

# 1.1 Rocks

## COMPARING AND GROUPING ROCKS

### GET STARTED

Use PowerPoint Slides 1 to 4 to introduce this topic. Many schools do not have a collection of the same kind of rocks so it can be difficult to teach children their geological properties. A great way to do this is to use a collection of sweets which, if stored in small plastic containers, can be kept and used another year. The sweets should show properties found in rocks, e.g. crystals, hard, soft, layers, holes, crumbly. Include in the sweet mix: sweets covered in sugar, Polo Mints, boiled sweets in transparent wrappers, lips, shrimps, laces, flumps / marshmallows, Love Hearts, Liquorice Allsorts and Mint Imperials.

### LET'S THINK LIKE SCIENTISTS

Use these questions to develop research skills and speaking and listening:

- How are rocks formed?
- Are all rocks the same?
- What rocks can be found where you live?

### ACTIVITIES

In these activities, the term *rock* is used rather than *mineral*. A rock is usually composed of a number of different minerals.

#### 1 SORTING ROCKS

**L.O. Gather, record, classify and present data in a variety of ways to help in answering questions.**

- Give each pair a set of 'Sweetie Rocks' (see Get Started), and explain that they are going to use them to learn about the properties of rocks, that is what rocks are like. Remind 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*.
- This initial sort is useful to find out the language that children remember and use from Year 2 and how comfortable children are carrying out independent sorting activities.

### YOU WILL NEED

- A collection of different sweets that can be used to represent different types of rock (see Get started)
- Hand lenses / magnifying glasses
- Bowls or pots for sorting 'Sweetie Rocks'

### ASSESSMENT

#### 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 range of groups according to obvious characteristics.
- Exc. Children group according to scientific properties, e.g. melt, dissolve, crystals.

## 2 BEING A GEOLOGIST

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

**Gather, record, classify and present data in a variety of ways to help in answering questions.**

- Sometimes, in science, a whole-class lesson where children are taught basic understanding is a useful approach. In this activity, the whole class is engaged in learning how geologists identify, group and classify rocks. The first part of the pupil video for this topic shows children investigating rocks with hand lenses.
- Remind or introduce children to the word *property* (characteristic): a way of describing how something looks, e.g. rocks. Again, explain to children that they will use the 'Sweetie Rocks' so everyone has the same kind and new words are learned together.
- 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 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'.
- At the end of this lesson, all children will have had experience of sorting 'Sweetie Rocks' according to their geological properties.

### YOU WILL NEED

- PowerPoint Slide 5
- Collection of 'Sweetie Rocks' that can be used to represent different types of rock
- Hand lenses / magnifying glasses
- Torches or light sources
- Paper

### ASSESSMENT

#### Subject Knowledge

- 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.

#### Working Scientifically

- 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.

### 3 MOHS' SCALE OF HARDNESS

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

**Gather, record, classify and present data in a variety of ways to help in answering questions.**

- This activity also benefits from children using the 'Sweetie Rocks' because this can be taught to the whole class and then they can apply this way of identifying and classifying to rock samples. 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.
  - As a home-school activity, challenge children to find out some more information about Friedrich Mohs and create a fact file card or poster for the working wall on rocks.

#### YOU WILL NEED

- PowerPoint Slide 6
- Collection of 'Sweetie Rocks' to represent different types of rock
- Sticky notes for each group

#### ASSESSMENT

##### Subject Knowledge

- 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.

##### Working Scientifically

- Em. Children require support to classify.
- Exp. Children classify a set of 'Sweetie Rocks'.
- Exc. Children explain their reasons for how they have classified.

### 4 COMPARING ROCKS

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

- Having compared and grouped 'Sweetie Rocks', the whole class can work with rocks because they know about properties or have a geology word list to remind them, so it does not matter if children have some rocks that do not have the same properties.
- Working in pairs, children closely observe rocks and sort them into different groups based on their properties.
- Encourage children to use a hand lens or a digital microscope to enhance their observations.
- Go around and ask different pairs how they have grouped their rocks to assess their ability to compare and group rocks.

#### YOU WILL NEED

- Collection of rocks with different appearance and properties – you could ask children to bring in their own examples
- Hand lens / magnifying glass
- Digital microscope (optional)

#### ASSESSMENT

##### Working Scientifically

- Em. With support, children sort according to appearance, e.g. colour.
- Exp. Children are able to classify according to one property.
- Exc. Children classify according to more than one property, e.g. hardness and lustre.

## 5 PERMEABLE OR IMPERMEABLE?

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

**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).

### YOU WILL NEED

- Collection of rocks with different appearance and properties – you could ask children to bring in their own examples
- Water
- Transparent containers for observing rocks in water

### ASSESSMENT

#### Subject Knowledge

- 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.

## 6 ADOPT A ROCK

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

**Ask relevant questions and use different types of scientific enquiries to answer them.**

- Children will enjoy adopting their own rock, especially if you have some fun and allow children to stick on some craft ‘goggle eyes’.
- Give children a range of rocks from which they can choose their own.
- Explain that they are going to find out as much as they can about their rock and record what they find out in an interesting way, e.g. fact file, rock passport, poster. They begin by observing their rock, then using sticky notes to ask questions using question stems (these were used in the Key Stage 1 units and include: How...? What...? Does...? Which...? Has...? Could...? Where...? What if...? How does...? Who...? When...? Why...?). Use PowerPoint Slide 7.

### YOU WILL NEED

- PowerPoint Slide 7
- A range of rocks for children to adopt
- Equipment for testing rocks, e.g. magnifying glasses
- Sticky notes
- Research materials, e.g. non-fiction books
- Activity Resource 1.1

### ASSESSMENT

#### Subject Knowledge

- Em. Children are able to talk about what their rock looks like.
- Exp. Children are able to talk about the appearance and properties of their rock.
- Exc. Children apply their knowledge of the appearance and properties of their rock and research further information.

- Give children time to explore their rock and ask a range of questions such as: How hard is my rock? Is it permeable? What kind of rock is it? Can this rock be used for anything?
- They then decide how to answer their own questions using different types of scientific enquiries, e.g. test, classify, observation, research. At this stage, most children will need some support in deciding what kind of scientific enquiry to use to answer their questions. They could use research to find out, e.g. which rocks do people use? How are rocks used? What are rocks used for?
- Children use Activity Resource 1.1 to record their tests.

### Working Scientifically

- Em. With support, children ask questions about their rocks and answer them.
- Exp. Children are able to ask questions about the properties of their rocks and, with some support, decide how to answer them.
- Exc. Children are able to ask a range of questions and decide the best way to answer them.

## HOW ARE ROCKS MADE?

### GET STARTED

The activities in this section model how rocks are formed and are extensions to the statutory curriculum requirements. Start by explaining to children they are going to watch a video clip showing how different rocks are formed (see Useful website links on *My Rising Stars*) and, when it has finished, in their groups they are going to talk about what they learned under the headings sedimentary, igneous and metamorphic. For some

children this helps to both make it interesting but also more accessible.

Tell children some geologists like to explain how rocks are formed using food and that they are going to try out this idea to see if it helps them understand about rocks. Use PowerPoint Slide 8 to start a discussion to find out how children think rocks are made.

### ACTIVITIES

#### 1 SEDIMENTARY SANDWICHES

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

- 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

#### YOU WILL NEED

- PowerPoint Slide 9
- Ingredients for a sandwich, e.g. different types of bread, chocolate spread, lettuce or other ingredients
- Plates and blunt knives

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.
- Use PowerPoint Slide 9 to show children an example of a sedimentary rock.

## ASSESSMENT

### Subject Knowledge

- 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').

## 2 CHOCOLATE METAMORPHIC ROCKS

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

- 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 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. Show children PowerPoint Slide 10, which shows a metamorphic rock.

## YOU WILL NEED

- PowerPoint Slide 10
- Milk chocolate
- White chocolate
- Foil tins
- Knife
- Cling film

## ASSESSMENT

### Subject Knowledge

- 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.

### 3 CHOCOLATE IGNEOUS ROCKS

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

- 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.
- Children use Activity Resource 1.2 to reinforce their knowledge about rocks.
- Show children PowerPoint Slide 11 on igneous rocks.

#### YOU WILL NEED

- PowerPoint Slide 11
- White and dark chocolate chips
- Bowls
- Tray
- Warm water
- Activity Resource 1.2

#### ASSESSMENT

##### Subject Knowledge

- 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.

## Igneous rocks



Igneous rocks like granite are very hard, dark and heavy.

They are formed when molten magma from a volcano cools down.

They do not contain fossils.

There are lots of granite rocks in Scotland and some parts of England too!

