

Science - Rocks, Forces, Electricity, States of Matter, Sound,

Rocks Year 3 Cycle 2 Autumn 1	Forces + magnets Year 3 Cycle 2 Spring 1	Electricity Year 4 Cycle 2 Autumn 2		States of matter Year 4 Cycle 1 Autumn 1/2	Sound Year 4 Cycle 1 summer 1
Impact statements					
Year 3	Year 3	Year 4		Year 4	
<p>N.C</p> <p>* Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.</p> <p>*Describe in simple terms how fossils are formed when things that have lived are trapped within rock.</p> <p>* Recognise that soils are made from rocks and organic matter</p>	<p>N.C</p> <p>*Compare how things move on different surfaces.</p> <p>* Notice that some forces need contact between two objects, but magnetic forces can act at a distance.</p> <p>* Observe how magnets attract or repel each other and attract some materials and not others.</p> <p>* Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. * Describe magnets as having two poles. * Predict whether two magnets will attract or repel each other, depending on which poles are facing.</p>	<p>N.C</p> <p>* Identify common appliances that run on electricity.</p> <p>* Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.</p> <p>*Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery.</p> <p>*Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.</p> <p>* Recognise some common conductors and insulators, and associate metals with being good conductors</p>	<p>N.C</p> <p>*Compare and group materials together, according to whether they are solids, liquids or gases. * Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). *Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature</p>	<p>*Identify how sounds are made, associating some of them with something vibrating.</p> <p>*Recognise that vibrations from sounds travel through a medium to the ear.</p> <p>*Find patterns between the pitch of a sound and features of the object that produced it.</p> <p>*Find patterns between the volume of a sound and the strength of the vibrations that produced it.</p> <p>* Recognise that sounds get fainter as the distance from the sound source increases.</p>	<p>*Recognise that they need light in order to see things, and that dark is the absence of light.</p> <p>* Notice that light is reflected from surfaces. * Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.</p> <p>* Recognise that shadows are formed when the light from a light source is blocked by an opaque object.</p> <p>* Find patterns in the way that the size of shadows change</p>
<p>Explicit reference to:</p> <p>Rock is a naturally occurring material. There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft. They have different sizes of grain or crystal. They may absorb water. Rocks can be different shapes</p>	<p>Explicit reference to:</p> <p>A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves.</p> <p>-It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes.</p> <p>-A magnet attracts magnetic</p>	<p>Explicit reference to include:</p> <p>- Many household devices and appliances run on electricity.</p> <p>-Some plug in to the mains and others run on batteries. -An electrical circuit consists of a cell or battery connected to a component using wires.</p> <p>-If there is a break in the circuit, a loose connection or a short circuit, the component will not work.</p>	<p>Explicit reference to include:</p> <p>-A solid keeps its shape and has a fixed volume. -A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level, horizontal surface.</p> <p>-A gas fills all available space; it has no fixed shape or volume. -Granular and powdery solids like sand can be confused with liquids because</p>	<p>Explicit reference to include</p> <p>-A sound produces vibrations which travel through a medium from the source to our ears. - Different mediums such as solids, liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter).</p>	<p>Explicit reference to:</p> <p>-We see objects because our eyes can sense light.</p> <p>-Dark is the absence of light.</p> <p>-We cannot see anything in complete darkness.</p> <p>-Some objects, for example, the sun, light bulbs and candles are</p>

<p>and sizes (stones, pebbles, boulders). Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil. Some rocks contain fossils. Fossils were formed millions of years ago. When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water.</p> <p><u>Common misconceptions-</u> - rocks are all hard in nature - rock-like, man-made substances such as concrete or brick are rocks -materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural' - certain found artefacts, like old bits of pottery or coins, are fossils - a fossil is an actual piece of the extinct animal or plant -soil and compost are the same</p>	<p>material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. - The strongest parts of a magnet are the poles. Magnets have two poles - a north pole and a south pole. -If two like poles, e.g. two north poles, are brought together they will push away from each other - repel. If two unlike poles, e.g. a north and south, are brought together they will pull together - attract -For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts</p> <p><u>Common misconceptions-</u> - the bigger the magnet the stronger it is - all metals are magnetic.</p>	<p>- A switch can be added to the circuit to turn the component on and off. -Metals are good conductors so they can be used as wires in a circuit. -Non-metallic solids are insulators except for graphite (pencil lead). -Water, if not completely pure, also conducts electricity.</p> <p><u>-Common misconceptions:</u> -electricity flows to bulbs, not through them -electricity flows out of both ends of a battery - electricity works by simply coming out of one end of a battery into the component.</p>	<p>they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid. - Melting is a state change from solid to liquid. - Freezing is a state change from liquid to solid. The freezing point of water is 0oC. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100oC. - Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. - Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. -Condensation is the change back from a gas to a liquid caused by cooling. Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). -This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is</p>	<p>-The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. --Therefore, sounds decrease in volume as you move away from the source. - A sound insulator is a material which blocks sound effectively. - Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.</p> <p><u>Common misconceptions:</u> - Pitch and volume are frequently confused, as both can be described as high or low. Some children may think: - sound is only heard by the listener - sound only travels in one direction from the source - sound can't travel through</p>	<p>sources of light. Objects are easier to see if there is more light. - Some surfaces reflect light. Objects are easier to see when there is less light if they are reflective. - The light from the sun can damage our eyes and therefore we should not look directly at the sun and can protect our eyes by wearing sunglasses or sunhats in bright light. - Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface and blocks some of the light. - The size of the shadow depends on the position of the source, object and surface</p> <p><u>Common misconceptions:</u> - we can still see even where there is an absence of any light - our eyes 'get used to' the dark - the moon and reflective surfaces are light sources - a transparent object is a light source</p>
---	---	--	--	--	---

<p>thing.</p>			<p>the water cycle</p> <p><u>Common misconceptions:</u></p> <ul style="list-style-type: none"> -solid' is another word for hard or opaque - solids are hard and cannot break or change shape easily and are often in one piece - substances made of very small particles like sugar or sand cannot be solids - particles in liquids are further apart than in solids and they take up more space -when air is pumped into balloons, they become lighter - water in different forms - steam, water, ice - are all different substances - all liquids boil at the same temperature as water (100 degrees) - melting, as a change of state, is the same as dissolving - steam is visible water vapour (only the condensing water droplets can be seen) - clouds are made of water vapour or steam - the substance on windows etc. is condensation rather than water - the changing states of water (illustrated by the water cycle) are irreversible - evaporating or boiling water makes it vanish - evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material 	<p>solids and liquids - high sounds are loud and low sounds are quiet.</p>	<p>-shadows contain details of the object, such as facial features on their own shadow</p> <p>- shadows result from objects giving off darkness.</p>
---------------	--	--	---	--	--

Tier 3 Vocab: Y3	Tier 3 Vocab: Y3	Tier 3 Vocabulary: Year 4		Tier 3 vocabulary: Year 4	
Tier 3 Vocabulary: rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, fossil, bone, flesh, minerals, marble, chalk, granite, sandstone, slate, soil, types of soil (e.g. peaty, sandy, chalk, clay)	Tier 3 Vocabulary: Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole	Tier 3 Vocabulary: Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol	Tier 3 Vocabulary: solid, liquid, gas, heating, cooling, state change, melting, freezing, melting point, boiling, boiling point, evaporation, condensation, temperature, water cycle	Tier vocabulary Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation	Tier vocabulary light, light source, dark, absence of light, surface, shadow, reflect, mirror, Sun, sunlight, dangerous

Rocks- Links can be made between the Plants and Rocks topics. The ordering is not significant, but the links should be made explicit for the children

Sound-In the Sound topic, children need to understand that vibrations from sounds travel through a medium to the ear. It is useful if the children know about the three states of matter - solids, liquids and gases. It is therefore appropriate to teach the States of matter topic before the Sound topic. This topic is conceptually more challenging and is therefore best taught later in the year.

Light-Links can be made between the Plants and Light topics. The ordering is not significant, but the links should be made explicit for the children by the teacher.

Forces- /

States of matter- In the States of matter topic, children learn about solids, liquids and gases. This knowledge is required in order for children to understand, in the Sound topic, that vibrations from sounds travel through a medium to the ear. It is therefore appropriate to teach the States of matter topic before the Sound topic.

Electricity- Children in Year 4 do not need to use standard symbols for electrical components, as this is taught in Year 6.

Skills Progression

<u>Skills progression</u>	<u>Skills progression</u>	<u>Skills progression</u>	<u>Skills progression</u>	<u>Skills progression</u>
Classifying and presenting data to help answer questions. Using results to draw a simple conclusion and suggest improvements. Using simple scientific equipment. Setting up simple practical enquiries. -compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. 1. Begin by allowing the	Working scientifically: Gathering, recording, classifying and presenting data to answer questions. Identify common appliances that run on electricity. Children go on an electricity hunt/ or shown images etc. Children then must group (sorting and classifying) these appliances into changes light, changes heat, changes sound or changes movement. Setting up simple practical enquiries. Record findings using labelled diagrams. Using results to draw conclusions and	Making systematic and careful observations. Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions- Compare and group materials together, according to whether they are solids, liquids or gases. Show different states of matter by using balloons. In some of the balloons make sure you have frozen water. In other balloons fill with liquid water. Just fill the remaining balloons with gas by blowing into them. Ask the children to feel each of the balloons and decide what a solid is, a liquid and a	Setting up simple practical enquiries. Making systematic, careful observations. Reporting on findings from enquiries-: Identify how sounds are made, associating some of them with something vibrating. Some of the following activities could be completed by the children to demonstrate sound vibrations. - Allow the children to place their fingertips against their throats as they speak. - Place filled balloons between two children. One talks against it and the other places their ear against	Setting up simple practical enquiries. Recording findings using a labelled diagram: recognise that they need light in order to see things and that dark is the absence of light. Create a dark den from desks and blankets.. Now allow the children to use a torch. Provide groups of children with a box. In one end of the box make a small viewing hole. The children can place objects in the end of the box, which the other child must describe when

<p>children to handle a selection of rocks and look at them carefully using a hand lens or microscope where possible.</p> <p>First the children could sort them in any way they chose, then feedback and discuss different ways of sorting as a class. Then they could sort them according to whether or not they can see crystals in them.</p> <p>Children could then choose sorting criteria of their own: e.g. texture, sharpness of edges etc. Children present their findings and draw conclusions.</p> <p>2. Children to understand the different types of rocks and how they are formed. Sedimentary, igneous and metamorphic</p> <p>3. Children to carry out a simple test to see which rocks are impermeable/permeable.</p> <p>Use systematic and careful observations using a range of equipment.</p> <p>-describe in simple terms how fossils are formed when things that have lived are trapped within rock. Children understand what is meant by a fossil and can explain this. Show children examples of</p>	<p>make predictions for new values. Construct a simple series electrical circuit, identifying</p> <p>-To be able to use recognised symbols when representing a simple circuit in a diagram. Children will have cards with symbols on the back and they have to test each other on the symbol. Then the children could have circuit diagrams and photographs of that circuit and they have to spot the mistake.</p> <p>Setting up simple practical enquiries. Record findings using labelled diagrams. Using results to draw conclusions and make predictions for new values- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. Children must construct a simple series circuit. Children to draw and label the circuit in their book. Discuss what happens when certain aspects of the circuit are removed. Challenge pupils by - problem solving opportunities where they must fix circuits which are not complete. What is missing? Et</p> <p>Setting up simple practical enquiries. Reporting on findings from enquiries, including oral or written explanations. Using straightforward scientific evidence to answer questions to support findings- Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. E4: Recognise</p>	<p>gas is.</p> <p>Children could act out the different states of matter. Demonstrate how solid particles are all close together and moving slowly. As they become liquids, they remain in close contact but move around more. Finally, as gases, they move around quicker and in a random fashion.</p> <p>Children are given a selection of materials which they must decide if they are solid, liquid or gas. Children could then present their results in a Venn diagram and use this to answer questions about their findings.</p> <p>Working scientifically: Setting up practical enquiries, comparative and fair tests. Making systematic and careful observations. Using a range of scientific equipment. Gathering and recording data using a table- :Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C). Children to come up with their own chocolate experiment to see what temperature they think chocolate will melt. Children to decide the melting point of different types of chocolate. Children carry out their own investigation to answer the question 'Do all liquids freeze?'. Children can plan and set their own investigation and draw conclusions from their results.</p> <p>- Setting up a simple practical enquiries. Making systematic and careful observations. Identifying differences, similarities or changes</p>	<p>it.</p> <p>- Place some rice on a piece of paper. Hold this paper a small distance above a drum that has been struck.</p> <p>-Hang a metal coat hanger upside down. Tie a piece of string from each of the two corners and place each one on ear. Someone else strikes the coat hanger. -Hit a tuning fork on a table and then place into a bowl of water.</p> <p>Setting up simple practical enquiries. Making systematic and careful observations. Reporting on findings from enquiries. Using results to draw simple conclusions- Recognise that vibrations from sounds travel through a medium to the ear. -Children create their own string telephones to recognise sound travels through a medium. Children could design and make their own earmuffs from a variety of materials to see which is the best insulator of sound.</p> <p>Setting up simple practical enquiries. Making systematic and careful observations. Reporting on findings from enquires.</p> <p>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions- Find patterns between the volume of a</p>	<p>looking through the viewing hole. Try to prevent any light from entering the box. The children can then add holes in the top of the box so that light can enter the box. Children can record by drawing a diagram of the investigation.</p> <p>Working scientifically: Using straightforward evidence to answer questions or to support their findings- notice that light is reflected from surfaces. Take the children on a 'shadow search' around the school. Every time a shadow is discovered, encourage the children to indicate the light source/s and the object that is blocking the light from that source/s.</p> <p>To make a prediction. Asking relevant questions and using different types of scientific enquiry to answer them: Recognise that shadows are formed when the light from a light source is blocked by an opaque object. Children understand and investigate that light cannot pass through opaque objects. Children try to find out how much light will pass through different materials. They will have to think about how</p>
--	--	--	---	---

<p>fossils. Children make their own fossils. E.g. using clay and imprinting shells (could use plasticine as an alternative).</p> <p>Working scientifically: Setting up practical enquiries, comparative and fair tests. Record findings using simple scientific language/ using tables (scaffolded table) Using results to draw simple conclusions and make predictions for new values.</p> <ul style="list-style-type: none"> - Types of soil, how much water is absorbed by the soil, how could the way the farmer uses the field affect the way the water is absorbed? 	<p>that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. Children to design and make a lantern or torch incorporating a series circuit</p> <p>Setting up simple practical enquiries. Using results draw simple conclusions. E5: Recognise some common conductors and insulators, and associate metals with being good conductors. Children to set up investigation to test conductors and insulators to see which are the most effective. As a result children can make a switch</p>	<p>related to simple scientific ideas and processes. Recording findings using simple scientific language and a table- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. Show children a video of the water cycle e.g. bbc bitesize</p> <p>Children observe the features of the water cycle by placing some plasticine mountains and warm water in a clear bowl. Cover the top of the bowl with cling film. Onto the cling film place ice wrapped in cotton wool (clouds). Children can investigate how different liquids evaporate at different rates. Leave out dishes of different liquids, eg water, vinegar, lemon juice, salty water and tea for the children to observe.</p>	<p>sound and the strength of the vibrations that produced it. How can we alter the loudness of a sound? This is could be set up as a carousel of activities. At each station the children have to try a range of ways to make a sound. 1. Water in a washing up bowl. Provide straws, tuning forks (dry afterwards to prevent rusting), plastic spoons, balloons, etc. 2. Different types of paper (children can tear, scrunch up, blow against, wave in the air, etc.) 3. A range of instruments 4. Plastic bottles of different sizes and beakers of water. The children can fill the bottles with water and then tap them or blow over the necks (provide anti-bacterial wipes for cleaning the opening of the bottles after each child)</p>	<p>they will reduce the amount of interfering light. It could be that make a hole in the end of a shoe box in which to shine their torch. Children make a prediction of which objects they think light will pass through/not.</p> <p>Reporting on findings from enquiries- Find patterns in the way that the size of shadows change. Children to make their own puppets and create shadows using these. Children set up an investigation to see how they can change the size of the shadow of the puppet.</p>
--	--	--	---	---