Rocks and Soils – Y3 Planning

National Curriculum objectives

Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.

Describe in simple terms how fossils are formed when things that have lived are trapped within rock.

Recognise that soils are made from rocks and organic matter.

SCIENTIFIC VOCABULARY: ROCKS, SOILS AND FOSSILS

You can download a Word mat of essential vocabulary for this topic from *My Rising Stars*.

mineral: a natural substance that makes up rock

rock: made from one or more minerals

permeable: allows water to pass through

impermeable: does not allow water to pass through

crystals: rock that has formed into a pattern of three-dimensional shapes, e.g. cubes

magma: hot liquid rock

sediment: small bits of rock

sedimentary: rock made from sediment

humus: part of soil made from dead plants and animals – gives soil a dark colour

fossil: the prehistoric remains of a plant or animal

extinct: when there are no more of a particular animal or plant species alive anywhere in the world – they have died out

palaeontology: the study of plants and animals that lived millions of years ago

palaeontologists: scientists who study the remains of plants and animals that lived millions of years ago

granite: a kind of igneous rock which is very hard and light-coloured

igneous: rock formed from magma

metamorphic: rock that has been changed by heat or pressure

soil: small particles of rock mixed with decayed plant and animal material

Key words: names of some rocks: granite / marble / sand / clay / limestone

Working scientifically

Asking relevant questions and using different types of scientific enquiries to answer them

Setting up simple practical enquiries, comparative and fair tests

Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

Identifying differences, similarities or changes related to simple scientific ideas and processes

Using straightforward scientific evidence to answer questions or to support their findings.

Lesson, focus and SC	Lesson Plan	Assessment
1) Focus: Gather, record, classify and present data in a	Give each pair a set of 'Sweetie Rocks' and explain that they are going to use them to learn about the properties of rocks, that is what rocks are like. Remind	Working Scientifically Em. Children sort their 'Sweetie Rocks' into a limited number of categories, e.g. colour. Exp. Children sort their 'Sweetie Rocks' into a wide

variety of ways to help in answering questions.	children that they are going to work like scientists and therefore should not eat the rocks for health and safety reasons. Ask children to find out as much as possible by sorting (classifying) their 'Sweetie Rocks' into as many different groups as possible, e.g. hard, soft. Tell them to write their classification down and then begin a new sort. Give children a target, e.g. beat ten sorts. When a group gets to ten, stop everyone and share the language that they have used, which might include shape, size, colour, texture, writing on it, squash, stretch, melt, bounce.	range of groups according to obvious characteristics. Exc. Children group according to scientific properties, e.g. melt, dissolve, crystals
1.1. Focus: Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. W/S: Gather, record, classify and present data in a variety of ways to help in answering questions.	Remind or introduce children to the word property (characteristic): a way of describing how something looks, e.g. rocks.. Teach children each geological term (see below), then ask them to find and show you a sweet with that property. Children then sort their collection of 'Sweetie Rocks' by that property, e.g. hard, not hard. This activity introduces children to basic geological terms (use PowerPoint Slide 5), which can be more interesting for children and more challenging for the more able. The aim is not to assess children on these terms but on their ability to compare and group. **Hardness:** some rocks are harder than others; granite is a hard rock, while chalk is soft. Hardness is easily spotted amongst 'Sweetie Rocks'; harder rocks do not wear away easily, soft rocks do. **Colour:** e.g. chalk is white, coal is black. 'Sweetie Rocks' come in all different colours. **Cleavage**: is how a rock breaks along a layer, e.g. how easily the rock splits, such as slate and shale. Try Liquorice Allsorts sandwiches. **Streak:** the colour a rock makes when it is scratched on the back of a plain tile; it can also work on paper or card, e.g. chalk and gypsum will leave a white streak, haematic is a reddish brown. Many 'Sweetie Rocks' will leave a colour mark on paper. **Lustre:** how the rock reflects light, e.g. glassy (obsidian), shiny like metal / metallic (galena, pyrite). If it does not reflect and is dull, this is called earthy. Boiled 'Sweetie Rocks' will reflect light well. **Crystalline:** has crystals, e.g. any 'Sweetie Rocks' coated in sugar. **Friable**: any rock that easily crumbles, e.g. sandstone, chalk. Ask children to make a hand sign to help them	Em. With support, children sort according to appearance. Exp. Children are able to classify according to each property. Exc. Children apply some properties to rocks that have one or more of the properties, e.g. diamond is shiny and very hard. W/S: Em. Children, with support, classify according to given criteria. Exp. Children can classify using given criteria. Exc. Children use both given and their own criteria

	remember this word; some children will look like they are crumbling something or frying in a pan. With children, create a working wall of the key properties. Children can also create their own 'Geological Dictionary' page to use in later activities. In groups, children take turns to test each other with someone stating a property and the rest of the group sorting the 'Sweetie Rocks'	
2) Focus: Compare and group together different kinds of rocks on the basis of their hardness and permeability.	Friedrich Mohs (Born: 1773) developed a 'Scratch test', which is quite simple and is based on the idea that a harder material will scratch a softer one. His scale goes from talc at 1, which is the softest material, to diamond the hardest at 10. Show children PowerPoint Slide 6. The second part of the pupil video for this topic shows children investigating hardness using this activity. Children choose five or six 'Sweetie Rocks' and sort them in order of hardness, softest to hardest. The softest rock can be scratched by all the other rocks; the hardest one cannot be scratched. This is an activity that will be rich in discussion as children debate if one can scratch or be scratched by another rock. Once they have sorted their 'Sweetie Rocks' according to Mohs' Scale, ask them to swap tables with another group to test the order of rocks: do they agree or disagree? Why? They could leave a comment on a sticky note as peer assessment.	. Em. With support, children order a limited number of rocks, e.g. three or four. Exp. Children are able to use Mohs' Scale of Hardness to order a set of 'Sweetie Rocks'. Exc. Children use Mohs' Scale of Hardness and talk about rocks they know, e.g. diamonds, chalk, coal. W/S: Em. Children require support to classify. Exp. Children classify a set of 'Sweetie Rocks'. Exc. Children explain their reasons for how they have classified.
2.1) Focus: Set up simple practical enquiries, comparative and fair tests.	Some rocks such as sandstone and chalk can be permeable; they let water soak through them. Rocks that do not let water through are called impermeable, e.g. slate and marble. Ask children to think of ways they could test and group the rocks in their collection into permeable and impermeable. Children might decide to drip water onto the rock and observe whether or not it soaks into the rock. An alternative approach is to place different pieces of rock into water in a plastic transparent container. If bubbles come from the top of the rock, it means that water is getting into it and it is permeable as there are spaces inside the rock with air in and water can travel through. If there are no bubbles from the rock, it shows that the rock is tightly packed with no air inside and so water cannot get through; therefore it is impermeable (although there might be some air trapped on the surface, so let the rock settle).	Em. With support, children notice bubbles and can compare two rocks. Exp. Children are able to classify rocks into permeable and impermeable. Exc. Children offer reasons why bubbles appear and why a rock is permeable. Working Scientifically Em. Children, with support, are able to carry out a simple comparative test. Exp. Children test their own ideas. Exc. Children are able to carry out a simple test and use observations to draw conclusions.

3) Focus: To understand how rocks are formed.	Sedimentary Sedimentary rocks are laid down in layers; often these rocks have been worn away by the sea or rivers to create sand, shells and the remains of tiny animals as well as plants. An easy way to illustrate this is for children to make a sedimentary sandwich. Show children a sedimentary sandwich you have made and explain what each part represents: White bread = sand Chocolate spread = bones of animals Brown bread = dust Lettuce = plants Granary bread = mud with stones and rocks Over time, as more and more layers are created, the bottom layers get squashed and become rock. Show this by placing a plate on top of the sandwich and exerting pressure. You can also show how the layers can be changed if they are squashed (pressure applied) from below, the sides or in the centre. Show how this works by gently pressing down and upwards on the middle of the sandwich and pushing gently from the sides. This model is used to help children to visualise how this happens. It is hard for young children to understand that this happens on a massive scale and over incredibly long periods of time. Now let children make their own sandwiches. They could create a short video to explain what they are doing or take and annotate a photograph. Give children sedimentary rocks to handle and compare so that they are given the opportunity to link the model with rocks. Metamorphic In this activity, children use chocolate firstly to model sedimentary rocks and then to model how metamorphic rocks are made. This is a safe activity for children; the water does not have to be boiling, just very hot but not scalding. Use small foil cake tins and scrape pieces of milk and white chocolate with a knife so that they form three or four layers (milk, white, milk, white). Use some cling film to press the layers firmly together so the chocolate joins together. Children try this part to see how the different layers form a sedimentary rock when pressed together. Ask children to compare this with the sedimentary sandwich: how is it the same? Show children how to place a piece of their sedimentary rock	Em. Children, with support, make a sedimentary sandwich and describe what they did. Exp. Children are able to state that their sedimentary sandwich shows how rocks are made. Exc. Children apply what they know and decide on the composition of their rock (as opposed to a 'sandwich'). Em. Children, with support, make their metamorphic rock and describe what they did. Exp. Children are able to say that heating and squashing the sedimentary chocolate rock shows how metamorphic rocks are made. Exc. Children apply what they know and use scientific / geological language to describe how to make a metamorphic rock.

	into a piece of cling film and make sure that it is sealed so it does not leak. Use your hands to show how to massage the rock and how it changes because of the pressure and heat from your hands. Try not to melt the rock completely, but roughly keep its shape. Leave it to cool and explain that heat and pressure (force) can change rocks. These are called metamorphic rocks, e.g. slate and marble. Igneous In this activity, you model how to use chocolate chips to make igneous rocks. Use hot but not scalding water so that children can try out this activity for themselves. Place some white and milk / dark chocolate chips in a transparent plastic bowl so that children can see what is happening. Point out that the individual pieces (chocolate chips) are just like the rock in the ground. Place the bowl in a larger bowl of very warm water, explain that this is like rocks being melted by the high heat at the centre of the Earth: the Earth's core. Mix well until all signs of individual chips are gone and the colours are completely blended. Show children the bowl again so they see the individual chips are no longer visible and the minerals (rocks) they started with have melted. This is similar to the liquid rock, called magma, in the Earth's core. Pour the melted rock (chocolate) onto a tray and explain that this is molten rock coming from the inside of the Earth. When it gets to the Earth's surface (the tray), the molten rock solidifies (hardens) and forms a new rock, which is called igneous rock. Pumice, obsidian and basalt are all examples.	Em. Children, with support, make their igneous rock and describe what they did. Exp. Children are able to say that heating the chocolate rock and then cooling it shows how igneous rocks are made. Exc. Children apply what they know and use scientific / geological language to describe how to make igneous rock.
4) Focus: Recognise that soils are made from rock and organic matter. W/S: Ask relevant questions and use different types of scientific enquiries to answer them. Gather, record, classify and present data in a	In this activity, children use the soil that they have collected (or, if unavailable, soil given to them: not compost) to find out what soil is made up of. They use a hand lens or digital microscope along with a paintbrush to sweep bits to one side and tweezers to pick bits out on a large sheet of paper. Children could use clear tape to stick pieces down and annotate to say what they are. Children should find pieces of rock, plants (e.g. stems, leaves, twigs) and dead animals. They might also find live animals and evidence of humans, e.g. plastic. As you go around each pair or small group, talk with them about what they have found and, through careful questioning, support them in using the evidence to decide what each piece is. Ask children to count how many different things they have found in their soil. Children could create a long list as part of a working wall on soil.	Em. With support, children sort and label the soil into groups. Exp. Children sort and begin to classify their soil and are able to say that soil is made up of bits of rock and plants. Exc. Children recognise that soil is made up of many things; mainly rock and dead / decaying animals and plants. Working Scientifically Em. Children use question stems and are supported in using them to ask questions about the soil. Exp. Children use question stems to ask questions and are able to suggest ways to answer them. Exc. Children are able to say which scientific enquiry activities they could use to answer their questions.

variety of ways to help in answering questions	Give children a selection of the three different kinds of soil: clay, silty loam and peat. Ask them 'Are all these soils the same?' and then guide them to observe the soil using their senses (what does it look like? smell and texture?). Give them the opportunity to explore and compare what the different soils look like. After children have explored the soil, use Activity Resource 1.3 (how much water travels through soil) to guide them through the investigation. From their activity, children should be able to say that not all soils are the same and that they have different characteristics, e.g. sticky, grainy.	Em. Children require support to understand the question and decide which scientific enquiry to use to answer it. Exp. Children decide how to answer the question but not necessarily classification. Exc. Children decide to classify soils and use a key to answer the question
5) Focus: Describe in simple terms how fossils are formed when things that have lived are trapped within rock. W/S: Focus: Ask relevant questions using different types of enquiries to answer them	Explore page about Mary Annning. Can children guess what they will be learning about? https://www.bbc.co.uk/bitesize/topics/zd8fv9q/articles/zf6vb82 Give children a range of fossils. Tell them that these are the type of 'curiosities' that Mary Anning and her father found and ask why she called them curiosities. Ensure that there is time for children to observe fossils (using hand lenses) and even swap fossils from another table. Use PowerPoints Slides 14 and 15 and explain that fossils are important because they can tell us about things that lived millions of years ago. Ask them to think about what their fossil tells them and if they can work out what the object in the fossil is. Encourage children to think of a fossil as a rock that can tell them a story. What is the story of this rock and its fossil? What do they want to find out? Encourage children to ask and write down their questions on sticky notes, working in pairs or small groups. They could place their sticky notes on the Rocks and Fossils working wall and find ways to answer them. Introduce children to the word palaeontology, which is the study of fossils, and the person who studies fossils is called a palaeontologist. Encourage children to call themselves palaeontologists by using the word frequently yourself. Children to watch video on smart about how fossils are made. Then to create their own storyboard.	Em. Children observe the fossils and describe them. Exp. Children observe the fossils and know that they represent an animal or plant that lived millions of years ago. Exc. Children observe, describe and suggest how fossils are formed. W/S : Em. With support, children ask questions about the fossils Exp. Children can ask questions about their fossils and suggest ways of answering them. Exc. Children ask questions relating to the fossil and its habitat and decide how to answer them.
Recap and test	Ask children to mindmap everything they have learnt from this unit. Then present them with test about rocks.	