Replica Rocks - Teacher Notes

Replica Rock Recipes

Conglomerate(left), breccia (top) and sandstone(right)

This activity helps students remember the difference between matrix and clasts. It also reinforces that clastic sedimentary rocks are classified according to their clast size. Mortar can be used instead of cement and sand mix.

<u>To make a mould</u>

Lightly fill an old container or tray with damp sand or soil. Push down firmly to form a mould for the rock. The surrounding sand stops the wet rock from bonding to the container.

Alternatively make a rock sized depression in damp soil in the garden or yard.

<u>Replica conglomerate -</u> Clastic sediment

Clasts

- rounded pebbles (aquarium, garden centre, creek)

Matrix

- Cement (1 part) + sand (3 parts) + water
- Optional grout colouring (NOTE: Grout colouring is mostly iron oxide and not ochre. It is therefore acceptable for non-indigenous use)

Replica Rocks - Teacher Notes

1. Make rock sized depressions in damp sand or soil and partially press rounded pebbles into the sand
2. Mix matrix of sand (3 parts), cement (1 part) and water to a thick mix.
3. Add grout colour, if you wish
4. Pour matrix into the depression making sure not to displace pebbles
5. Place remaining pebbles on top and press gently in
6. Leave to set for 24 hours
7. Remove, leave to dry and brush away excess sand/soil

Extra If you have access to a grinder, cut across pebbles to create a clean cross section

Replica breccia - Clastic sediment

Repeat process for conglomerate using angular clasts of road metal or gravel.

Replica sandstone Clastic sediment

If different groups make different coloured mixes, they can exchange them to create different beds in their sandstone

- Sand. The sand can be of different colours and clast size.
- Cement (1 part) + sand (3 parts) + water
- Grout colouring

1. Mix the sand, cement and water to make a stiff mix
2. Pour a thin layer (about a quarter) of the mix into the depression.
3. Add a little colouring and pour another layer of the mix.
4. Sprinkle a layer of sand round the edge of the underlying cement
5. Add more colour and pour the rest of the mix
6. Leave for 24 hours to dry
7. Remove and brush away excess sand or soil

Replica Limestone Biogenic sediment

Fossils

- Shells (sea shells or land snail shells)

Matrix

- Pale yellow coloured mortar or white sand and cement
- Water
- Shells

Replica Rocks - Teacher Notes

1. Press some shells into the sand mould
2. Add some mixed mortar
3. Sprinkle most of the shells on top of the mortar layer
4. All the rest of the mortar
5. Sprinkle remaining shells on top
6. Leave 24 hours to dry
7. Remove and brush away excess sand and dirt

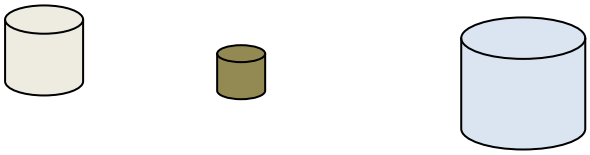
And ... of course ... the rock was made by a human!

Physical facts about replica rocks

1. The mass of an object is a measure of **the amount of matter in the object.**

Students confuse mass and weight. Weight also has a component of gravitational force. Objects of the same mass will weigh less on the moon than on Earth. The word "mass" comes from the Ancient Greek for a lump of dough or barley cake.

Which object has the greatest mass?



1kg iron 2kg lead 0.5kg water **2kg lead**

2. The volume of an object is a measure of **the amount of space it takes up.**

Some students have problems with conservation of volume. If you ask them to pour a measured 50mL of water into a Petri dish, a test tube and a large beaker they may not understand that the height of a liquid in the container does not directly relate to its volume. Filling a collection of different old shampoo or detergent bottles may also be useful to those who still use concrete operational ways of thinking.

Which object has the greatest volume?

1kg iron 2kg lead 0.5kg water **0.5kg water**

3. The density of an object is a measure of **mass per unit volume**

Which object has the greatest density?

Replica Rocks - Teacher Notes

1kg iron 2kg lead 0.5kg water **2kg lead (more "stuff" packed into a smaller volume)**

You shall measure the density of your replica rocks and compare your finding with those of others.

Scientists only accept data that is

Observable (using our senses – except taste)

Measurable (using international standards SI)

Repeatable (to enable statistical accuracy and remove the effect of outliers)

Materials required per student or group

<u>To measure mass</u>

- Triple beam balance or weighing machine

1. Select units of measurement that are appropriate.
2. Place the rock on the pan and weigh.
3. Repeat twice and find the average mass. Enter this in the table provided.

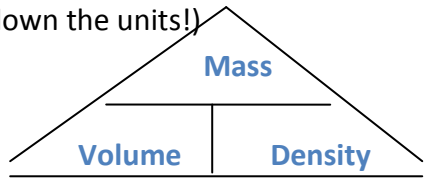
<u>To measure volume</u>

- Beaker filled to the brim with water
- Measuring cylinder

Since rocks are not regular geometrical shapes we can estimate their volume by the amount of water they displace.

Gently place the rock into the beaker full of water and collect the water it displaces in the measuring cylinder. The volume of water in the cylinder is the same as the rock

Repeat twice and find the average volume. Enter this in the table provided. (Don't forget to write down the units!)

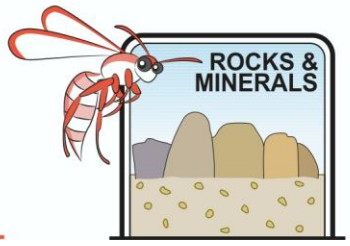


Mass = Volume X Density

Volume = Mass over Density

Density = Mass over Volume

Replica Rocks - Teacher Notes



To estimate density

Divide the average mass by the average density. (Don't forget to write down all the units!)

	MASS				VOLUME				DENSITY
	1	2	3	Average	1	2	3	Average	
Breccia									
Conglomerate									
Sandstone									
Limestone									

Rate your rocks from densest to least dense **Rating depends on materials used – usually sandstone is densest**

Compare your results with those of other class members **Results will vary because different students will choose to use varying number and size of large clasts and shells in their rocks**

Which rocks had the greatest range of densities? **Usually conglomerate**

Why is this so? **Not everyone used the same number of same sized clasts in their rocks**

Would you expect this to happen with real rocks? **The same. Rock density is variable. Students may wish to compare their results with real specimens. Real rocks are not only cemented but have been compacted when they were buried in the Earth and are usually much denser than replicas.**