting fat and helps the body to sleep at nighttime. • Know that taking health risks can damage the body. • Know that smoking causes heart attacks, blocked arteries, lung cancer and breathing problems. • Know sniffing solvents is extremely dangerous as damages the brain. • Know that drinking alcohol slows down the reactions. • Know heavy drinking damages the liver, heart, and stomach. • Know drugs can be dangerous if misused and can cause damage to the brain.	biography of Charles Darwin • Present what they learnt in a range of ways • What different biomes did Darwin visit on his Beagle journey? • How have different animals of the Galapagos adapted to suit their environment? • How has our understanding of electricity changed over time?
Electricity	• Know when a switch is open, the circuit is incomplete. • Know that by adding more batteries the bulb gets brighter or the buzzer becomes louder as there is a greater current. • Know current is the amount of electricity flowing through the circuit. • Know that the higher the voltage of a battery, the more powerful it is – the more current flowing through a circuit. • Know that using higher voltage batteries causes a brighter bulb or a louder buzzer.	 • Use classification keys effectively to classify organisms • How would you make a classification key for vertebrates/invertebrates or microorganisms?

	• Know that if you add more bulbs, the bulbs get dimmer. • Know that if you add more buzzers, they buzz more quietly. • Know several motors would each turn more slowly than just one. • Know using longer wires between the components provides more resistance so bulbs become dimmer, and buzzers quieten. • Know that in parallel circuits, electrical components are connected alongside one another, forming extra loops. • Know the symbols of a simple circuit.	• How would you group electrical components and appliances based on what electricity makes them do?  • How does latitude effect adaptation?
Light	• Know light is a form of energy and plants use sunlight in the process of photosynthesis, where leaves of a plant act like solar panels. • Know light travels in straight lines. • Know objects are seen because they emit or reflect light into our eyes. • Know light that is not reflected by a surface is absorbed. • know that light travels from light sources to our eyes and from light sources to objects and then to our eyes. • know because light travels in straight lines that shadows will have the same shape as the objects that cast them. • Know how to use diagrams and models to describe how light travels in straight lines.	 • How does my fitness level change over time? • Be able to answer their questions, describing the change over time • Choose an appropriate form of presentation, including line and bar graphs

	• Know how to use diagrams and models to describe how light travels in straight lines when reflected from other objects. • Know how to use models and diagrams to describe light travelling in straight lines past an opaque/translucent object to cast a shadow of the same shape.	 • Refer directly to their evidence when answering their question • Where appropriate provide oral or written explanations for their findings • Use results from an investigation to make a prediction about a further result

Experiences	**SMSC**	**British Values**	**WPAT Values**
Chemistry with Cabbages.	Spiritual- by asking questions about the world around them and how living things rely on and contribute to their environment. Moral – recognising the right choices to have a healthy body. Cultural – through understanding how	Mutual respect and tolerance are taught when discussing people's beliefs around evolution. Individual liberty – recognising that people have a choice in how they look after their body (choice of diet).	Humility – working as a team when creating circuits experiments. Resilience – keep going when your circuit does not work first time. Responsibility is taught through keeping the body healthy discussions.

	Charles Darwin's original theory of natural selection has influenced genetics and the way evolution shapes our world. Cultural – understanding the importance that Darwin and Linnaeus were pioneers for evolution and classification.		Honesty is taught through discussions of looking after the body.