

The STM Science Curriculum

National Curriculum aims & purpose:	School aims - skills, attitudes and knowledge that we would like all children to develop on their journey through the school	
<p>A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry, physics and earth science. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.</p> <p>Aims:</p> <ul style="list-style-type: none"> • develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry, physics and earth science. • develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them • equip pupils with the knowledge required to understand the uses and implications of science, today and for the future 	<p>Science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments.</p> <p>We want our children to have an interest in science and how it impacts our daily lives. We want them to constantly be asking questions, both 'big' and 'small', as they seek to better understand the world they live in and the fundamental scientific laws that govern it, from gravity to evolution to the way light travels. Moreover, we want to ensure that they understand the role that science (and scientists) has played in our past and how it will continue to play a vital role in our future, especially in the areas of healthcare and the environment.</p> <p>By the time that they leave St. Thomas More, we want all children to have become informed, curious, scientifically literate citizens, and our science curriculum is designed to build the broad foundations of that goal. During science lessons, we will ensure that children are given the opportunity to ask ambitious questions and then plan and conduct investigations with the aim of answering these questions. Children will draw conclusions, use evidence to justify their ideas and use their understanding to explain their findings.</p> <p>It is key that knowledge content and practical skills are taught hand-in-hand, with children developing and building on their factual knowledge as they journey through the school, making links between topics applying skills and understanding from previous learning to new areas as they are met. As part of this it is also vital that they are exposed to and specifically taught the essential scientific vocabulary related to each topic in order to demonstrate their knowledge and understanding effectively.</p>	
Links to learning in EYFS:	STM Connections Curriculum	STM Plus Curriculum
<ul style="list-style-type: none"> • Comments and asks questions about aspects of their familiar world such as the place where they live or the natural world • Talks about why things happen and how things work • Developing an understanding of growth, decay and changes over time • Begin to understand the effect their behaviour can have on the environment • Looks closely at similarities, differences, patterns and change in nature • Talks about the features of their own immediate environment and how environments might vary from one another • Makes observations of animals and plants and explains why some things occur, and talks about changes 	<ul style="list-style-type: none"> • Use of ICT to collect data, analyse results and present findings • History - the lives and impact of famous scientists from the past • Geography - animal habitats from around the world, weather systems, rock formation • Maths - Data handling • English - posing and writing questions, presenting findings both verbally and through written observations and conclusions • Art - using plants and animals in the local and wider environment as a starting point for art • DT building structures using a variety of materials, selected for their properties and effectiveness 	<ul style="list-style-type: none"> • Observing a range of plants and animals first-hand, in the local environment, parks, garden centres, zoos and other animal centres • Growing their own fruits and vegetables all the way through from seed to the plate • Creating electrical circuits and watching something they have constructed respond to their commands • Make things go 'bang', react vigorously and create new substances through chemical reactions • Be surprised by what happens and excited about what they discover when working practically • Make discoveries through trial and error - and not being afraid to get things wrong • Ask 'big questions' about life and the universe

Science Long Term Plan

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 1	Chemistry: Everyday Materials		Biology: Animals including Humans		Earth Science: Seasonal Changes	Biology: Plants
Year 2	Chemistry: Uses of Everyday Materials		Biology: Living Things and Life Cycles		Biology: Plants and Animals Including Humans	
Year 3	Physics: Light		Chemistry and Earth Science: Rocks and Fossils	Physics: Forces and Magnets	Biology: Plants and Animals	
Year 4	Chemistry: Solids, Liquids and Gases	Physics: Sound	Physics: Electricity	Biology: Animals Including Humans	Biology: Living Things and Their Habitats	
Year 5	Earth Science and Physics: Earth and Space	Physics: Forces	Chemistry: Properties and Changes of Materials			Biology: Living Things and Their Habitats
Year 6	Biology: Living Things and Their Habitats	Biology: Evolution and Adaptation	Biology: Animals Including Humans	Biology: Animals Including Humans	Physics: Light	Physics: Electricity

Physics **Chemistry** **Biology** **Earth Science**

Science Skills and Knowledge Progression

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Working Scientifically	<p>Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments</p> <p>Know that we can ask questions about the world and that when we observe the world to answer these questions, this is science</p> <p>Know that we can use magnifying glasses to observe objects closely</p> <p>Know that we can test our questions to see if they are true</p> <p>Know that objects can be identified or sorted into groups based on their observable properties</p> <p>Know that we can write down numbers and words or draw pictures to record what we find</p>	<p>Know that we can ask questions about the world and that when we observe the world to answer these questions, this is science</p> <p>Know that we can use magnifying glasses to observe objects closely</p> <p>Know that we can test our questions to see if they are true</p> <p>Know that objects can be identified or sorted into groups based on their observable properties</p> <p>Know that we can write down numbers and words or draw pictures to record what we find</p>	<p>Know that we can ask questions and answer them by setting up scientific enquiries</p> <p>Know how to make relevant predictions that will be tested in a scientific enquiry</p> <p>Know that in a fair test one thing is altered (independent variable) and one thing that may change as a result is measured (dependent variable) while all other conditions are kept the same</p> <p>Know how to use a range of equipment to measure accurately, including thermometers, data loggers, rulers and stopwatches</p> <p>Know how to draw bar charts; how to label a diagram using lines to connect information to the diagram; how to use a coloured key</p> <p>How to draw a neat table; how to draw a classification key; how to show the relationship between an independent variable in a two-way table; and how to label specific results in a two-way table</p> <p>Know – with structured guidance - how to write a simple scientific enquiry write-up including an introduction, a list of equipment, a numbered method, a detailing of results and a conclusion</p> <p>Know how to present a scientific enquiry write-up into a brief oral discussion of what was found in a scientific enquiry</p> <p>Know that scientific enquiries can suggest relationships, but that they</p>	<p>Know that we can ask questions and answer them by setting up scientific enquiries</p> <p>Know how to make relevant predictions that will be tested in a scientific enquiry</p> <p>Know that in a fair test one thing is altered (independent variable) and one thing that may change as a result is measured (dependent variable) while all other conditions are kept the same</p> <p>Know how to use a range of equipment to measure accurately, including thermometers, data loggers, rulers and stopwatches</p> <p>Know how to draw bar charts; 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			<p>do <u>not</u> prove whether a prediction is true</p> <p>Know that scientific enquiries are limited by the accuracy of the measurements (and measuring equipment) and by the extent to which conditions can vary even, and that repeating enquiries, measurements and taking measures to keep conditions as consistent as possible can improve an enquiry</p> <p>Know that the conclusions of scientific enquiries can lead to further questions, where results can be clarified or extended to different contexts (e.g. effect of changing sunlight on a plant – does this work with other plants / different types of light / etc)</p> <p>Know that they can draw conclusions from the findings of other scientists</p> <p>Know that a theory is an explanation of observations that has been tested to some extent and that a hypothesis is an explanation that has not yet been tested, but that can be tested through a scientific enquiry</p>	<p>Know that scientific enquiries can suggest relationships, but that they do <u>not</u> prove whether a prediction is true</p> <p>Know that scientific enquiries are limited by the accuracy of the measurements (and measuring equipment) and by the extent to which conditions can vary even, and that repeating enquiries, measurements and taking measures to keep conditions as consistent as possible can improve an enquiry</p> <p>Know that the conclusions of scientific enquiries can lead to further questions, where results can be clarified or extended to different contexts (e.g. effect of changing sunlight on a plant – does this work with other plants / different types of light / etc)</p> <p>Know that they can draw conclusions from the findings of other scientists</p> <p>Know that a theory is an explanation of observations that has been tested to some extent and that a hypothesis is an explanation that has not yet been tested, but that can be tested through a scientific enquiry</p>		
Physics			<p>Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments</p> <p>Know that light is a form of energy</p> <p>Know that energy comes in different forms and can be neither created nor destroyed, only changed from one form to another</p>	<p>Know that sound is generated when an object vibrates; some of the energy from the vibrating object is transferred to the air, making the air particles move</p> <p>Know that sound is a form of energy that transfers in a longitudinal wave - like that seen in a slinky - <u>not</u> a transverse wave - like that seen in water ripples</p>	<p>Know that a force is measured in a unit called Newtons, named after a British scientist called Sir Isaac Newton who discovered lots about gravity and how planets move</p> <p>Know that Newton was undoubtedly one of the greatest scientists who ever lived, a genius who discovered a great deal about forces, including</p>	<p>Know that translucent objects allow some light to pass through, but some of the light changes direction as it passes through the object; this means that an object seen through a translucent object is not clearly defined (see diagram below)</p> <p>Know that when light passes from one medium to another (e.g. from air to water), it changes direction; this is called refraction; this happens because light travels at different speeds in different media</p>

			<p>Know that we need light to see things and that darkness is the absence of light</p> <p>Know that light travels in straight lines</p> <p>Know that light is reflected when it travels from a light source and then 'bounces' off an object</p> <p>Know that everything that we can see is either a light source or something that is reflecting light from a light source into our eyes</p> <p>Know that the Sun is a light source, but that the Moon is not and is merely reflecting light from the Sun</p> <p>Know that many light sources give off light and heat</p> <p>Know that the Sun gives off light and heat when hydrogen turns into helium</p> <p>Know that filaments in traditional bulbs heat up until they glow, giving off light and heat</p> <p>Know that fluorescent bulbs glow when electricity adds energy to a gas within the bulb</p> <p>Know that opaque objects block light creating shadows and that light passes easily through transparent objects</p> <p>Know that opacity/transparency and reflectiveness are properties of a material</p> <p>Know that sunglasses can protect eyes from sunlight but looking at the Sun directly – even with sunglasses – can damage the eyes</p> <p>Know that as objects move towards a light source, the size of the shadow increases</p> <p>Know how to show the changing of shadow size by drawing a diagram with straight lines representing light</p>	<p>Know that sound travels through a medium (e.g. particles in the air) and thus sounds does <u>not</u> travel through a vacuum which has no particles in it at all</p> <p>Know that longitudinal sound waves are detected in the ear by humans and that the brain interprets this as the sounds we hear</p> <p>Know that sound travels at different speeds through different objects; it travels at around 340 metres per second in air, much slower than light travels; this is why we often hear thunder <u>after</u> we see lightning as the light reaches our eye before the sound reaches our ears</p> <p>Know that pitch is how high or low a sound is and that this is determined by how many vibrations per second are being made by the vibrating object; the number of vibrations per second is called frequency</p> <p>Know that volume is how loud or quiet a sound is and that this is determined by the amount of energy in the wave (e.g. from how hard or soft a percussion instrument is hit)</p> <p>Know that the volume of a sound is quieter if the listener is further away from the object</p> <p>Know that there are many kinds of jobs as a scientist including communicator scientist, teacher scientist, technician scientist, explorer scientist, entrepreneur scientist, regulator scientist, investigator scientist and developer scientist</p> <p>Know that investigator scientists to make</p>	<p>gravity, mathematics and light</p> <p>Know that pull forces can be measured using a device called a force meter</p> <p>Know that the amount of matter (stuff) in an object is its mass</p> <p>Know that gravity is a force that acts between all objects in the universe, but that it acts much more strongly between objects that have more mass and that are close together</p> <p>Know that unsupported objects are pulled towards the Earth by the force of gravity</p> <p>Know that acceleration is a change in speed and that unbalanced forces acting on an object cause it to accelerate</p> <p>Know that air resistance is a force felt by an object as it moves through the air; it is caused by the object bumping into the gas particles that make up air; the quicker an object moves, the more gas particles it bumps into and the more air resistance it experiences</p> <p>Know that a falling object will accelerate until its air resistance matches the gravitational force pulling it down; at this point, the object will continue to move at this speed (called its terminal velocity) without getting any quicker or slowing down (see diagram below)</p> <p>Know that a parachute's shape increases the air resistance that a falling object experiences, giving it a much lower terminal velocity</p> <p>Know that water resistance is a force felt by an object as it moves through water; it is caused</p>	<p>Know that white light comprises all the colours of light</p> <p>Know that white light refracted by two surfaces in a prism will spread out so that all of its constituent colours can be seen; this array of colours is called a spectrum; it happens because the different colours that constitute white light travel at different speeds</p> <p>Know how to draw a diagram to show why the shape of a shadow will match the shape of an object</p> <p>Know that when light reflects off an object, the angle of incidence is equal to the angle of reflection</p> <p>Know that a periscope takes advantage of the predictable angles of incidence and reflection to allow an image to be shown to a viewer</p> <p>Know how to draw simple circuit diagrams</p> <p>Know the recognized symbols for a battery, bulb, motor, buzzer and wire</p> <p>Know how to predict whether components will function in a given circuit, depending on whether or not the circuit is complete; whether or not a switch is in an on or off position; and whether or not there is a cell to provide electrical current to the circuit</p> <p>Know that voltage is a measure of the power of a cell to produce electricity; it is a measure of the 'push' of electric current, not the size of the electric current</p> <p>Know that as the number and voltage of cells in a circuit increases, the brightness of a bulb or the volume of a buzzer will increase (though too high a voltage may 'blow' the bulb or buzzer)</p> <p>Know that two bulbs in a circuit can be wired up to create a series circuit or a parallel circuit; if one bulb blows in a series circuit the other will not shine as the circuit has been broken; in contrast, if one bulb blows in a parallel circuit (see diagram below), there will still be a complete circuit for the other bulb so it will continue to shine; use this knowledge to explain the advantages of using parallel</p>
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			<p>Know that a data logger can keep track of light levels and that this can be plotted on a graph to show how this changes over the course of a day</p> <p>Know that Hasan Ibn al-Haytham - sometimes known as Alhazen - was a scientist and mathematician during early Islamic civilisation</p> <p>Know that al-Haytham was the first to explain that we see objects because light reflects from objects into our eyes</p> <p>Know that al-Haytham was an early pioneer of the scientific method which used evidence to find things out about the world</p> <p>Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments</p> <p>Know that metal is a material from which objects can be made</p> <p>Know that as objects move across a surface there is friction when they rub against each other and that sometimes this friction is larger or smaller</p> <p>Know that applying forces to objects can change their shape</p> <p>Know that the roughness of a material is an example of a property</p> <p>Know that a force can be thought of as a push or a pull</p> <p>Know that there are different types of contact force: impact forces (when two surfaces collide), frictional forces</p>	<p>connections between different areas of science</p> <p>Know that developer scientists find new uses for scientific discoveries that other people hadn't thought of</p> <p>Know that electrical energy is one of many forms of energy</p> <p>Know that static electricity is an imbalance of charged particles on a material; it does <u>not</u> operate by flowing around a complete circuit</p> <p>Know that current electricity is the flow of charged particles called electrons around a circuit</p> <p>Know that current electricity is the form of electricity that we use in our lives in lights, computers, televisions, etc</p> <p>Know that electrical current flows well through some materials, called electrical conductors, and poorly through other materials, called electrical insulators</p> <p>Know that conductors have free electrons (tiny, negatively charged particles) and that when electrical current flows around a conductor the electrons move</p> <p>Know that electrical conductivity (how well a material conducts electricity) is an example of a property</p> <p>Know that metals are good electrical conductors</p> <p>Know that a chemical reaction inside a cell produces the charged particles that can flow around a circuit</p> <p>Know that more than one cell lined up to work together is called a battery</p>	<p>by the object bumping into the water particles</p> <p>Know that the shape of an object determines how much air resistance or water resistance it experiences; shapes of object that experience little air resistance or water resistance are described as streamlined</p> <p>Know how to draw a force diagram with arrows representing the different forces acting on an object</p> <p>Know that a lever is a rigid length pivoting around a fulcrum</p> <p>Know that a pulley is a wheel with a fulcrum that supports a moving cable or belt (see diagram below)</p> <p>Know that a gear is a rotating wheel with cut teeth that mesh with the teeth of another gear so that turning one gear turns an adjacent gear in the opposite direction</p> <p>Know that gears, levers and pulleys are simple machines that are used to allow a smaller force to have a greater effect; they do this by moving a smaller force over a longer distance at one end of the machine, which the machine turns into a larger force over a small distance at the other end</p>	<p>circuits (e.g. in the lighting in homes)</p>
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			<p>(when two surfaces are already in contact) and strain forces (when an elastic material is stretched or squashed) Know that objects move differently on rough and smooth surfaces; objects resist movement more on rough surfaces because there is higher friction as the object moves Know that there are also non-contact forces that can act between objects without them touching and that magnetism is an example of a non-contact force Know that magnets have two poles called north and south Know that like poles (south-south and north-north) of two magnets repel each other and that opposite poles of two magnets (north-south) attract each other Know that there is a magnetic field around a magnet which is strongest at each pole (see diagram below) Know that some materials are magnetic, meaning that they are attracted to a magnet, while other materials are non-magnetic</p>	<p>Cells, batteries and the mains are all sources of electrical energy Know that electrical current can flow if there is a complete circuit Know that wires – which contain a conductor inside them, usually made of metal – can allow electrical current to flow around a circuit Know that when electrical current flows through a circuit components within that circuit – such as buzzers which make a noise and bulbs which emit light – begin to work Know that a switch functions by completing or breaking a complete circuit Know how to construct a simple circuit using components Know that exposure to high levels of electrical current can be dangerous Know that Michael Faraday was a scientist who studied electricity Know that he invented the electric motor and showed that the movement of a magnet could create electricity, which is the reason we can generate electricity to power our world Know that he is considered "the father of electricity"</p>		
Chemistry	<p>Know that an object is made from/of a material and know some examples of materials in the real world Know that materials can be hard, soft, strong, weak, absorbent, heavy, light, solid and runny,</p>	<p>Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments Know that objects are made from materials</p>		<p>Know that things are composed of a matter commonly in one of three states of matter: solid, liquid or gas Know that things are made of particles (tiny building blocks) and that these are organized</p>	<p>Know that materials can be sorted in a variety of ways based on their properties Know that in some solid materials the bonds between particles break when surrounded by a liquid; this allows the</p>	

	<p>smooth and rough; these descriptions denote the properties of a material</p> <p>Know from observation how to distinguish between materials made of wood, plastic, glass, metal, water, rock</p> <p>Know that matter (stuff) is made from tiny building blocks</p>	<p>such as wood, plastic, glass, metal, water, rock</p> <p>Know that materials have properties such as being hard, soft, strong, weak, absorbent, heavy, light, solid, runny, smooth and rough; these descriptions denote the properties of a material</p> <p>Know that matter (stuff) is made from tiny building blocks</p> <p>Know that materials can have useful properties for a given job (including being waterproof, strong, hard, soft, flexible, rigid, light or heavy.)</p> <p>Know that many types of plastic are waterproof, that steel (a type of metal) is strong, that rock is hard, that cotton wool is soft, that rubber is flexible, that rock is rigid, that polystyrene (a type of plastic) is light and that iron (a type of metal) is heavy,</p> <p>Know that when objects move across a surface there is friction when they rub against each other and that sometimes this friction is larger or smaller</p> <p>Know that applying forces to objects can change their shape, by squeezing, stretching, bending and twisting</p> <p>Know that Isambard Kingdom Brunel was a famous scientist who used materials to build impressive and important things; know that he was an engineer</p> <p>Know that Brunel lived in the Victorian era and that he designed steamships, railways, bridges, tunnels and dockyards</p>		<p>differently in different states (see diagram below)</p> <p>Know that materials can change state when temperature changes</p> <p>Know that there are bonds between the particles (building blocks) in a solid; as temperature increases, these bonds are somewhat overcome as the particles absorb energy and solids can change into liquids; with a further increase in temperature, the particles become even more energetic and the bonds are overcome entirely so the liquid changes into a gas</p> <p>Know that when solids turn into liquids, this is called melting and that the reverse process is called freezing (see diagram below)</p> <p>Know that when liquids turn into gases, this is called evaporation and that the reverse process is called condensation (see diagram below)</p> <p>Know that when a solid turns into a gas without passing through the liquid state, this is called sublimation (see diagram below)</p> <p>Know that the melting point of water is 0° C and that the boiling point of water is 100° C</p> <p>Know that water flows around our world in a continuous process called the water cycle (see diagram below)</p> <p>Know that, along with evaporation, water on the Earth's surface moves to the air in a process called transpiration in which water turns into water vapour (gas) on the surface of leaves on plants</p>	<p>liquid to absorb the solid; when this happens, the solid is called a solute, the liquid is called a solvent and the result is a solution; when a solid does dissolve in a liquid it is described as being soluble in that solvent (e.g. sugar in water); when it cannot it is insoluble (e.g. sand in water)</p> <p>Know that a given amount of solvent can only absorb a certain amount of solid before no more will dissolve; when this happens the liquid is said to be saturated</p> <p>Know that when a solvent is evaporated from a solution, the original solute is left behind; the remaining solid will often form crystals – the slower the solvent evaporates, the larger the crystals that will be formed</p> <p>Know how to dissolve a solute in a solvent and then how to evaporate the solvent to recover the solute</p> <p>Know that a reversible change is one that can be reversed and that examples of this are mixing, dissolving and changes of state where no chemical reaction takes place</p> <p>Know that an irreversible change is one that cannot be reversed and that examples of this often involve a chemical change where a new material is made, often a gas (e.g. burning, boiling an egg, the reaction of bicarbonate of soda and acid)</p> <p>Know that filtering allows solids and liquids to be separated and that sieving allows solids made up of different sized parts to be separated</p>	
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				<p>Know that rain condenses in clouds and falls to earth as rain, snow or hail in a process called precipitation</p> <p>Know that water flows across the land in rivers and streams in a process called surface run-off and under the ground as groundwater</p>	<p>Know how to separate a mixture of sand, salt and small stones by sieving (to remove the small stones), followed by dissolving in water (so the salt is absorbed), followed by filtering to remove the sand from the mixture, followed finally by evaporation of the water to recover the salt.</p> <p>Know that materials' different properties can be tested through acting upon them, including testing to find whether materials are magnetic, thermally conductive and electrically conductive; know that the various properties of different materials make them suitable for a given function</p> <p>Know how to explain orally and in writing the reasons why various materials are suited or unsuited to a function</p> <p>Know that Marie Curie was a genius physicist, earning two Nobel Prizes. She discovered two new elements (the building blocks of everything) and made discoveries that suggested that atoms - which were thought to be the smallest building blocks - could be divided into smaller building blocks still</p>	
Biology	<p>Know that a trout is an example of a fish; a frog is an example of an amphibian; a lizard is an example of a reptile; a robin is an example of a bird; a rabbit and a human are examples of a mammal and explore further examples of each animal type</p> <p>Know that herbivorous animals eat plants; carnivorous animals eat other animals;</p>	<p>Know that dandelions, rose bushes, grass, ash trees, birch trees and conifers trees are examples of plants.</p> <p>Know that trees can be deciduous or evergreen.</p> <p>Know that a trout is an example of fish, a frog is an example of an amphibian; a lizard is an example of a reptile; a robin is an example of a bird; a rabbit and a human are examples of a mammal</p>	<p>Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments</p> <p>Know that evergreen trees maintain their leaves throughout the year and that deciduous trees shed their leaves in autumn</p> <p>Know that flowering plants consist of roots, stem, leaves and flowers, and that a tree's stem is called a trunk</p>	<p>Know that food passes through the body with the nutrients being extracted and the waste products excreted, and that this process is called digestion</p> <p>Know that the process of digestion involves breaking complex foodstuffs into simpler building blocks that can be absorbed by the body</p> <p>Know that the process of digestion begins with food being chewed in</p>	<p>Know that the life cycle of a living thing is a series of stages of development starting with a fertilized egg in animals or a seed in many plants</p> <p>Know that in most mammals (e.g. dogs) a fertilized egg develops in the womb into an embryo and is then born and fed on milk before it is weaned onto the food that is adapted to eat; it then develops to maturity in a period called</p>	<p>Know that there are three types of micro-organism: viruses, fungi and bacteria; of these three, viruses are often not really considered to be alive by many scientists mainly because they don't have the 'machinery' to reproduce inside them</p> <p>Know that germs are disease-causing micro-organisms</p> <p>Know that an arthropod is an invertebrate with a hard, external skeleton and jointed limbs</p> <p>Know that insects are a type of arthropod; their bodies consist of six legs, a head, a thorax and an</p>

<p>omnivorous animals eat both animals and plants Know that a cat is an example of a carnivore; that a rabbit is an example of a herbivore; know that many humans are examples of omnivores (though not vegetarians) Know that fish, amphibians, reptiles, birds and mammals are similar in that they have internal skeletons and organs; these are known as vertebrates, which means they are animals that have a backbone Know that fish are different to other animals in having gills so that they can breathe underwater and scaly skin Know that amphibians are different to other animals in that they begin their lives with gills but then develop lungs and breathe on land Know that reptiles are different to other animals in that they breathe air and have scaly skin Know that birds are different to other animals in that they have feathers and wings Know that mammals are different to other animals in that they have fur/hair and they feed milk to their young Know that feet, legs, arms, hands, torso, head, skin, ears, eyes, nose, mouth and tongue are parts of the body and identify them Know that eyes are associated with sight, ears with sound, nose with smell, tongue with taste and skin with touch Know that Linda Brown Buck won a Nobel prize in 2004 and that she discovered that</p>	<p>Know that herbivorous animals eat plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants Know that living things move, grow, consume nutrients and reproduce; that dead things use to do these things, but no longer do; and that things that never lived have never done these things. Know that there are many kinds of jobs as a scientist including communicator scientist, technician scientist and explorer scientist Know that technician scientists are scientists that help other scientists to do their job Know that explorer scientists try to find out new things that no one has ever learned before; many of the most famous scientists in history were explorer scientists Know that light is a form of energy Know that plants absorb energy from the Sun; that this energy is consumed by herbivorous animals; and that carnivorous animals eat other animals Know that the arrows on a food chain show the direction that the energy travels Know that polar bears are an example of an animal adapted to its environment – thick fur for warmth and oily paw pads to ensure that they don't freeze to the ice Know that sharks are another example – smooth skin and streamlined shape for quick swimming; and gills for breathing underwater Know that cacti are an example of a plant</p>	<p>Know that living things move, grow, consume nutrients and reproduce; that dead things use to do these things, but no longer do; and that things that never lived have never done these things. Know that plants absorb energy from the Sun; that this energy is consumed by herbivorous animals; and that carnivorous animals eat other animals. Know that seeds and bulbs need to be buried underground in soil and that they will grow into adult plants under the right conditions (water, warmth) Know that the arrows on a food chain show the direction that the energy travels. Know that plants that are deprived of light, food or air will not grow and will die. Know that animals, including humans, need food, water and air to survive Know that there are food groups: fruit and vegetables, carbohydrates, protein, dairy, fat and sugary foods Know that more than half of our diet should be made up of carbohydrates, fruit and vegetables Know that fats and sugary foods should be eaten rarely and in small amounts Know that different parts of plants have one or more functions (jobs) Know that the roots collect water and minerals from the soil, and hold the plant firmly in the ground Know that the stem holds up the leaves so that they can gather light to make food and holds up the</p>	<p>the mouth by the teeth and saliva added Know that a human has three types of teeth – incisors, canines and molars – and that these each perform different functions Know that incisors slice food, canines tear food (especially meat) and that molars grind food Know that children develop an initial set of teeth which are gradually replaced between the ages of 6 and 12 Know that food is squeezed down the oesophagus towards the stomach in a wave-like action called peristalsis (see diagram below) Know that the stomach releases acid and enzymes to continue breaking down the food; the stomach is an organ; an organ is a part of living thing that is self-contained and has a specific important job Know that further enzymes and bile break down the food further as it moves through the duodenum towards the small intestine Know that the small intestine adds more enzymes and then absorbs the nutrients Know that the large intestine absorbs water from the undigested food Know that undigested food is stored in the rectum before being excreted through a muscle called the anus Know that a food chain traces the path of energy through a habitat Know that the arrows in a food chain show the direction that energy is travelling through a habitat Know that all energy for a food chain initially comes</p>	<p>adolescence after which it can reproduce and the cycle can begin again Know that in amphibians (e.g. frogs) a fertilized egg develops into an embryo and then hatches into a tadpole; the tadpole develops adult characteristics, metamorphoses into the adult form after which it can reproduce and the cycle can begin again (see diagram below) Know that in many insects (e.g. butterflies) a fertilized egg develops into wingless feeding form called a larva (caterpillar); the larva feeds then later becomes a pupa (chrysalis) with a protective cocoon; inside this cocoon, the pupa metamorphoses into the adult butterfly after which it can reproduce and the cycle can begin again (Know that in birds (e.g. robins) a fertilized egg hatches in a nest (a hatchling) and is fed by its parents until it is ready to fly (i.e. becomes a fledgling); it then leaves the nest and grows into an adult after which it can reproduce and the cycle can begin again Know that humans go through stages of development; they begin as fertilized eggs and then develop into embryos before developing into babies; once they are born, these newborn babies become infants (roughly 2 months to 2 years) then into young children (roughly 2-12 years old); children develop into adults during adolescence (roughly 12-16 years old) at which age they become physically capable of reproduction; as adults develop into old age</p>	<p>abdomen; most insects also have a pair of antennae and a pair of wings (e.g. wasp) (see diagram below) Know that an arachnid (e.g. spider) is a type of arthropod with eight legs and no antennae or wings (see diagram below) Know that a crustacean is a type of arthropod with two pairs of antennae (e.g. woodlouse) (see diagram below) Know that a myriapod is an arthropod with a flat and long or cylindrical body and many legs (e.g. centipede) (see diagram below) Know that Jane Goodall is an anthropologist, most famous for her study of chimpanzees, of which she is considered the world's foremost expert Know that Goodall discovered that chimpanzees are much more intelligent than they had ever been thought to be Know that Goodall is also a conservationist and environmentalist, which means she does important work to help protect the planet, in particular animal habitats Know that all life on Earth began from a single point around 4.5 thousand million years ago Know that living things change over time and that this gradual change is called evolution Know that natural selection is the cause of this change; natural selection works as there is natural variation within a species; there is also competition to survive and reproduce and that members of a species with advantageous characteristics survive and reproduce - these characteristics are passed down to their offspring; members of a species with less advantageous characteristics do not survive and reproduce - these characteristics are not passed down to offspring (see diagram below) Know that offspring vary and are not identical to their parents Know that the gradual change of species over millions of years can be observed by looking at examples of fossils</p>
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	<p>mammals smell over 1000 smells.</p> <p>Know a rose bush, a sunflower and a dandelion by sight</p> <p>Know a sycamore tree, a birch tree and a horse chestnut tree by sight</p> <p>Know that evergreen trees maintain their leaves throughout the year and that deciduous trees shed their leaves in autumn</p> <p>Know that a flowering plants consist of roots, stem, leaves and flowers, and that a tree's stem is called a trunk</p> <p>Know that there are many kinds of jobs as a scientist including communicator scientist and teacher scientist</p> <p>Know that teacher scientists teach others - often children - about science</p> <p>Know that communicator scientists help the world to understand about science</p> <p>Know that David Attenborough is a famous communicator scientist who has created and presented some of the most famous television programmes ever made about plants and animals</p>	<p>adapted to its environment – thick skin keeps a store of water safe; sharp spikes keep animals from stealing the water</p> <p>Know that pine trees are adapted to their environment in that they have thick bark and pine cones to protect against cold winters</p> <p>Know that woodlice live under logs – an example of a microhabitat - as they need somewhere dark and damp so that they do not dry out</p> <p>Know that frogs can live in ponds – an example of a microhabitat - as they water in which to lay their eggs (frogspawn)</p> <p>Know that science is a way to understand our world by carefully thinking about it and testing our guesses with observations and experiments</p> <p>Know that living things move, grow, consume nutrients and reproduce; that dead things use to do these things, but no longer do; and that things that never lived have never done these things</p> <p>Know that seeds and bulbs need to be buried underground in soil and that they will grow into adult plants under the right conditions (water, warmth)</p> <p>Know that plants that are deprived of light, food or air will not grow and will die.</p> <p>Know that plants and animals produce offspring that grow into adults.</p> <p>Know that George Washington Carver was a practical scientist and inventor</p> <p>Know that he helped farmers in America to grow more crops by</p>	<p>flowers so that they can receive pollen and disperse their fruits; know that the stem also transports water and minerals from the roots to the other parts of the plant</p> <p>Know that the leaves make food by absorbing light and using its energy to turn carbon dioxide and water into carbohydrates</p> <p>Know that the function of a flower is reproduction, where flowers of the same kind exchange pollen – made by an anther – in a process called fertilisation, and a structure in the flower's ovary called an ovule becomes a seed; the ovary then becomes a fruit which helps the seed leave the plant in a process called dispersal</p> <p>Know that animals, including humans, have a skeleton made up of solid objects</p> <p>Know that some animals (such as insects) have an exoskeleton – a solid covering on the outside of their body</p> <p>Know that many invertebrates (such as earthworms and slugs) have water held inside by muscles which acts like a skeleton</p> <p>Know that skeletons provide support for muscles and protect the body; for example, the rib cage protects the vital organs in the human body</p> <p>Know that human skeletons are made up of bones and cartilage</p> <p>Know that muscles can only contract, so they must be arranged in pairs in the body so that as one contracts the other loosens</p> <p>Know that excess of a food group can cause ill health, such as tooth</p>	<p>from the Sun which is absorbed and turned into energy by plants which are called producers</p> <p>Know that consumers take in energy by eating</p> <p>Know that an animal that is eaten by another is called prey, and that an animal that eats other animals is called a predator</p> <p>Know that the first consumer in a food chain is called a primary consumer, the second is called a secondary consumer and above it is called a tertiary consumer</p> <p>Know that animals can be grouped based on their physical characteristics (e.g. vertebrates and invertebrates) and based on their behavior (e.g. herbivores, carnivores and omnivores)</p> <p>Know that living things are divided into kingdoms: the animal kingdom, plants, fungi, bacteria, and single-celled organisms</p> <p>Know that a species is a group of living things that can reproduce together produce offspring</p> <p>Know that a classification key uses questions to sort and identify different living things</p> <p>Know how to use a classification key to identify living things</p> <p>Know how to create a classification key to sort plants on the school premises</p> <p>Know that changes to the environment can make it more difficult for living things to survive and reproduce; in extreme cases this leads to extinction, where an entire species dies</p>	<p>(roughly 55+ years old) they experience changes in their body which require them to move more carefully and rest more frequently</p> <p><i>NB: the changes of adolescence in humans is taught as part of mandatory sex and relationship education; it must be taught with due sensitivity to children's backgrounds and must reflect the PSHE curriculum</i></p>	<p>Know that Charles Darwin posited this theory of evolution by natural selection</p> <p>Know that Darwin was a naturalist whose theory of evolution by natural selection developed while travelling through the Amazon rainforest</p> <p>Know that Darwin's theory is accepted as fact by the scientific community</p> <p>Know that Darwin did not know similarities were passed between parents and their offspring; know DNA, a chemical discovered in the 20th century, is contains the "code" that passes on information between parents and their offspring in all living things</p> <p>Know the names of key bones in the body, including the rib cage, cranium, mandible, sternum, vertebrae, femur, tibia, fibula, patella, humerus, radius and ulna; know how to label these on a diagram of the human body</p> <p>Know that an adult human body has 206 bones, the longest of which is the femur</p> <p>Know that Ibn Sina (known also as Avicenna) was a scientific genius during early Islamic civilisation</p> <p>Know that he wrote books about medicine and healing people</p> <p>Know that he helped guide the modern world towards the idea of using evidence in medicine</p> <p>Know that he also made major contributions to other areas of science, mathematics and philosophy</p> <p>Know that the heart and lungs are organs protected by the ribcage and understand this as a part of the skeleton</p> <p>Know that the heart beats, pumping blood around the body and that blood vessels carry the blood; arteries carry blood away from the heart; veins carry blood towards the heart; capillaries are tiny blood vessels that connect arteries and veins</p> <p>Know that the heart is composed of four chambers: two atria and two ventricles; the aorta is the largest artery in the body and most major arteries branch off from it (see diagram below)</p> <p>Know that blood travels around the body transporting nutrients</p>
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		<p>showing them the benefits of growing different things at different times and of using fields for different crops</p> <p>Know that animals, including humans, need food, water and air to survive</p> <p>Know the basic food groups: fruit and vegetables, carbohydrates, protein, dairy, fat and sugary foods</p> <p>Know that proteins are good for growth, carbohydrates for energy and fruit and vegetables provide vitamins and minerals which help keep us healthy (e.g. calcium for healthy bones and teeth)</p> <p>Know that more than half of our diet should be made up of carbohydrates, fruit and vegetables (see diagram below)</p> <p>Know that fats and sugary foods should be eaten rarely and in small amounts</p> <p>Know that people need to exercise often to help their body stay strong and fit</p> <p>Know that keeping clean, including washing and brushing teeth, is an important part of staying healthy</p>	<p>decay due to excess sugar</p> <p>Know that excess fat from fatty foods such as butter and cheese - and created in the body from excess calories – builds up in the body and can cause obesity</p> <p>Know that excess body fat can lead to heart disease and increases the strain on joints and growing bones</p> <p>Know that there are many kinds of jobs as a scientist including communicator scientist, teacher scientist, technician scientist, explorer scientist, entrepreneur scientist and regulator scientist</p> <p>Know that entrepreneur scientists are people who use things learned in science to start new businesses and make money</p> <p>Know that regulator scientists use science to make sure things that people use are reliable and safe</p>	<p>Know that human activity – such as climate change caused by pollution - can change the environment for many living things, endangering their existence</p> <p>Know that many species of living things have already been made extinct as a result of human activity</p> <p>Know that the polar bear is a famous example of climate change endangering the existence of a species; as the climate changes and gets warmer, the sea ice on which polar bears live reduces in amount making it harder for them to survive and reproduce</p> <p>Know that Carl Linnaeus was a famous scientist who studied life and created a system for sorting living things into different groups</p> <p>Know that the concept of species and kingdoms (such as the animal kingdom or the plant kingdom) was his invention, and that all living things are given a name that uses his method of classification</p>	<p>that have been absorbed into the bloodstream from digestion; blood also absorbs oxygen from the lungs and carries it around the body which is used to power the body; this use of oxygen to create energy is called respiration</p> <p>Know that when we exercise, our heart beats more frequently so that the oxygen that is used around the body can be replenished; it returns to a resting heart rate afterwards; fitter people tend to have lower resting heart rates</p> <p>Know that drugs are chemicals that have an impact on the natural chemicals in a person's body; know that drugs can be harmful or helpful, depending on what they are and how they are used; know that all drugs can be harmful if overused</p> <p>Know that paracetamol and aspirin are examples of drugs that can be helpful as a painkiller</p> <p>Know that cannabis and cocaine are examples of illegal drugs that can have serious negative effects</p> <p>Know that alcohol and tobacco are examples of drugs that are legal to adults but that can have serious negative effects, such as liver disease and lung disease, respectively</p> <p>Know that there are many kinds of jobs as a scientist that fall into these categories: communicator scientist, developer scientist, entrepreneur scientist, explorer scientist, investigator scientist, regulator scientist, teacher scientist, technician scientist, policy scientist and business scientist</p> <p>https://sciencecouncil.org/about-science/10-types-of-scientist/</p> <p>Know that policy scientists use their science and technical knowledge, as well as their understanding of government and policy making, to ensure that legislation and policy have a sound evidence base. Some policy scientists describe themselves as 75% scientist and 25% politician.</p> <p>Know that a business scientist helps businesses to make evidence-informed decisions</p>
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Earth Science	<p>Know that days are longer in the summer and shorter in winter</p> <p>Know that weather changes through the year, getting hotter in the summer and colder in the winter</p> <p>Know that the four seasons are spring, summer, autumn and winter and know the order of the cycle</p> <p>Know that the winter is likely to bring ice on the ground when water freezes due to the cold</p> <p>Know that the Earth orbits the Sun with one orbit constituting a year of 365/366 days</p>		<p>Know that the Earth has a solid crust made up of tectonic plates with molten rock beneath</p> <p>Know that there are three kinds of rocks: igneous, sedimentary and metamorphic</p> <p>Know that granite and basalt are types of igneous rock and that igneous rocks form from molten rock below the Earth's crust</p> <p>Know that limestone and sandstone are types of sedimentary rock which form when small, weathered fragments of rock or shell settle and stick together, often in layers</p> <p>Know that marble and slate are types of metamorphic rock which form when rocks in Earth's crust get squashed and heated in processes such as when tectonic plates press against each other</p> <p>Know that fossils form when a plant or animal dies and is quickly covered with silt or mud so that it cannot be rotted by microbes or eaten by scavenging animals; in time layers of sediment build, squashing the mud and turning it to stone</p>		<p>Know that the universe comprises all matter and space in existence</p> <p>Know that a celestial body is a large object in the universe</p> <p>Know that a star is an exceptionally hot ball of gas, originally made from hydrogen and helium</p> <p>Know that the Sun is a star</p> <p>Know that a planet (e.g Earth) is defined as a spherical celestial body that orbits a star and that has cleared the neighbourhood of its orbit of other objects, some of which crash into the planet and others that become moons of that planet</p> <p>Know it was once thought that everything orbited the Earth, but that scientists like Copernicus and Galileo used telescopes and measurement to show that the Earth orbited the Sun</p> <p>The Sun and the objects that orbit it are collectively known as our Solar System</p> <p>Know that there are eight major planets in our solar system: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune</p> <p>Know that a satellite orbits a planet and that moons are natural satellites</p> <p>Know that humans have sent man-made satellites into orbit that assist with telecommunication</p>	

around the dead plant or animal; the materials in the body are replaced by minerals that flow in water through the rock, leaving a rock in the shape of the animal or plant that was once there

Know that fossils can help us learn about things that lived long ago
Know that soil is made from tiny particles of rock broken down by the action of weather (weathering)

Know that Zhang Heng was a genius in many areas: he was a scientist, mathematician, poet, inventor and artist
Know that Zhang Heng invented the world's first seismoscope that was able to detect where and when earthquakes had happened (when the Earth's tectonic plates suddenly shift causing massive vibrations)

Know that all the planets in the solar system orbit the Sun and that the further away they are from the Sun, the longer their orbit

Know that the Earth spins around an imaginary line through its centre called an axis and that this axis is tilted relative to the Earth's orbit

Know that night and day are the result of the Earth rotating on its axis

Know that the tilt of the Earth towards and away from the Sun's light as the Earth orbits the Sun leads to the seasons as during winter the light is spread over a wider area (see diagram below)

Know that the Moon orbits the Earth roughly every 28 days

Know that as the Moon orbits the Sun, different parts of it are lit up by the Sun, which is why we see a different shape lit up on the Moon as the lunar cycle progresses; these are called phases of the Moon

Know that a solar eclipse occurs when the Moon is between the Sun and the Earth, casting a shadow on the Earth; a lunar eclipse occurs when the Earth is between the Sun and the Moon, casting a shadow on the Moon

Know that Katherine Johnson was a scientist and mathematician from America

She worked for NASA and her calculations and work were critical to the success of the first and subsequent manned space flights

She was one of the first black women to attend an integrated university in her state, West Virginia, having been handpicked due to her ability

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