

**Derwent Gorge,
near Castleside
County Durham**



***Landscape Detective:
Spot the Rock***



ORGANISATIONAL DETAILS

Location

Allensford, near Consett, County Durham

Target Group

Key Stages 1 and 2 science and geography

AIM OF FIELDWORK

To demonstrate how Earth science (geology) principles can be illustrated out of doors, in a simple and safe way. It can be used to engage pupils in discussions about Earth processes and products

Logistics

The field work day is based at Allensford and can be combined with the option of Derwent Gorge for geographical landscape exercises or visiting perhaps Frosterley or Stanhope. All sites are located along the A68 in Derwentside or County Durham. It is suggested that half a day is suitable for visiting Allensford (GR: NZ078502). This can easily be extended with a picnic in the park and wildlife walk on the way to STOP 3 of the activity.

Practical Details

- Parking - easy access and parking for a coach and minibus at the Allensford Park car park, Pemberton Road (GR NZ078502)
- Useful maps - Ordnance Survey Explorer 307

Materials Required

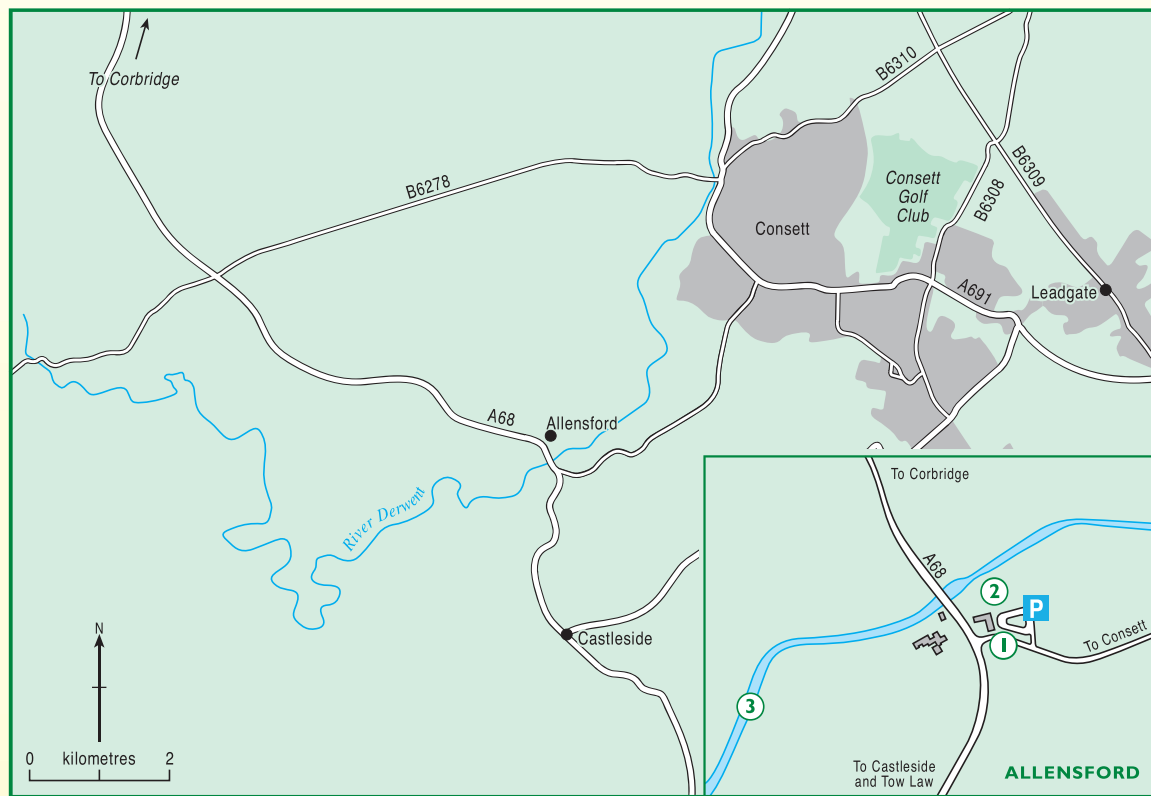
- Clipboard
- Pencil
- Hand lens (available from the Rock Boxes)
- Bottled water and sufficient small plastic pipettes for class to use one between two

Safety Issues

- Allensford picnic area and coach park is off the main road but caution needed when disembarking the coach / minibus in the car park and working on the large boulders in the corner of the car park
- No children should be allowed to approach the banks of the River Derwent
- The A68 is a very busy road and students should be supervised on and off the coach and crossing the main road
- Refer to the Hazards Identification panel below

Derwent Gorge, County Durham

Teacher Resource Sheet



SPOT THE ROCK!

Use the map of Allensford on Pupil Information Sheet 1 and the Teachers Resource Sheet to follow the route and complete the activities on Pupil Resource Sheet 2. The following information provides a background to the geology of the area.

GENERAL INFORMATION

The Earth during Carboniferous times (359 – 299 Million years) was very different from today. Through the Carboniferous movement of the continental plates resulted in the North Pennines being positioned at the equator. After 100's of millions of years of erosion the Carboniferous rocks are now exposed at the surface allowing geologists to interpret the ancient geological past. The Carboniferous is named after the presence of coal (carbon) in much of the succession world wide.

During the early part of the Carboniferous much of the North Pennines was submerged in a shallow warm sea, similar to that today around the Bahamas. In this sea lived an array of marine creatures including corals, sponges and crinoids (sea lilies). When these animals died the remains accumulated on the sea floor eventually preserved as fossils in the Limestones. One of the most easily recognisable beds in the Carboniferous limestones of the North Pennines is known as the 'Frosterley Marble'.

It is a dark grey limestone, that preserves fossils of a solitary coral. These grew in the warm shall seas of the carboniferous. The rock has often been used for ornamental stone masonry in Durham Cathedral and other churches. It should be noted that the rock is not a marble (metamorphic rock) and is a fossiliferous limestone (sedimentary rock) that was confusingly named by quarrymen.

Regularly through the Carboniferous, large deltas built out into the sea fed by rivers draining areas now occupied by Scotland and the North Sea. The large quantities of sand, silt and mud formed layers that were compressed and now known as shales and sandstones. Sandstones and shales can be widely seen in the North Pennines frequently giving rise to the characteristic landscape. Often when the sandstones are analysed in the field they are coarse-grained with a brown-buff colouration (e.g Durham Grit).

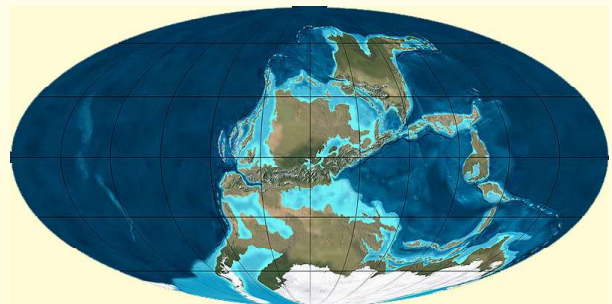


Frosterley Marble

0 cm 2



Durham Grit



*Carboniferous plate reconstruction
(www.cpgeosystems.com)*



Derwent Gorge, County Durham

Field Work - Pupil Resource Sheet 1

SPOT THE ROCK!

What you will need: a pencil, a hand lens, clipboard, and a map (Pupil's Resource Sheet 1).

Where you will go: follow the map and answer the following questions:

STOP 1: West side of car park

Pick up a pebble or stone from the floor of the car park or surrounding grounds, now swap this with a friend.

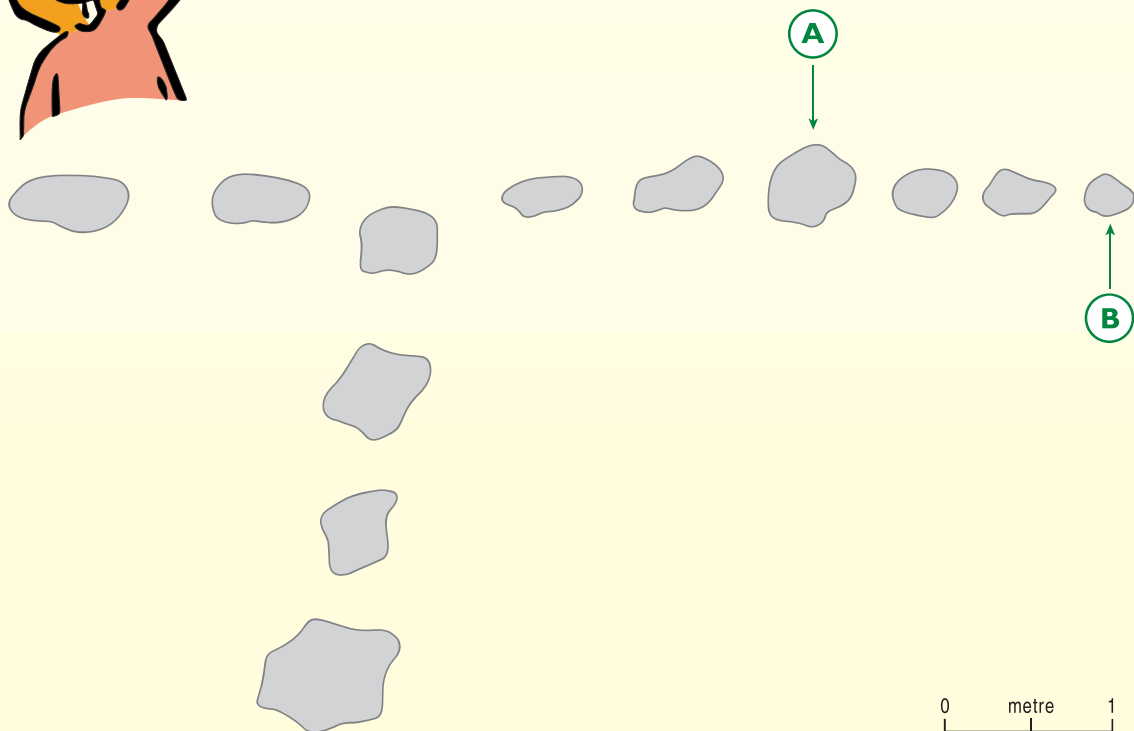
Describe the pebble or stones that you have been given (some good words to include: rough, smooth, hard, soft etc).



Fact: Many pebbles or stones found in car parks are naturally occurring rocks, that have been quarried to produce road stone for making roads.

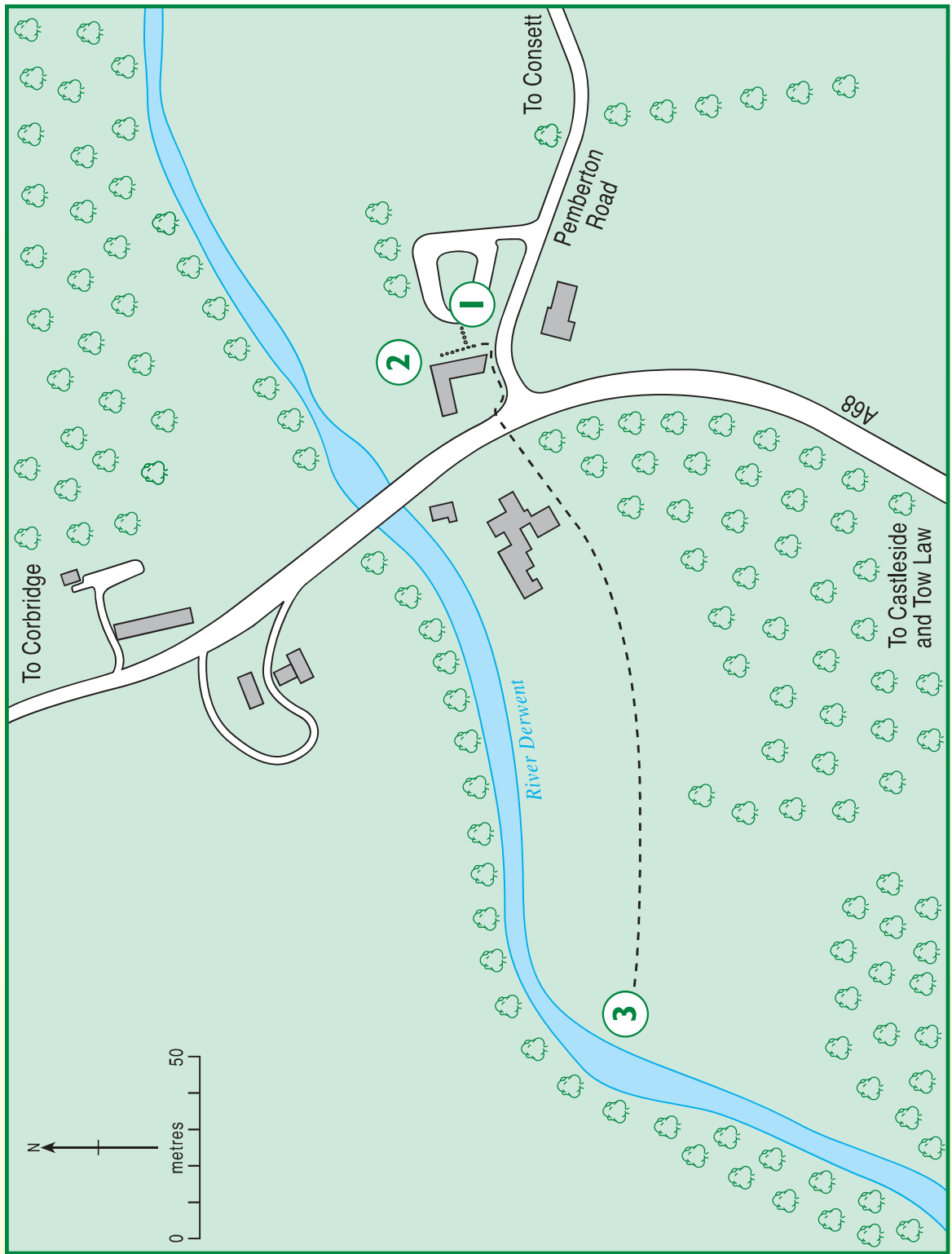
Odd One Out

Circle the boulders that you think look different on the sketch plan below:



Look at each of the boulders with your hand lens and touch each of the rocks.





Map of Allensford





Fact: Many rocks that look the same can be very different and come from different sources.

Look at Boulders A and B using your hand lens. Carefully rub your hand on the two boulders. Draw a wiggly line to join the rock to the correct properties (follow the example given).

Boulder A

Granular grains

Interlocking crystals

White circular fossils

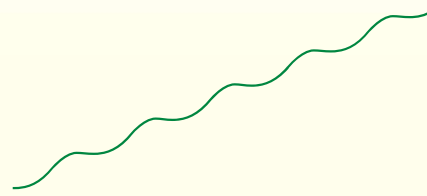
Rough

Dark grey in colour

Smooth

Orange-brown in colour

Boulder B



Frosterley Marble

Boulder A is called 'Frosterley Marble'. It is approximately 325 million years old. It contains beautifully preserved fossils of corals, that once grew in shallow warm tropical seas.

Are the fossils in the Frosterley Marble (cross out the **WRONG** answer):

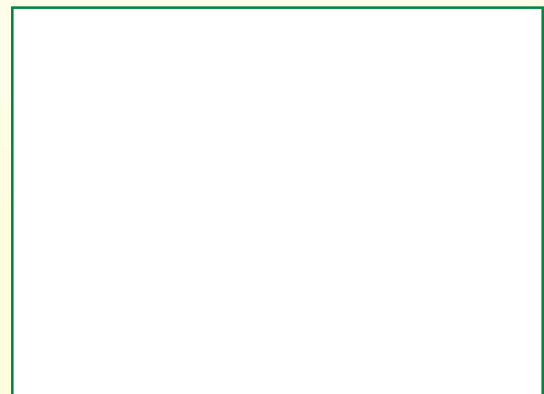
OLDER THAN THE DINOSAURS

YOUNGER THAN THE DINOSAURS

Draw an example of the fossil corals seen in the rock - some of the corals look like spider webs!



Photograph of the Frosterley Marble



Your sketch of the Frosterley Marble



Fact: Although the rock is called Frosterley Marble it is not true marble, but really a fossiliferous limestone. This rock can be found as an ornamental stone used in many churches and Durham Cathedral.



STOP 2: The Rock Wall

This building is made of many different types of natural materials, with several from very local sources.



- Circle each of the following you can recognise at Stop 2.

BRICK SANDSTONE TILE WOOD GRANITE SLATE

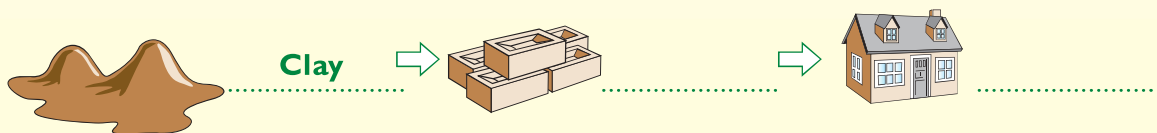
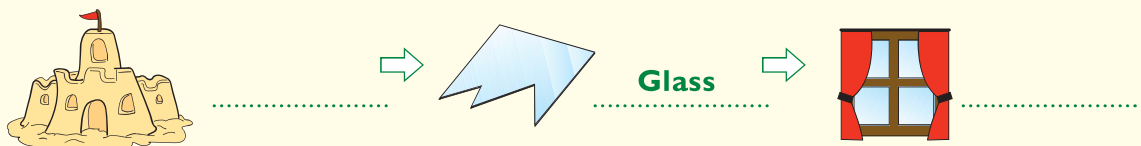
Look at the building stones. Are the rocks (circle the correct answer):

SMOOTH
(like wood)

GRANULAR
(like sugar)

CRYSTALLINE
(interlocking crystals
that sparkle)

- Fill in the blank spaces under each picture to see how natural materials are used by geologists:



Fact: Most things that are man-made require materials that are natural and come from the ground. These are frequently found by a geologist for use in industry.



The wall of the house is made from sandstone. The sandstone was formed in an ancient river over 300 million years ago. The sandstone was then quarried for building stone.



USED LIKE A BUILDING STONE

**LINES IN THE ROCK INDICATE
MOVEMENT OF WATER**

NO FOSSILS PRESENT

**SAND IS COMMONLY FOUND
IN RIVERS**

**YOU NEED TO LOOK AT MORE
ROCKS TO BE SURE**

What features of the sandstones seen in the wall of the house and shown above in the photograph tell geologists it was formed in an ancient river? Put a tick (✓) in the correct boxes.



STOP 3: Durham Grit

Follow the map to STOP 3. Do not attempt to cross the busy main road (A68) without an adult helping you.



These rocks are called the Durham Grits and are about 320 million years old.

You have seen a similar rock type before. At which stop?

Rocks are either IMPERMEABLE – they do not let water pass through or PERMEABLE – they let water soak through.

Field Experiment

Using a pipette and water in a bottle, drop some water onto a sample of the Durham Grit and watch what happens. Repeat the experiment two more times, each time trying to drop the same amount of water onto the rock in a dry spot.

Why is it important to repeat the experiment?

Based on your observations, the Durham Grits are (circle the correct answer)

PERMEABLE

IMPERMEABLE

Why do you think this is?



Rocks are all around us and are very useful. Complete the following paragraphs about the uses of rocks, by filling in the missing words from the list:

SLATE

IMPERMEABLE

LIMESTONE

SOFT

SANDSTONE

MARBLE

PERMEABLE

HARD

Some rocks are and they let water soak through. It is mostly
..... rocks that are permeable and are good examples of
permeable rocks.

..... rocks do not let water pass through and are frequently rocks.

Roof tiles are often made from as they help keep our houses dry.

..... is a hard rock that is commonly used as an ornamental stone.



At school, on your way home and at home look for different natural stones used for building, facing stones, paths, gravestones, or fireplaces. Tell your teacher or friends what you have discovered.







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Follow-up Activity 1

MAKING SANDSTONE

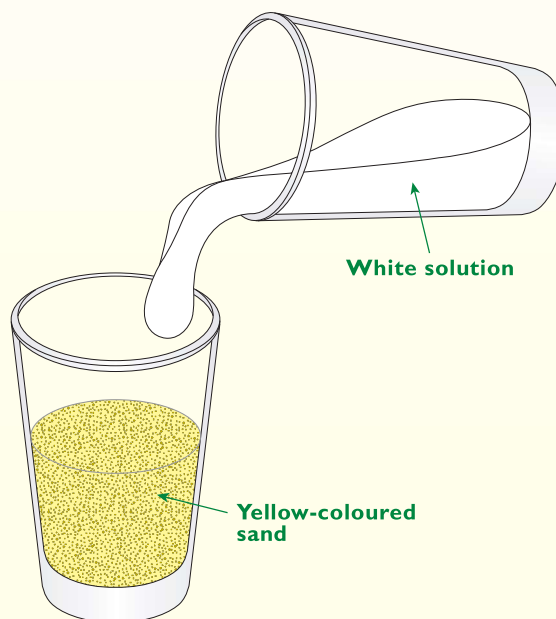
Make your very own piece of sandstone

MATERIALS

- Dry sand
- Cementing solution (2 parts water to 1 part Epsom salts)
- Paper cups
- Paper towel

Instructions

- 1) Half fill a small paper cup with sand
- 2) Slowly add the cementing solution until it completely covers the sand
- 3) Now you have to let the sand mixture dry. Make sure you place the cup in a warm place. Keep it there overnight
- 4) In the morning, remove the dry mixture from the cup. Make sure the mixture is set, but give it a further day if not dry enough.
- 5) Congratulations! You now have your very own sandstone sample to analyse as a geologist.



Did You Know? Sandstone is classified as a sedimentary rock by geologists. Sedimentary rocks can take several thousands of years to form. Some sedimentary rocks are over 600 million years old.







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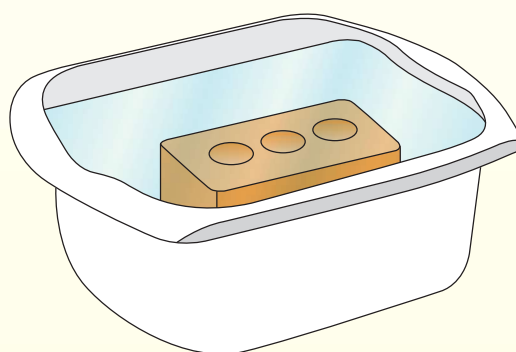
Follow-up Activity 2

THE THIRSTY BRICK

Investigate whether rocks can absorb water

MATERIALS

- Measuring container to measure volume of water accurately.
- Large plastic bowl for the water - make sure it is large enough to fit a brick.
- A brick.
- You can extend the exercise with using different rock samples - perhaps slate, granite, sandstone and limestone and use the tabulated results to plot a simple graph.



Instructions

- 1) Pour a measured amount of water into a container. You need sufficient water to cover the brick.
- 2) Put the brick into the middle of the water filled container. Can you see anything happening to the water level.
- 3) Leave the brick in the container for 60 minutes.
- 4) Lift the brick out of the water. Make sure you allow all excess water to drain off before completely removing the brick.
- 5) Calculate how much water was soaked up by the brick. This can be done by pouring the excess water back into the measuring container. Subtract the remaining volume from the original starting volume of water. Your answer will be the amount of water absorbed by the brick.



Did You Know? Most rocks absorb some water. However, the amount that they absorb depends on many factors including how many holes there are in the rock, how the holes are connected and whether the rock is granular like sugar (e.g. sandstone) or crystalline and hard (e.g. marble).







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Follow-up Activity 3

MAKING LIMESTONE

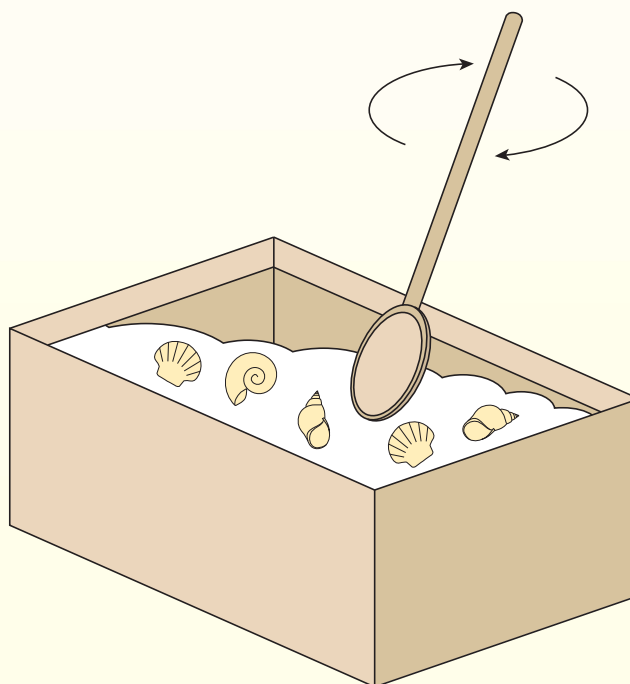
Making a piece of limestone

MATERIALS

- Large plastic bowl for mixing of plaster.
- Plastic cups.
- Water.
- Plaster of Paris.
- Shells - whole or broken.
- Fossils - whole or broken.

Instructions

- 1) Using a plastic mixing bowl add the plaster and water, taking care to mix it properly.
- 2) Add the shell pieces and any broken fossils. Thoroughly mix them in with the plaster
- 3) Pour the mixture carefully into some plastic cups
- 4) Place the cups in a warm place where they will not be disturbed for a minimum of 4-5 days.
- 5) Remove the limestone from the cup and describe what the limestone looks and feels like.



Did You Know? Limestone is a type of sedimentary rock made of calcium carbonate. When animals die with hard shells made of calcium carbonate and small microscopic organisms, fall to the sea floor they all accumulate with their hard shells being preserved eventually as limestone. Some limestones have so many fossils in them geologists call these fossiliferous limestones.







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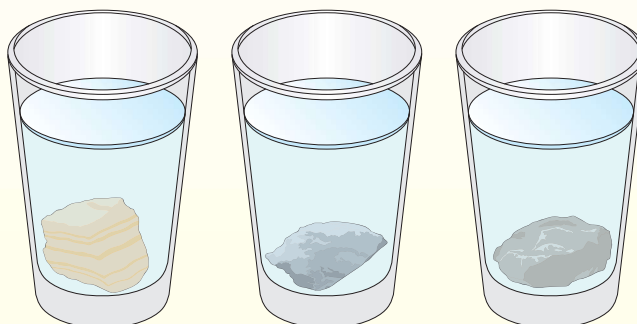
Follow-up Activity 4

WHICH ROCK IS THIRSTIEST?

Identifying what type of rock is most porous

MATERIALS

- Three large, clear plastic containers.
- A measuring cylinder or measuring jug.
- A sample of granite.
- A sample of slate.
- A sample of sandstone.
- You can use alternative rock samples but best using sedimentary, igneous and metamorphic for variety.



Instructions

- 1) Measure and pour the same amount of water into three containers.
- 2) Make a note of how much water was poured into each of the containers
- 3) Put one rock into each of the different water-filled containers
- 4) Make sure there is enough water to cover each of the rocks
- 5) Leave each of the rocks in the water for 30 minutes
- 6) Carefully remove each of the rocks from the containers. Make sure you allow all excess water to drain off before completely removing the rocks.
- 7) Calculate how much water each rock has soaked up. This can be done by pouring the excess water back into the measuring container and subtracting this from the total original volume.
- 8) As an alternative you can use measuring cylinders to measure the initial volume of water used and then measure the final volume after the rock has been removed.



Did You Know? That granite can occur in many different colours from pink to grey. They also often contain minerals of different sizes and some of these can grow to a very large size of 10 cm or more.



