

Year 3: Autumn 1

Chemistry: Rocks



	Required prior knowledge	Knowledge to be explicitly taught	How knowledge will be built upon
Substantive	<ul style="list-style-type: none"> Materials can be artificial (man-made) or natural (N3-4 Aut1). Geography: We live on Earth (Y1 Aut). Materials have physical properties that make them better or worse for certain uses, such as waterproof, absorbent, windproof, heatproof, malleable. Materials such as wood, metal, plastic, brick, rock, paper and cardboard have these physical properties to different extents (Y2 Spr). Living things are called organisms (Y2 Spr). Everything in the world is either living (or used to be living) or not-living (Y2 Sum). The word fauna is a word used to describe animal life (Y2 Spr2). Some animals can be grouped into fish, amphibians, reptiles, birds and mammals (name common examples) (Y1 Sum). A species is a group of living things that are the same type (Y2 Spr). 	<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 its 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 or lava 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 organisms; they are indirect evidence of life. Examples include imprints of, or marks left by, an organism, such as a footprint, imprint of a feather or poo. Fossils can be formed when an organism 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 also form when dead organisms are frozen in ice or preserved in amber. Megafauna are very large animals. Fossils provide evidence for megafauna that are extinct. When there are no living individuals of a species, that species is extinct. Soil is a mixture of tiny pieces of rock, dead plants and animals, air and water. Different soils have different properties. 	<ul style="list-style-type: none"> History: Rocks that build historical monuments including Stonehenge and the Great Pyramid in Egypt (Y3). History: Importance of fossils in archaeology (Y6). Geography: Beneath the Earth's solid crust is a hot layer called the mantle (Y3). Geography: Volcanic eruptions release magma (Y3 Spr). Fossils provide evidence for evolution, because they show how organisms have changed over time (Y6 Aut). The rock cycle and the formation of igneous, sedimentary and metamorphic rocks (KS3). The composition of the Earth (KS3). Earth as a source of limited resources and the efficacy of recycling (KS3).
Disciplinary	<ul style="list-style-type: none"> A&P: Scientists group based on their properties (Y1 Spr). M&O: Make systematic observations (Y2 Aut). R&P: Use a pair of axes to classify items based on the extent to which it displays two properties (Y2 Spr). 	<p>Make observations about rocks using senses and magnifying glass, and classify them in a Carroll diagram/pair of axes</p>	
VCs	<ul style="list-style-type: none"> 5A: Some plants grow in soil (Y1). 9: A species is a group of living things of the same type (Y2). 	<ul style="list-style-type: none"> 5A: Rocks are formed when placed under pressure. Much of the solid surface of the Earth is covered in soil, which is a mixture of pieces of rock of various sizes and the remains of organisms. Some soil also contains air, water and some nutrients. There are three main kinds of rock: igneous, sedimentary and metamorphic, which each have different composition and properties. 9: When there are no living individuals of a species to reproduce, the species is extinct. 10: We know about extinct and dead species from fossils. These are the preserved remains (or traces) of organisms that lived many years ago. 	<ul style="list-style-type: none"> 5A: Geography – The Earth has four layers. Its upper layer of tectonic plates move. Shield and composite volcanoes can form at plate boundaries, which produce lava, pyroclastic flows and lahars (Y3). 10: Fossils provide evidence for evolution (Y6).

Year 3: Autumn 2

Physics: Light



	Required prior knowledge	Knowledge to be explicitly taught	How knowledge will be built upon
Substantive	<ul style="list-style-type: none"> We see shadows during the day (N3-4 Aut1). It is important to wear sun cream and sun hats when it is sunny (N3-4 Sum2). Daytime happens when we are facing the sun; nighttime happens when we are facing away from the sun (Y1 Aut). The Moon is more visible at night (Y1 Aut). Humans have five senses, smell, taste, touch, sight and hearing (Y1 Sum2). The five senses are each associated with different body parts (eyes, ears, nose, tongue) (Y1 Sum 2). 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 (Y1 Spr1). 	<ul style="list-style-type: none"> Light travels in straight lines. We see when light enters our eyes. Darkness is the absence of light. Sources of light emit their own light, and others reflect light; both occur in nature as well as man-made objects. Some materials 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"> In ray diagrams, straight lines with arrows show where the energy is being transferred from and to by light (Y6). 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 (Y6 Spr). On a rough surface, light will be reflected in all directions. This is known as diffuse reflection (Y6 Spr). Specular reflection between mirrors allow us to see the objects that do not directly reflect light into our eyes (e.g. periscope) (Y6 Spr). When light meets an opaque object, some of the light is reflected and some of it is absorbed (Y6 Spr). White light, which comes from most light sources we use in the classroom, contains all the colours of the visible spectrum (Y6 Spr). When a light meets a surface, some colours are absorbed and some are reflected. We see the colour(s) that are reflected (Y6 Spr). 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 (Y6).
Disciplinary	<ul style="list-style-type: none"> Mathematics: Measure length and height (cm/m) (Y2). A&P: There are four main stages of enquiry (A&P, M&O, R&P, A&E) (Y2 Spr). 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 (Y2 Aut). 	<p><i>Investigate how the height of a shadow varies as the distance between light source and object changes</i></p> <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. 	<ul style="list-style-type: none"> A&P: Scientists must work out if the factor is the cause of the outcome in a correlation (Y5).
VCS	<ul style="list-style-type: none"> 6: Naming the Sun, Earth and Moon (EYFS). Daytime is when the Earth is facing the Sun; nighttime is when the Earth is facing away from the Sun (Y1). 	<ul style="list-style-type: none"> 2: Objects can affect other objects even when they are not in contact with them. Light reaches our eyes, even though the light source may be far away. 6: The Sun emits light, some of which reaches Earth. The Moon reflects light from the Sun. 	<ul style="list-style-type: none"> 2: Sound comes from objects that vibrate and can be detected at a distance from the source, because the air or other material around is made to vibrate. Sounds are heard when the vibrations in the air reach our ears (Y4). 6: The Sun as a star in our universe; Earth as a planet and the Moon as a satellite (Y5).

Year 3: Spring 1

Biology: Organisms



	Required prior knowledge	Knowledge to be explicitly taught	How knowledge will be built upon
Substantive	<ul style="list-style-type: none"> Some animals hibernate in winter (N3-4 Aut1). Animals can be placed into groups (carnivores, herbivores and omnivores) based on the foods they eat (Y1 Sum). Humans are omnivores, but some choose to eat only plants (Y1 Sum). Humans need to eat a healthy and balanced diet. This should include all the nutrients that we need, should be high in fruits and vegetables and low in fats and sugars (Y2 Aut). 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, ears, eyes, nose, mouth, arms, legs, hands, feet, toes (Y2 Aut). Living things move, reproduce, are sensitive to their surroundings, grow, need oxygen, get rid of their waste, and need nutrition (MRS GOWN) (Y2 Spr). Living things are called organisms (Y2 Spr). Animals get their food from plants and other animals, this food provides the energy animals need (Y2 Spr). 	<ul style="list-style-type: none"> The main food groups are carbohydrates (starch and sugars), proteins, fats, fibre, vitamins and minerals. Humans need a balanced diet which is made of main food groups. Plant-based diets can be balanced. Eating foods that are in season can reduce food waste. 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. Some organisms have endoskeletons, some have exoskeletons, and some have neither. Endoskeletons grow with the organism. Exoskeletons do not grow, so need to be shed and replaced. 	<ul style="list-style-type: none"> Invertebrates can be placed into groups based on their skeletons; endoskeletons, exoskeletons, or hydrostatic skeletons (Y4 Aut). There are four main types of teeth: incisors, canines, pre-molars and molars. They each have a different purpose (Y4 Aut). Herbivores, carnivores and omnivores have these types of teeth in different proportions (Y4 Aut). Animals and plants need to digest food to transfer energy from it (Y4 Aut). The digestive system is the group of organs that help your body digest food (Y4 Aut). The heart is a muscle that pumps blood around the body through blood vessels (Y6 Sum).
Disciplinary	<ul style="list-style-type: none"> R&P: Draw a diagram, a simple scientific drawing that explains or informs. 	<ul style="list-style-type: none"> Science is studied as three disciplines: biology (study of organisms), chemistry (study of materials) and physics (study of energy). Label the main bones on a diagram of a human skeleton, give the function of each bone. 	<ul style="list-style-type: none"> A&P: Science is studied as three disciplines: biology (study of organisms), chemistry (study of properties of matter and how it interacts with energy) and physics (study of energy) (Y5).
VCs	<ul style="list-style-type: none"> 7: Plants are organised with roots, stem, leaves and flowers (Y1). 10: There are lots of types of animal, and some types can be grouped as amphibians, birds, fish, mammals and reptiles (Y1). 11: Humans need to exercise, practise good hygiene and eat a healthy and balanced diet to stay healthy. Their diet should be high in fruits and vegetables and low in fats, sugar and salt (Y2). 	<ul style="list-style-type: none"> 7: Humans are organised with organs like hearts and lungs, which do particular jobs. The skeleton and muscles allow the body to move. 10: To help scientists make sense of the diversity of organisms, they are classified into different groups. Each group has similar features. 11: A balanced diet includes the right proportions of the main food groups of carbohydrates (starch and sugars), proteins, fats, fibre, vitamins and minerals. Animals, including humans, may get diseases (like scurvy) if they are deficient in vitamins and minerals. 	<ul style="list-style-type: none"> 7: A cell is the smallest building block of living things. All organisms are made of cells. There are lots of different types of cell (e.g. sex cells), which each have different purposes (Y5). 10: Classification of organisms (Y6).

Year 3: Spring 2

Biology: Plants



	Required prior knowledge	Knowledge to be explicitly taught	How knowledge will be built upon
Substantive	<ul style="list-style-type: none"> Coniferous plants keep their leaves all year round; deciduous plants lose their leaves in winter (e.g. oak, silver birch, horse chestnut, sycamore, ash) (Y1 Aut). The basic parts of a plant are leaves, flowers, roots, stem/trunk/branch. Trees are a type of plant that have a tall stem made of wood. (Y1 Aut). Germination is the development of a plant from a seed, during germination roots and shoots emerge and grow (Y1 Aut). Plants need water, light and a suitable temperature to grow (Y2). 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. To germinate, a seeds needs water and a certain temperature (Y2 Aut). Many plants make fruits or vegetables; some of these grow below ground (Y2 Aut). Living things move, reproduce, are sensitive to their surroundings, grow, need oxygen, get rid of their waste, and need nutrition (MRS GOWN) (Y2 Spr). Living things have adapted to their environment. This means they may not be able to survive in other habitats (Y2 Spr). Soil is a mixture of particles of rock, dead plants and animals, air and water (Y2 Aut). 	<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 are adapted 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. Pollinators like bees and other insects, bats and hummingbirds are vital for the reproduction of many plants. 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). 	<ul style="list-style-type: none"> The male part of the plant is called the stamen, made up of the anther and filament, and the anther produces pollen grains (Y5 Spr). 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 (Y5 Spr). Sexual reproduction is two parents - usually male and female - create a new organism by mixing their gene (Y5 Spr). Asexual reproduction does not involve sex cells or fertilisation. Only one parent is needed, and the offspring are (genetically) identical to the parent and each other (Y5 Spr). Potatoes develop tubers and daffodils have bulbs, which will grow to be identical copies of the plant (Y5 Spr). Geography: Adaptations of some plants in rainforests (e.g. buttress roots) (Y4 Spr).
Disciplinary	<ul style="list-style-type: none"> Mathematics: Measure length and height (cm/m) (Y2); Interpret and construct block diagrams (Y2). A&P: Dependent, independent and control variables (Y3 Aut). A&P: Make a prediction based on substantive knowledge (Y2). A&P: Scientists identify factors in an investigation that should be controlled, and try to find ways to control them. 	<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. 	
VCs	<ul style="list-style-type: none"> 4: All living things need food to give them energy. All food chains start with a producer (a living thing that makes its own food) (Y2). 5B: The air is all around us on Earth. Air has oxygen in it (Y2). 8: Most plants make their own food (Y2). 9: Plants and animals reproduce (have offspring) (Y2). 	<ul style="list-style-type: none"> 4: In most plants, sunlight, carbon dioxide and water are used to make food in the leaves. 5B: Air has carbon dioxide in it. 8: Plants make their own food using sunlight, carbon dioxide and water. 9: When a plant reproduces, it goes through stages of pollination, fertilisation and seed dispersal. The seed will then germinate and grow into a plant. 	<ul style="list-style-type: none"> 4: The process of photosynthesis, and how the glucose it produces is used to make other sugars (KS3). 8: Transfer of biomass (KS3). 9: Asexual reproduction in plants (Y5).

Year 3: Summer 1

Physics: Forces & Motion



	Required prior knowledge	Knowledge to be explicitly taught	How knowledge will be built upon
Substantive	<ul style="list-style-type: none"> How slow/fast a vehicle moves along a track depends on how hard/gently it is pushed/pulled, how steep the slope is, or whether there is an obstacle in its way (N3-4 Spr1). How slow/fast a boat moves across the water depends on how hard/gently we blow at them through straws (N3-4 Spr1). Solids keep their shape unless a force is put on it. They will change their shape if you cut or squash them (Y2 Sum). 	<ul style="list-style-type: none"> Forces are pushes or pulls. Forces arise when objects interact with each other. Forces can cause a change in speed, direction or shape of an object. Forces act in particular directions. We use arrows to show the size of the force and the direction it acts in. Forces that act in opposite directions are called opposing forces. Forces that act in opposite directions and are equal are described as balanced forces. When forces are balanced, there is no change in the speed, direction or shape of an object. Forces that act in opposite directions and are not equal are described as unbalanced forces. When forces are unbalanced, there is a change in the speed, direction and/or shape of an object. Friction is a force between two surfaces that are sliding or trying to slide over each other. The bumpier or rougher the surfaces, the more friction there will be. 	<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) (Y3 Sum2). Magnetism is a non-contact force exerted by magnets when they attract or repel each other (Y3 Sum2). Gravity is a non-contact force (Y5 Sum). Air and water resistance are contact, frictional forces (Y5 Sum).
Disciplinary	<ul style="list-style-type: none"> Mathematics: Measure length and height (cm/m) (Y2). A&P: Science is studied as three disciplines: biology (study of organisms), chemistry (study of materials) and physics (study of energy) (Y3 Spr). A&P: Dependent, independent and control variables (Y3 Aut). R&P: Design a table to collect data with the appropriate number of rows and columns and correct headings. A&E: Make simple statements about the results of an enquiry. 	<p><i>Investigate how the surface of a ramp affects the distance a car will travel</i></p> <ul style="list-style-type: none"> M&O: Taking multiple readings allows you to see if your data is repeatable and helps you identify anomalous results. Anomalous results should be discarded and re recorded. 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. A&E: Draw conclusions (e.g. 'the greater the... , the greater the...'). 	<ul style="list-style-type: none"> The difference between accurate data and precise data (KS3). Using the mean as a method of analysing a set of data (Y6).
VCs	<ul style="list-style-type: none"> 3: We can move or change the shape of objects by pushing and pulling: by squashing, bending, twisting or stretching the materials (Y2). 	<ul style="list-style-type: none"> 3: Forces act in pairs. Forces acting against each other are opposing. If opposing forces equal, they are balanced, and the object's motion will stay the same; this includes staying stationary. If opposing forces are unequal, they are unbalanced will change an object's speed, direction or shape. Friction is a force that will slow an object down (Y3). 	<ul style="list-style-type: none"> 3: Friction is an example of a contact force (Y3).

Year 3: Summer 2

Physics: Magnetism



	Required prior knowledge	Knowledge to be explicitly taught	How knowledge will be built upon
Substantive	<ul style="list-style-type: none"> Magnetic materials are attracted to magnets (N3-4 Spr1). Magnets can repel or attract each other, depending on which way they are held to each other (N3-4 Spr1). Objects have a name and often have a purpose. For example, a cup is the object, and its purpose is for drinking from. The material is what an object is made of, for example a cup can be made of paper or plastic (Y1 Spr). Forces are pushes or pulls (Y3 Sum). Forces can cause a change in speed, direction or shape of an object (Y3 Sum). Forces act in particular directions (Y3 Sum). Forces that act in opposite directions are called opposing forces (Y3 Sum). Forces that are equal and act in opposite directions are described as balanced forces, they cancel each other out (Y3 Sum). Friction is a force between two surfaces that are sliding or trying to slide over each other. Geography: The North Pole and the South Pole are at the top and bottom of the Earth (Y1 Spr). 	<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 contact force because it requires the two objects to be touching. Magnetism is the force exerted by magnets when they attract or repel each other. Magnets can exert a force at a distance, so is 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 objects made from magnetic materials. Some metals are magnetic but not all are. Plastics, wood, fabric, glass are all non-magnetic. The closer to the poles of the magnet, the stronger the magnetic force. Magnetic forces act at a distance (non-contact force) and can act through materials. A stronger magnet can attract an object through thicker layer of material compared to a weaker magnet. The stronger the magnet, the heavier the object it can attract. 	<ul style="list-style-type: none"> Force is measured in newtons (Y5 Sum), Gravity is a non-contact force that pulls all objects towards each other (Y5 Sum), The greater the mass of an object, the greater the gravitational pull around it (Y5 Sum), Gravity is most commonly experienced as the pull of the Earth (and all objects on it) towards each other (Y5 Sum), 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 (Y5 Sum), Air resistance is a frictional force that acts between air and a moving object to slow it down (Y5 Sum), Water resistance is a frictional force that acts between water and a moving object to slow it down (Y5 Sum),
Disciplinary	<ul style="list-style-type: none"> Mathematics: Measure length and height (cm/m) (Y2). A&P: Dependent, independent and control variables (Y3 Aut). A&E: Draw conclusions (e.g. 'the greater the... , the greater the...'). 	<p>Test which materials are magnetic, and use this knowledge to make predictions about which objects will be magnetic.</p> <ul style="list-style-type: none"> A&E: Use findings of an investigation to make further predictions. A&E: Suggest ways to improve practical procedures to obtain more accurate measurements. 	
VCs	<ul style="list-style-type: none"> 2: Magnets can attract or repel other magnets. Magnets attract magnetic objects (EYFS). 3: Friction is a force that will slow an object down (Y3). 	<ul style="list-style-type: none"> 2: The non-contact force of magnetism mean magnets can attract or repel other magnets and attract objects made of magnetic materials. 3: Friction is an example of a contact force. 	<ul style="list-style-type: none"> 2: The non-contact force of gravity pulls objects towards the centre of the Earth (Y5).

