



Science Whole School Overview

	Unit	Substantive Knowledge	Disciplinary Knowledge
Nursery	Autumn Marvellous Me Polar Express	<ul style="list-style-type: none"> Use all their senses in hands-on exploration of natural materials. Explore collections of materials with similar and/or different properties. 	<ul style="list-style-type: none"> Use their senses in hands on exploration. Sort clothing to wear in different climates/ types of weather. Dress appropriately to go outside in wet, cold and windy weather. Match animals to their young. Plant seeds and look after growing plants with support. Identify that certain animals live in different environments
	Spring On the Move On the Farm	<ul style="list-style-type: none"> Explore and talk about different forces they can feel. Explore how things work. Plant seeds and care for growing plants. Understand the key features of the life cycles. Begin to understand the need to respect and care for the natural environment and all living things. 	
	Summer Once Upon a Time All Creatures Great and Small	<ul style="list-style-type: none"> Use all their senses in hands-on exploration of natural materials. Explore collections of materials with similar and/or different properties. Talk about the differences between materials and changes they notice. Talk about what they see, using a wide vocabulary. Understand the key features of the life cycle of a plant and an animal. 	
Reception	Spring Castles, knights and dragons <i>Fantasies and fairy tales</i> Spring in our Step Exploring life cycles	<ul style="list-style-type: none"> Explore the natural world around them. Describe what they see, hear and feel whilst outside. Understand the effect of changing seasons. 	<ul style="list-style-type: none"> Identify some key signs of each season. Can talk about what a plant needs to survive Care for the natural world and living things. Sequences and talk about the life cycles of living things. Talk about changes they observe e.g. melting and freezing, cooking. Describe some the effects of changing seasons on the natural world. Begin to understand what they can do to help the environment.
	Summer Where we live <i>Our local area and significant buildings and individuals,</i>	<ul style="list-style-type: none"> Recognise some environments that are different to the one in which they live. Understand the effect of changing seasons on the natural world around them. 	



	<i>both now and in the past</i>		
	Science Detectives		
Year 1	Unit	Substantive Knowledge	Disciplinary Knowledge
	Autumn 1 Biology Plants	<ul style="list-style-type: none"> A plant is a living thing that usually grows in one place Coniferous plants keep their leaves all year round (e.g. pine, yew, juniper in UK) Deciduous plants lose their leaves in winter (e.g. oak, silver birch, horse chestnut, sycamore, ash) Trees are a type of plant that have a tall stem made of wood The basic parts of a plant are leaves, flowers, roots, stem/trunk/branch 	<p>Draw and label a scientific diagram of a plant</p> <ul style="list-style-type: none"> R&P: Draw a diagram, a simple scientific drawing that explains or informs <p>Classify trees as deciduous or coniferous using images of them at different times in the year</p> <ul style="list-style-type: none"> R&P: Use a table to classify items based on properties
	Autumn 2 Biology and Physics Seasonal Changes	<ul style="list-style-type: none"> There are four seasons: spring, summer, autumn and winter The weather changes gradually as we move from season to season The weather can change rapidly in one day (e.g. sunny morning and rainy afternoon) Recognise differences between four seasons in terms of living things (trees lose leaves; flowers drop and we see different animals, such as butterflies in the summer) Daytime is when the Earth is facing the Sun; nighttime is when the Earth is facing away from the Sun In the summer that there are more hours of daylight and in winter there are fewer hours of daylight In the summer, we face the sun for more of the day and so it is lighter/darker when we travel to school in summer/winter The Moon is more visible at night 	<p>Use information from images of four seasons to identify and record differences in wildlife and weather in four seasons</p> <ul style="list-style-type: none"> A&P: Scientists look for patterns in the world around them M&O: Gather information from text/books/images R&P: Record numerical or descriptive observations in a table
	Spring 1 Chemistry	<ul style="list-style-type: none"> An object is a 'thing' that can be seen and touched Objects have a name and often have a purpose. For example a cup is the object, and its purpose is for drinking from. 	<p>Sort materials into a Carroll diagram based on their characteristics</p>



Science Whole School Overview

	<p>Everyday Materials</p>	<ul style="list-style-type: none"> The material is what an object is made of, for example a cup can be made of paper or plastic Common materials include wood, paper, metal, glass, water, rock Materials have different physical properties, some materials are hard whilst others are soft, some can be described as rough whilst others are smooth, some are dull whereas others are shiny. Materials can be grouped in a number of ways based on their physical properties The material that we choose to make an object from depends on its purpose (e.g. no chocolate kettle) 	<ul style="list-style-type: none"> A&P: Scientists group objects or living things based on their properties R&P: Use a Carroll diagram to classify items based on properties <p>Find the best material for a dog bed (waterproof and soft)</p> <ul style="list-style-type: none"> A&P: It is important that we keep as much as we can the same, apart from the thing we measure and the one thing we change A&E: Make simple statements about the results of an enquiry
	<p>Summer 1</p> <p>Biology</p> <p>Animals</p>	<ul style="list-style-type: none"> Animals are different to plants because they usually move around, rather than stay in the same place Animals can be placed into different groups (carnivores, herbivores and omnivores) based the foods they eat. Animals have different features, including fins, wings, scales, legs, feathers, claws, paws etc. Animals can be grouped into fish, amphibians, reptiles, birds and mammals (name common examples) 	<p>Research different animals and use images and text to classify the animals as herbivores, carnivores or omnivores, and based on their physical characteristics</p> <ul style="list-style-type: none"> A&P: Scientists conduct secondary research to learn from what other scientists have already learned R&P: Use a Venn diagram to classify items into two or



Year 2			three sets based on properties
	Summer 2 Biology Animals	<ul style="list-style-type: none"> Humans are omnivores, but some choose to eat only plants Humans are made of many different body parts including head, neck, back, ears, eyes, nose, mouth, arms, shoulders, elbows, hands, fingers, legs, knees, feet, toes, face, ears, eyes, nose, mouth, arms, legs, hands, feet, toes. Humans have five senses, smell, taste, touch, sight and hearing. The five senses are each associated with different body parts (eyes, ears, nose, tongue) 	Draw a scientific diagram, labelling key human body parts
	Autumn 1 Biology Plant Growth	<ul style="list-style-type: none"> A seed is living A seed is the embryonic stage of the plant life cycle. A seed consists of three parts, the seed coat, the endosperm and the embryo Germination is the development of a plant from a seed. During germination roots and shoots emerge and grow To germinate a seed needs water and a certain temperature Temperature is a measure of how hot or cold something is Some plants grow from bulbs. A bulb is a resting stage for certain plants. They have a large underground food store, short stems and fleshy leaves. When a plant grows it gets bigger. Plants need water, light and a suitable temperature to grow Many plants make fruits or vegetables; some of these grow below ground 	Investigate the conditions required for germination <ul style="list-style-type: none"> A&P: Make a prediction based on substantive knowledge Investigate how light affects the growth of plants <ul style="list-style-type: none"> M&O: Make systematic observations of an object
	Autumn 2 Biology Needs of Animals	<ul style="list-style-type: none"> Animals, including humans, need food to survive Animals, including humans, need water and oxygen to survive Animals, including humans, the right temperature to survive Animals, including humans, reproduce. This means they have offspring that grow into adults As animals grow they get bigger. Some animals change during their life cycle as the mature (e.g. tadpole to frog) Humans need exercise to stay healthy Humans need to eat a healthy and balanced diet Humans need to practice hygiene to stay healthy 	Gather information from images and/or text and group animals into those that change form as they grow and those that do not.
Spring 1 Chemistry	<ul style="list-style-type: none"> Matter is all the 'stuff' that we experience in everyday life, including air, water, tables and us! Materials have different physical properties such as malleable, waterproof, heatproof, windproof and absorbent. These physical properties make the materials more suitable for certain uses 	Classify materials based on the extent of its properties by using a pair of axes <ul style="list-style-type: none"> R&P: Use a pair of axes to classify items based on the extent 	



	<p>Uses of Everyday Materials</p>	<ul style="list-style-type: none"> • Everyday materials such as wood, metal, plastic, brick, rock, paper and cardboard have these physical properties but to different extents • Different combinations of materials can be used to create different objects, for example a saucepan or a mop. • The shape of some solid objects made from some materials can be changed by squashing, bending, twisting or stretching the material. 	<p>to which it displays two properties</p> <p>Investigate the best material to use to make an umbrella that is waterproof and windproof</p> <ul style="list-style-type: none"> • A&P: There are four main stages of enquiry (A&P, M&O, R&P, A&E) • A&P: Scientists identify potential hazards in their experiments and plan ways to reduce them • A&E: Ask further questions that could be explored to extend findings
	<p>Spring 2</p> <p>Biology</p> <p>Living Things and their habitats</p>	<ul style="list-style-type: none"> • Everything in the world can be categorised as either alive, used to be alive or has never been alive. • Living things are called organisms • Living things grow, need air and nutrients, react to their surroundings, move, get rid of their waste, reproduce • Animals move from place to place, while plants move on the spot • Habitats are the places that living things live, a very small habitat is called a micro-habitat, these can be found within larger habitats • Animals and plants in a habitat depend on each other e.g. for food or shelter • Animals get their food from plants and other animals, this food provides the energy animals need. • Most plants produce their own food and are called producers. • In a food chain, the arrows show where the energy is being transferred from and to • Living things are adapted to their environment. This means they may not be able to survive in other habitats • Some animals and plants have adapted to life in a hot desert: camels and cacti. Some animals and plants have adapted to life in a cold desert: Arctic fox and shrubs 	<p>Examine microhabitats using a magnifying glass and counting the number and type of living organisms found in an area</p> <ul style="list-style-type: none"> • A&P: Scientists conduct investigations to identify whether a pattern they think they've seen is really there • M&O: Observe using a magnifying glass safely
	<p>Summer</p> <p>Chemistry</p>	<ul style="list-style-type: none"> • All materials are made of a single substance or a mixture of substances • There are three states of matter: solids, liquids and gases • Substances can exist as solids, liquids and gases 	<p>Classify different substances as solids, liquids or gases</p>



Science Whole School Overview

	<p>Solids, liquids, and gases</p> <p><i>Additional Unit</i></p>	<ul style="list-style-type: none"> • The three states of matter have different properties • Liquids take the shape of the container they are in, when you move the liquid into a different container the shape will change • Solids keep their shape unless a force is put on it. They will change their shape if you cut them or squash them. • Gases have no fixed shape or volume, they spread out to fill a container. If they are not in a container, they will keep spreading out • We can decide is a substance is a solid, liquid or gas by looking at its properties • One substance can exist in the different states, when the substance is in a different state it is still the same substance • Each substance in its state of matter is made up of parts that are too small to see without magnification 	
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Year 3</p>	<p>Autumn 1</p> <p>Chemistry</p> <p>Rocks</p>	<ul style="list-style-type: none"> • A rock is a naturally occurring material which is made up of different minerals. • The Earth's crust is it's the outermost layer of our planet. It is made of rocks and minerals. • Natural rocks are either igneous, sedimentary or metamorphic • Man-made rocks, like concrete, are called anthropic rocks • Igneous rock is formed when magma cools down • Sedimentary rock is formed when layers of small sediments are compressed over a long period of time. Igneous rock can become sedimentary rock if it breaks down into small pieces and forms layers • Metamorphic rock is formed when igneous or sedimentary rock is put under lots of pressure • Different rocks have different properties, including permeable/impermeable • A fossil is physical evidence of an ancient plant or animal , this could be their preserved remains or other traces that they made when they were alive. • Trace fossils are not physical remains of living things they are indirect evidence of life, examples include imprints of, or a mark left by an organism such as a footprint, imprint of a feather or poo • Fossils are formed when a living thing or trace is buried under sediment. The remains break down slowly and as layers of sediment build up the layers are squashed, turning them into sedimentary rock • Fossils can form when dead organisms are frozen in ice or preserved in amber • Soil is a mixture of tiny pieces of rock, dead plants and animals, air and water. Different soils have different properties 	<p><i>Make observations about rocks using senses and magnifying glass, and classify them in a Carroll diagram/pair of axes</i></p>
	<p>Autumn 2</p> <p>Physics</p>	<ul style="list-style-type: none"> • Light travels in straight lines • We see when light enters our eyes • Darkness is the absence of light 	<p><i>Investigate how the height of a shadow varies as the distance between light source and object changes</i></p>



Science Whole School Overview

	<p>Light</p>	<ul style="list-style-type: none"> • Sources of light emit their own light, and others reflect light; both occur in nature as well as man-made objects • Some objects are more reflective than others • Opaque, translucent and transparent materials allow no, some or all light to pass through them • Shadows form behind an opaque object when light from a source is blocked • The shape and position of shadows changes with the angle of the light source • The size of shadows changes when the distance of the light source changes • Light from the sun can be dangerous and there are ways to protect our eyes and skin. 	<ul style="list-style-type: none"> • A&P: A dependent variable is what you measure; an independent variable is what you change; controlled variables are things that stay the same • A&P: Scientists identify factors in an investigation that should be controlled, and try to find ways to control them • A&P: Recognise risk and build a plan to minimise them • A&P: Select most appropriate equipment to measure (the variables) • A&P: Write an appropriate method
	<p>Spring 1</p> <p>Biology</p> <p>Organisms</p>	<ul style="list-style-type: none"> • The main food groups are carbohydrates (starch and sugars), proteins, fats, dairy, fruit and vegetables • Humans need a balanced diet which is made of main food groups • Vitamins, minerals and fibre are needed and being deficient in these causes diseases • Different animals have different nutritional needs • Our skeleton is made up of bones that grow as we grow • Humans and some other animals have skeletons • Organs are parts of the body that do a particular job, the heart pumps blood around the body and the lungs are used for breathing which gets air into your body. • The skeleton protects organs, e.g. the skull protects the brain; and the ribcage protects the lungs, heart and other important organs • The skeleton supports the body, e.g. the spine helps the body stand • The skeleton helps the body move, e.g. pelvis and knee joints • The muscles and skeleton are required to help the body move. When muscles contract they pull the bone 	<p>Label the main bones on a diagram of a human skeleton, give the function of each bone.</p>



Science Whole School Overview

		<ul style="list-style-type: none"> Some organisms have endoskeletons, some have exoskeletons, and some have neither Endoskeletons grow with the organisms, exoskeletons do not so need to be shed and replaced 	
<p>Spring 2</p> <p>Biology</p> <p>Plants</p>		<ul style="list-style-type: none"> Oxygen and carbon dioxide are found in the air Plants need air (oxygen and carbon dioxide), water, light, nutrients from the soil, space, and a suitable temperature to grow Requirements for life vary from plant to plant and they adapt to their environment Roots absorb nutrients from the soil and help anchor the plant The stem/trunk supports the plant and transports water up the plant. The xylem transports water and nutrients from the roots, and the phloem transports food from the leaves to the all parts of the plant Leaves use sunlight, carbon dioxide from the air and water to make their own food The four main stages of the plant's life cycle include germination, pollination, fertilisation and seed dispersal Coniferous trees transport their seeds in cones; deciduous trees use seeds and flowers/fruit Pollination and fertilisation usually takes place in flowers. Dispersal is important to make sure there is enough space for seeds to germinate and plants to grow. Seeds can be dispersed by wind (e.g. sycamore), by animals in their droppings (e.g. things that are eaten, like a raspberry), attached to animal fur (e.g. goosegrass), or seeds can be self-propelled (pea pod) 	<p>Investigate the impact of light on the growth of plants, drawing a block diagram to illustrate results</p> <ul style="list-style-type: none"> R&P: Design a table to collect data with the appropriate number of rows and columns and correct headings <p>Research methods of seed dispersal of different plants</p> <ul style="list-style-type: none"> M&O: Gather information from the internet
<p>Summer 1</p> <p>Physics</p> <p>Forces and Motion</p>		<ul style="list-style-type: none"> Forces are pushes or pulls or twists Forces can cause a change in speed, direction or shape of an object Forces act in particular directions Forces that act in opposite directions are called opposing forces. Forces that are equal and act in opposite directions are described as balanced forces, they 'cancel each other out' When forces are balanced, an object will move at a constant speed in the same direction. This includes being stationary! When the forces acting in the opposite directions are not equal this can cause the object they are acting on to move at a different speed, in a different direction or to change shape. We can work out the speed of an object if we know how far it travelled and how long it took to get there The greater the mass of an object, the longer it will take to speed it up or slow it down. 	<p>Investigate the how long it takes cars of different masses to stop after travelling down a ramp</p> <ul style="list-style-type: none"> M&O: Data is repeatable if the same person repeats the investigation and gets the same results; data is reproducible if the investigation is repeated by a different person and the results are the same



			<ul style="list-style-type: none"> • A&E: Suggest ways to improve practical procedures to obtain more accurate measurements • A&E: Draw conclusions (e.g. 'the greater the... , the greater the...')
<p>Summer 2</p> <p>Physics</p> <p>Friction and Magnetism</p>		<ul style="list-style-type: none"> • Contact forces require contact between two objects (e.g. friction). Non-contact forces can affect an object at a distance (e.g. magnetism) • Friction is a force between two surfaces that are sliding or trying to slide over each other • Friction is a contact force because it requires the two objects to be touching • The bumpier or rougher the surfaces, the more friction there will be • Magnetism is the force exerted by magnets when they attract or repel each other • Magnets can exert a force at a distance, which is called a non-contact force • Magnets have a north and a south pole. • If opposite poles are facing the magnets will be attracted to one another (the magnets pull towards each other). If the same poles are facing the magnets will repel (the magnets will push away from each other). • Magnets attract magnetic objects • Some metals are magnetic but not all are. Plastics, wood, fabric, glass are all non-magnetic • The stronger the magnet, the heavier the object it can attract or the further away it can attract the object from 	<p>Investigating how the surface of a ramp affects the distance a car will roll</p> <ul style="list-style-type: none"> • M&O: Anomalous results should be discarded and re recorded • M&O: Taking multiple readings allows you to see if your data is repeatable, helps identify outliers and allows a mean to be calculated • A&E: Use scientific understanding to explain their findings • A&E: Use findings of an investigation to make further predictions <p>Test which materials are magnetic, and use this knowledge to make predictions about which objects will be magnetic</p>
<p>Y E O</p>			



Science Whole School Overview

<p>Autumn 1</p> <p>Biology</p> <p>Classifying Organisms</p>	<ul style="list-style-type: none"> • Classification refers to a method used to place all living things into groups. • Organisms can be classified in a number of ways • A species is a group of one type of organism, individuals in this group can breed with each other to produce offspring that can go on to reproduce • Fish, amphibians, reptiles, birds and mammals are all vertebrates • Vertebrates have endoskeletons • Vertebrates can be grouped in a number of ways based on their characteristics, e.g. warm/cold blooded; or physical features like fur, beak, wings etc. • Invertebrates can be grouped based on their characteristics as snails and slugs; worms; spiders and insects • Invertebrates can be placed into groups based on their skeletons; endoskeletons, exoskeletons, or hydrostatic skeletons • Plants can be grouped into flowering and non-flowering plants • Buildings and new developments have destroyed many habitats. This means number and types of organisms in these areas has gone down • Creating nature reserves is one way to prevent the loss of habitat. Setting aside land that cannot be used for building (greenbelt) helps keep habitats intact 	<p>Identifying animals and plants that do not support Aristotle's approach to classifying living things; exploring history of other debates (e.g. duck-billed platypus)</p> <ul style="list-style-type: none"> • A&P: Identify scientific evidence that has been used to support or refute ideas <p>Use a classification key to sort organisms</p> <ul style="list-style-type: none"> • R&P: Use a classification key to identify an object <p>Draw a classification key to identify four animals, and then several leaves (using a magnifying glass)</p> <ul style="list-style-type: none"> • R&P: Draw a dichotomous classification key to help others identify an object
<p>Autumn 2</p> <p>Biology</p> <p>Food and Digestion</p>	<ul style="list-style-type: none"> • A food chain starts with a producer (usually a plant) who can produce its own food. Organisms that eat producers are called consumers (primary and secondary) • A predator hunts prey to eat • A food web shows the transfer of energy between different organisms (include water as well as land organisms) • An ecosystem is made up of all organisms living in an area and the non-living features of the environment • There are four main types of teeth: incisors, canines, pre-molars and molars. They each have a different purpose. • Herbivores, carnivores and omnivores have these teeth types in different proportions • Babies' teeth develop before they are born, deciduous (milk) teeth push through the gums when a child is about 6 months. • Deciduous teeth fall out from the age of 5 and are replaced with adult teeth. • Bacteria can cause tooth decay. • Animals and plants need to digest food to transfer energy from it 	<p>Explain the digestion process using a prop to others in school or at home</p> <ul style="list-style-type: none"> • R&P: Present information orally using a prop or demonstration



Science Whole School Overview

		<ul style="list-style-type: none"> The digestive system is the group of organs that help your body digest food. Digestion in humans is chemical and mechanical Chemical and mechanical digestion takes place in the mouth (saliva and chewing) Food travels down the oesophagus from the mouth into the stomach In the stomach, mechanical (churning) and chemical digestion takes place to break down food further Food is further broken down by enzymes (chemical digestion) in the small intestines where most of the nutrients are absorbed Water is absorbed in the large intestine, leaving behind the faeces. Faeces are mainly made of food we could not digest; faeces are stored in the rectum and pass out of the human body via the anus. 	
<p>Spring 1</p> <p>Chemistry</p> <p>Particle Model</p> <p>Additional Unit</p>		<ul style="list-style-type: none"> The different substances in their different forms (solids, liquids and gases) are all made of particles The particles in the different states of matter are arranged differently In a solid the particles are packed tightly together, they vibrate slowly and are unable to move away from their neighbours In a liquid the particles are close together but they can slide past each other In a gas the particles are spread out and can move freely Substances can change from one state of matter to another. Solids can change to become a liquid, liquids can change to become a gas, gases can change to become liquids and liquids can change to become a solid The process that changes a solid to a liquid is called melting When you heat a solid it becomes a liquid. Different substances melt at different temperatures, this is called the melting point The process that changes a liquid to a gas is called evaporating Evaporation happens when a liquid is heated. This is called the boiling point The process that changes a gas to a liquid is called condensing The process that changes a liquid to a solid is called freezing Substances change state at different temperatures, i.e. they have different melting and boiling points Different substances are different states at room temperature The water cycle relies on evaporation and condensation. Water is collected in the oceans from rivers; it evaporates and then condenses to form clouds; it then precipitates and the cycle begins again 	<p>Investigate the effect of temperature on the rate of evaporation</p> <ul style="list-style-type: none"> A&P: Set a hypothesis to test A&P: Science is studied as three disciplines: biology (study of living organisms), chemistry (study of properties of matter and how it interacts with energy) and physics (study of energy) A&E: Scientists use models to help explain their ideas
<p>Spring 2</p> <p>Physics</p> <p>Sound</p>		<ul style="list-style-type: none"> Sounds are made when objects vibrate. These vibrations cause the air particles surrounding them to vibrate and collide, causing the vibrations to pass between particles Vibrations travel through a medium (e.g. air, water) to the ear Vibrations enter the ear, our inner ear vibrates and we hear them as sound. 	<p>Investigate the tautness on pitch using an app</p> <ul style="list-style-type: none"> M&O: Gather information using a data logger (e.g.



Science Whole School Overview

		<ul style="list-style-type: none"> Vibrations are passed on from one particle to the next, and so it travels more easily when particles are closer together (solids and liquids) Sound cannot travel in a vacuum The volume and pitch of sound can change 	<p>sound meter app; heart rate app)</p>
<p>Summer 1</p> <p>Physics</p> <p>Electricity</p>		<ul style="list-style-type: none"> A lamp in a circuit will only light if there is a complete circuit. A complete circuit must have a power source (cell/batteries) and have all the components connected in a loop. If it is missing any of these things it is an incomplete circuit A short circuit is the easiest route for electricity to travel and can be created by accident by connecting just the wire to the cell in a circuit. They can be dangerous Components include wire, lamp, buzzer, motor or switch Materials that allow electricity to pass through them easily are called electrical conductors Metals and water are good conductors of electricity Materials that do not allow electricity to pass through them easily are called electrical insulators Plastic, rubber, wood, glass, paper and fabric are electrical insulators Appliances use electricity to serve a purpose (e.g. toaster, kettle, fan, phone, game) 	<p><i>Investigate which materials are electrical conductors and which are electrical insulators</i></p> <ul style="list-style-type: none"> A&P: Draw diagram of the investigation R&P: Present information in a written format
<p>Summer 2</p> <p>Chemistry</p> <p>Properties of Materials</p>		<ul style="list-style-type: none"> Thermal conductors allow energy to be transferred through it easily when it is heated Metals are good thermal conductors Thermal insulators do not allow heat to be transferred (conducted) through it easily. Thermal insulators include air, plastic and wood Physical properties are properties that we can measure or observe in the classroom Physical properties include electrical conductivity; melting and boiling points; thermal conductivity; being malleable; windproof; hard/soft; and magnetic Chemical properties are properties that scientists need specialist equipment to measure Chemical properties include how easy a substance is to set on fire (flammability) or how poisonous something is (toxicity) As we learn more about a substance's properties, we may decide to stop using it to make certain objects (e.g. lead in pencils is toxic; asbestos is a good insulator but is toxic) 	<p><i>Investigating the physical properties (thermal conductivity; malleability; transparency; magnetism; electrical conductivity etc.) of materials, using own knowledge or setting up comparative tests</i></p> <p><i>Conduct secondary research to identify an object that was once made of one material but, when new evidence showed other chemical or physical properties, are now made of new materials (e.g. asbestos insulation; lead pencils; plastic bottles)</i></p>
<p>> ⊕ ⊙</p>			



Science Whole School Overview

	<p>Autumn 1</p> <p>Chemistry</p> <p>Separating Materials</p>	<ul style="list-style-type: none"> • A pure substance is one that contains only one substance and only type of particle, e.g. oxygen, iron, pure water • A mixture is two or more different substances, e.g. air, steel • Mixtures can be made of two gases (e.g. air), two solids (e.g. steel), two liquids (e.g. squash and water), or a liquid and a solid (e.g. salt water) • A solvent is a liquid that is used to dissolve other substances. • A soluble substance that dissolves in a solvent is called a solute • An insoluble substance is one that will not dissolve in a solvent • When a solute dissolves in a solvent, a solution is formed. A solution is a mixture • When no more solute can dissolve in the solvent, the solution is saturated • Solutes dissolve more quickly when the particles have more energy (i.e. when heated or stirred) • Two solids can be separated by using magnets or filters (e.g. sieve) • A solid and a liquid can be separated by using filtration (if the solid is insoluble) or evaporation (if the solid is soluble) • A reversible change is a change that can be undone, where the original substances can be recovered. An irreversible change is a change that cannot be undone, where the original substances cannot be recovered 	<p>Separate a mixture including coarse sand, water, salt and lumps of a magnetic material.</p>
	<p>Autumn 2</p> <p>Physics</p> <p>Energy</p> <p>Additional Unit</p>	<ul style="list-style-type: none"> • Energy can be transferred from one store to another store • Fossil fuels, batteries and the Sun are all examples of chemical energy stores • Energy stores are needed for something to happen • When energy is transferred from one store to another it can be transferred by light, or electrically. • When energy is removed from one store and is transferred to another store, the amount of energy in the first store goes down and the amount of energy in the second store goes up • Energy is not used up it is just moved around from store to store • In a food chain an amount of energy from the Sun (a chemical store) is transferred to the plant by light. The energy is then transferred along the food chain as the different organisms are eaten. • In a circuit that has a battery, the battery is the chemical store of energy. Energy is transferred electrically to the device in the circuit, but the device does not store the energy; the device changes the way the energy is transferred. • When a solid is heated the solid becomes a liquid. Energy from a chemical store is transferred to the solid, and as the solid becomes hotter its thermal store of energy goes up. The particles in the solid therefore move more • When a person pushes or pulls an object their chemical energy store decreases a little. • When a person hits a drum to make a sound, their chemical energy store decreases a little. 	<p>A&P: Science is studied as three disciplines: biology (study of living organisms), chemistry (study of properties of matter and how it interacts with energy) and physics (study of energy)</p>



Science Whole School Overview

<p>Spring 1</p> <p>Biology</p> <p>Life Cycles</p>	<ul style="list-style-type: none"> Plants and animals look similar to their parents in many features because information is passed from one generation to the next. This information comes from the parents' genome. Sexual reproduction involves two parents - usually male and female - create a new organism by mixing their genomes Sexual reproduction begins with fertilisation of an egg, which mixes the genes from two parents. Fertilisation can be internal or external After an egg is fertilised, an embryo will develop. Embryos develop inside the body in the gestation period for viviparous animals. Embryos develop outside the body in eggs for oviparous animals Viviparous animals are born, oviparous animals hatch from eggs, plant seeds germinate Almost all mammals are viviparous; all birds and most amphibians are oviparous Amphibians and most insects undergo metamorphosis Life cycle of: hedgehog: internal fertilisation, gestation, hoglet, adult, senior peregrine falcon: internal fertilisation, embryo is incubated in eggs, hatchling, nestling, fledgling, adult, senior frog: external fertilisation, frogspawn, tadpole, tadpole with legs, adult frog (metamorphosis) ladybird: internal fertilisation, eggs hatch, larva, pupa, adult Most plants have both male and female parts The male part of the plant is called the stamen, made up of the anther and filament, and the anther produces pollen grains. The female parts of the plant are the ovary (which produces the female sex cells which are contained in the ovule) and the stigma which collects pollen Asexual reproduction does not involve sex cells or fertilisation. Only one parent is needed and offspring are (genetically) identical to the parent and each other. Potatoes develop tubers and daffodils have bulbs, which will grow to be identical copies of the plant 	<p><i>Using images, text and the internet to research internal and external fertilisation, and viviparous and oviparous organisms</i></p>
<p>Spring 2</p> <p>Biology</p> <p>Human Development</p>	<ul style="list-style-type: none"> The human life cycle goes through the same stages as those for other animals: fertilisation, gestation, growth Fertilisation in most humans is internal, but it can happen externally (in vitro fertilisation - IVF - which means 'in glass' fertilisation) The human life cycle: embryo, foetus, infant, child, adolescent, adult, senior Human are viviparous and a foetus develops inside the mother (or surrogate mother) A human embryo is considered a foetus at the end of the 10th week of pregnancy The gestation period for humans is 40 weeks The bigger the animal, the longer the gestation period A foetus is considered a baby when it is born Cognitive, physical and social and emotional development takes place at the greatest rate during infancy 	<p><i>Draw a scatter graph to suggest whether there is a relationship between animal size and length of gestation period</i></p> <ul style="list-style-type: none"> A&P: Scientists look for patterns in data to try to identify correlations R&P: Scatter graphs can help you decide if there is a



Science Whole School Overview

		<ul style="list-style-type: none"> • During puberty, adolescents' bodies change, e.g. pubic hair, voice deepen, hips widen • Primary aging of adults occurs naturally as our bodies get older (e.g. slower reaction time, reduced hearing) • Secondary ageing relates to environmental factors, like poor diet, not enough exercise, smoking etc. • There are ages where humans at their peak for different things (e.g. reproduction, running etc.) • Different cultures around the world have different perceptions around the life cycle and ageing 	<p>relationship between two variables</p> <p>Discuss one aspect of IVF that is appropriate to your class (e.g. who in the world has access; post code lottery within the UK)</p> <ul style="list-style-type: none"> • A&E: Some people may agree or disagree with the use of some scientific discoveries
<p>Summer 1</p> <p>Physics</p> <p>Forces</p>		<ul style="list-style-type: none"> • Force is measured in newtons (N) • Gravity is a non-contact force that pulls all objects towards each other. The greater the mass of the object, the greater the gravitational pull around it. Gravity is most commonly experienced as the pull of the Earth (and all objects on it) towards each other • The Earth's gravitational pull is so large that all objects - regardless of how heavy they are - are pulled towards Earth at the same rate • Air resistance is a frictional force that acts between air and a moving object to slow it down • Cross-sectional area is the area that is facing the direction the object is travelling in. The larger the cross-sectional area of an object, the greater the air resistance • Water resistance is a frictional force that acts between water and a moving object to slow it down • Levers, pulleys and gears allow a smaller force to have a greater effect. Examples of levers, pulleys and gears include wheelbarrows, lifts, bicycle gears, in construction • Levers consist of a beam and a fulcrum (pivot). Effort lifts a load • The components of levers can be arranged in different orders: effort-fulcrum-load (e.g. see saw, neck joint); effort-load-fulcrum (e.g. wheelbarrow, calf muscle); load-effort-fulcrum (e.g. tweezers, bicep) • The greater the distance from the effort to the fulcrum, the less effort is required to move the load 	<p>Fair test to investigate how the distance between the load and the fulcrum affects the force required to lift it</p> <ul style="list-style-type: none"> • A&P: Scientists must work out if the factor is the cause of the outcome in a correlation • M&O: Measure force using a Newtonmeter • R&P: Line graphs can be used when data is continuous; bar charts can be used when data is discrete • A&E: Make judgements on the reliability of the data
<p>Summer 2</p> <p>Physics</p>		<ul style="list-style-type: none"> • The universe is made up of many galaxies. Our galaxy is called the Milky Way • The Milky Way is made up of lots of solar systems • Our solar system consists of a star (Sun), planets (which orbit a star), satellites (which orbit planets), and other bodies including asteroids, meteoroids, meteors and meteorites • The sun, planets and moons are approximately spherical bodies 	<p>Look for patterns between a planet's distance from the Sun and it's temperature and size</p>



Science Whole School Overview

	<p>Earth and Space</p>	<ul style="list-style-type: none"> • The Sun is at the centre of the solar system - the heliocentric model • Planets orbit the Sun in the same plane; moons orbit planets • The Earth takes 365.25 days to orbit the sun (one year). Every four years our Earth year is one day longer, this is called a leap year, this year accounts for the four 0.25 days • Bodies are held in their orbit by gravity • There are eight planets (M, V, E, M, J, S, U and N). Each planet has different characteristics, e.g. temperature; time taken to orbit the sun; number of moons; size. • The Earth rotates on its axis once every 24 hours, so only half of the Earth is facing the Sun at any one time; this creates night and day • The Earth's rotation means that the sun 'rises' in the east and 'sets' in the west, and that the Sun is highest in the sky at midday, this explains why the sun appears to move across the sky. • The time taken for the Moon to orbit the Earth is 28 days and, during this time, the sun shines on different parts of the Moon • The phases of the Moon include new moon, crescent, quarter moon, gibbous moon and full moon • Space is a vacuum, which means there are no air particles • The Earth's Moon is smaller than the Earth and has less mass so its gravitational force is less 	<p>Consider how the number of planets that humans consider to be planets has changed over time</p> <ul style="list-style-type: none"> • A&E: Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations
<p>Year 6</p>	<p>Autumn 1</p> <p>Physics</p> <p>Electricity</p>	<ul style="list-style-type: none"> • There are recognised symbols for cell, lamp, buzzer, motor, and switch. Wires are represented with straight lines • As long as batteries have the same voltage, the size of the battery does not affect the brightness of the lamp/loudness of the buzzer (though the smaller batteries will not last as long as the larger ones) • Adding more cells in the circuit increases the voltage. Increasing the voltage in a circuit makes the lamp in the circuit get brighter or the buzzer get louder. • More than one lamp can be put into one circuit. They can be placed in series or in parallel. • In a series circuit, the lamps are placed in a continuous loop. In parallel, the lamps are placed in separate loops that both connect to the cell • Connecting lamps in parallel means that if one lamp burns out the other will stay on and switches can be used to turn each lamp off independently. • Many of the appliances used in the home do not use batteries they use mains electricity. • Mains electricity is generated in a power station and transferred to our homes by overhead cables. Power stations can use both renewable and non-renewable sources of energy to generate electricity. • A non-renewable energy source is one where we have a fixed amount of the source, and where it would take too long for more to be formed. Burning fossil fuels to transfer electrical energy is a non-renewable energy source 	<p>Three different enquiries, where pupils will plan the most appropriate type of investigation and how they should present their results:</p> <ol style="list-style-type: none"> 1. Investigating the effect of increasing voltage on the volume of a buzzer or the brightness of a lamp 2. Investigating the effect of changing the number of components in a circuit on the volume of a buzzer <ul style="list-style-type: none"> • R&P: Decide which graph is most



Science Whole School Overview

		<ul style="list-style-type: none"> • Renewable energy sources quickly replenish themselves, meaning that we can use them again and again. Wind, solar, geothermal and hydrological power are all examples of renewable energy sources • Coal, oil and gas are all used to generate electricity. The store of chemical energy in the fuel is transferred electrically to the appliances that we use in the home. 	appropriate for the enquiry
<p>Autumn 2</p> <p>Biology</p> <p>Evolution</p>		<ul style="list-style-type: none"> • ariation occurs within and between species • Variation can be environmental or genetic, or a mixture of both • Genetic variation happens randomly through the mixing of genomes in sexual reproduction. • Some variation is advantageous to the organism in their environment; sometimes it is disadvantageous; and sometimes it gives no advantage/disadvantage • An organism with advantageous traits are more likely to survive and reproduce, passing those traits to the next generation. This is called natural selection • These advantageous traits - adaptations - can be physiological, structural and behavioural • Over many generations, the species will evolve so that all organisms have this adaptation/advantageous trait • Homo sapiens originated in many parts of Africa • Fossils provide evidence for evolution, because they show how organisms have changed over time • Scientists involved in the development of evolutionary biology include Al-Jahiz, Charles Darwin, Alfred Wallace, Mary Anning and Dr Danielle Lee 	<p><i>Sort variations within species in a Venn diagram, based on whether they are genetic, environmental or a mixture of both</i></p> <p><i>Identify how evidence of fossils has been used to support to change the theory of the evolution of Homo sapiens</i></p> <ul style="list-style-type: none"> • A&P: Science is never 'complete' and scientists are always working to make models more accurate or to discover new explanations
<p>Spring 1</p> <p>Physics</p> <p>Light</p>		<ul style="list-style-type: none"> • In ray diagrams, straight lines with arrows show where the energy is being transferred from and to by light • Objects emit (give out) or reflect light into the eye. We see things because light travels from light sources to our eyes, or from light sources to objects and then to our eyes • Objects would be invisible if they did not reflect light. • Many problems with our vision are caused by parts of the eye that are the not the right shape or size, or that have become cloudy. Many of these problems can be corrected through surgery or prescription glasses • People living with sight loss or blindness may use long canes or guide dogs when outside, talking books or Braille, and different devices in the home • The size and shape of shadows behind an opaque object can be explained using ray diagrams • Shadows have the same shape as the objects that cast them because light travels in straight lines. • On a flat surface, all light meeting a surface from one direction will be reflected in the same direction. This is known as specular reflection 	<p><i>Draw ray diagrams to show how light travels and how shadows are formed</i></p>



Science Whole School Overview

		<ul style="list-style-type: none"> • On a rough surface, light will be reflected in all directions. This is known as diffuse reflection • Specular reflection between mirrors allow us to see the objects that do not directly reflect light into our eyes (e.g. periscope) • When light meets an opaque object, some of the light is reflected and some of it is absorbed • White light, which comes from most light sources we use in the classroom, contains all the colours of the visible spectrum (red, orange, yellow, green, blue, indigo, violet) • When a light meets a surface, some colours are absorbed and some are reflected. We see the colour(s) that are reflected • Objects appear black if they absorb all the colours in white light, and reflect none. Objects appear white if they reflect all the colours in white light, and absorb none 	
	<p>Spring 2</p> <p>Biology</p> <p>Further Classification</p>	<ul style="list-style-type: none"> • Invertebrates can be grouped based on their characteristics as poriferans (sponges) cnidarians, echinoderms, molluscs, annelids, platyhelminths and arthropods (spiders, insects, crustaceans and myriapods). • Plants can be grouped into moss, ferns, conifers and flowering plants • Fungi are different to plants and animals. They cannot make their own food (like animals) but do not move (like plants) • Micro-organisms are organisms that are so small that we cannot see them with our eyes alone. • Some fungi are microorganisms (e.g. yeast), but not all are (e.g. mushrooms) • Bacteria are microorganisms. Some bacteria can cause disease in other organisms • Some bacteria are helpful for other organisms (e.g. those that help break down food in our digestive system) and those that form part of a symbiotic relationship 	<p>Use and draw classification keys to help classify invertebrates and plants</p> <p>Research the harmful and helpful effects that bacteria can have on humans and other organisms, and present this information in a written format</p>
	<p>Summer 1</p> <p>Biology</p> <p>Function of the Human Body</p>	<ul style="list-style-type: none"> • Each organ and muscle in the human body needs oxygen and nutrients (from breathing in and eating/digesting). Each organ and muscle releases carbon dioxide, which needs to be removed (and breathed out) • Blood carries oxygen, nutrients and carbon dioxide around the body • The heart is a muscle that pumps the blood through the blood vessels. Blood is pumped at a high pressure. • The heart pumps deoxygenated blood to the lungs, where oxygen is transferred to it and it flows back to the heart. The heart pumps oxygenated blood to the rest of the body, where the oxygen is transferred to the organs/muscles and carbon dioxide is transferred to the blood • Deoxygenated blood then travels back to the heart to begin the process again • Nutrients are absorbed by the blood along the small intestine, and transported to other organs in the body. Water is absorbed by the blood along the small and large intestines, and transported to other organs in the body 	<p>Investigate the effect of exercise on heart rate</p> <ul style="list-style-type: none"> • M&O: Planning to take multiple readings allows anomalous data to be identified and enables a mean to be calculated. Repeats show if our data is repeatable. • A&E: Calculating the mean can be used as a method of analysing data



Science Whole School Overview

		<ul style="list-style-type: none"> • Arteries carry blood away from the heart. Arteries have thick walls because they carry blood from the heart which is at a high pressure. blood is being pumped through very quickly. They mostly carry oxygenated blood • Veins carry blood back to the heart. They mostly carry deoxygenated blood • Arteries branch into smaller blood vessels called capillaries, capillaries are very small and supply our organs (and tissues) with oxygen and nutrients. The capillaries also remove carbon dioxide. • The heart rate is how quickly the heart pumps. It is usually measured in beats/min • Muscles need more oxygen when they are being used in exercise, so the heart rate increases • Smoking can damage the lungs, reducing the amount of oxygen that can enter the capillaries; this makes exercise harder. Smoke contains many chemicals, some of which are also absorbed by the blood and transported around the body. These can causes diseases 	<p><i>Research effects of smoking on the human body, and how our scientific understanding has changed over time, including in the current day. The difference between correlation and cause can be discussed in relation to the move from saying smoking is bad for your health to the idea of the many disease smoking cause.</i></p>
<p>Summer 2</p> <p>Chemistry</p> <p>Physical and Chemical Changes</p>		<ul style="list-style-type: none"> • A mixture is two or more substances that are mixed but not chemically joined together • A chemical change is a change where a new substance is formed. • A chemical change has usually taken place if: gas bubbles appear; a new solid appears; it changes colour; or smells different • A physical change is where the substance changes its properties, but it does not become a different substance • Some chemical changes are irreversible, (e.g. cook an egg, rusting iron), but some can be reversed • Most physical changes are reversible (e.g. water to ice), but some are not (e.g. crack an egg, turn wood into sawdust) • Reversible and irreversible chemical changes can be written as word equations 	<p><i>Use a Carroll diagram to classify changes as physical/chemical and reversible/irreversible</i></p> <p><i>Create and use a classification key to help identify whether a change is chemical/physical and reversible/irreversible</i></p> <p><i>Carry out changes and identify whether the change created is physical/chemical and reversible/irreversible</i></p>

KS3 Curriculum

Biology	Physics	Chemistry
<p>Hereditary is the process by which genetic variation is transmitted from one generation to the next (KS3)</p> <p>Chromosomes are made of DNA. Small sections of DNA are called genes. We inherit genes from our parents and this is how genetic variation is transmitted from one generation to the next.(KS3)</p>	<ul style="list-style-type: none"> • <i>Electric current is measured in amperes using an ammeter. Current is a flow of charge (KS3)</i> • <i>Current can be measured in parallel and series circuits. The current will be the same at all points in a series circuit (KS3)</i> • <i>Current splits where the circuit branches in a parallel circuit, currents add where branches meet (KS3)</i> 	<ul style="list-style-type: none"> • In an chemical reaction mass is conserved (KS3) • In a chemical reaction there is a rearrangement of atoms. (KS3) • Chemical reactions can be represented using formulae and equations (KS3) • Examples of types of chemical reactions include combustion, thermal



Science Whole School Overview

Variation between individuals of the same species is either continuous or discontinuous, this variation means that some individuals will compete more successfully and are more likely to survive, this drives a process known as natural selection. In this process advantageous versions of genes are passed onto offspring (KS3)
Plants and animals are made of cells. There are similarities and differences between the cells of animals and plants. (KS3)

Many plant cells have chloroplasts, and this enable plants to photosynthesise. The reactants of this process are carbon dioxide and water, and the products are sugar (glucose) and oxygen. (KS3)

The differences between species and how this difference can drive natural selection. (KS3)

The hierarchical organisation of multicellular organisms. Organisms consist of organ systems which are made of organs. Organs are a collection of different tissues and tissues are made of cells. An example being the circulatory system (KS3)

Aerobic respiration occurs in the cells of living organisms, it involves the breakdown of organic molecules (sugar) and using oxygen (KS3)

The blood is oxygenated in the lungs and this is transported to the organs (and cells) that require it for aerobic respiration, along with sugar, by the blood vessels in the circulatory system (KS3)

- *Potential difference is measured in volts (V) using a voltmeter. It is measured across a component (KS3)*
- *In a series circuit the sum of the potential difference across all components will equal the battery voltage. In a parallel circuit the potential difference across each of the components will be the same as that of the battery (KS3)*
- *Resistance is measured in ohms and is the ratio of potential difference to current (KS3) Conducting and insulating components will differ in resistance (KS3)*

decomposition, oxidation neutralisation and displacement (KS3)

- Reactions of acids with metals produces a salt and hydrogen (KS3)
- Reactions of acids with alkalis produces a salt and water (KS3)
- Reactions can be endothermic or exothermic (KS3)