

DRY POROSITY

Purpose

The purpose of activity I is firstly to measure the porosity of well sorted sand before and after compaction, and secondly to see what variation there is between different grain sizes. In activity II you will measure the porosity of sandstone and limestone slabs.

sandstone are made of quartz or other minerals which have a density of about 2.65 and that limestone is made of calcite, density 2.7.

Activity I Porosity of sediment

- 1. Weight the empty plastic container. It must be dry.*

Fill the container to overflowing and level off the sediment using the Background

- 2. It is usual to measure porosity by finding out how much water the sediment will hold. This method does not use any water but assumes the sand and edge of a ruler. Do not shake or jog the container.*
- 3. Weigh the container full of sand.*
- 4. Tap the base of the container ten times on the table fill it up again and level it off as before*
- 5. Weigh the container again*
- 6. Repeat instructions 2 to 5 with a different grain size.*
- 7. Empty the container of all sediment and then fill it brim full with water. Then pour the water into a measuring cylinder to find the volume V of the container.*

Activity II Porosity of rectangular blocks

1. Measure the rock slab and calculate its volume in ml.
2. Find the weight of the rock slab in grams.

Calculations

If the sand or sandstone were completely solid (i.e. no porosity) their weight would be $\text{Volume (V)} \times \text{density of quartz} = V \times 2.65$.

The fraction of the sediment or rock which is solid is

the actual weight

$$V \times 2.65$$

And the fraction of the sediment or rock which is air (the porosity) is the remainder. So the porosity as a percentage is

$$\frac{(V \times 2.65) - \text{actual weight}}{V \times 2.65} \times 100$$

For limestone use the density of calcite

Teacher's Section

Requirements

Lightweight but rigid plastic cups or containers 300 to 400 cc

Well sorted sediment, preferably quartz sand, 0.25mm to 4mm

Balance

Rectangular blocks of sandstone and limestone

Notes

Make sure that they do not jog the container before the initial weighing.

The same calculations can be used for any shaped piece of rock provided the volume and the density of the mineral or rock is known.

Results

The porosity for the uncompacted sediment should be between 42% and 50% whereas the compacted sediment will vary from 37% to 46%.

Time

30 minutes for 5 grain sizes.