

# Density

**Overview:** Density is a measure of how heavy an object is for its size. Meteorites have a larger density than styrofoam, for example. You'd need a huge piece of foam to even begin to come close to weighing the same amount as a small meteorite.

**What to Learn:** Density can be found by weighing an object and dividing by the volume of the object, and for geologists, is the same thing as specific gravity. Water has a density of 1, which means that 1 gram of water takes up 1 cubic centimeter of space. Specific gravity is a number you get when you divide the density of an object by the density of water, which happens to be 1 gram/cm<sup>3</sup>.

## Materials

- Measuring cup that has graduation marks for milliliters (mL)
- Scale that measures in grams
- Rock samples (in the video: quartz, meteorite, pumice)

## Experiment

1. Label and number each of your samples and record this on your data table.
2. Weigh each sample and record the information on your table.
3. Fill your cup with water and note the level. Write it here: \_\_\_\_\_ mL
4. Completely submerge your sample and read the new water height.
5. Subtract #4 from #3 answers to get the amount of water your sample displaces. Record this in your data table.
6. Find the volume of water displaced for every sample.
7. Divide the mass of the object by the volume to find the density:  $\rho = m / V$  with the units of grams / mL

Note: 1 mL = 1 cm<sup>3</sup>

## Density Data Table

| Sample | Mass<br>(grams) | Initial Volume<br>of Water<br>(mL) | Final Volume<br>of Water<br>(mL) | Water Displaced by<br>the Sample<br>(mL) | Density<br>$\rho = m / V$<br>(g/mL) |
|--------|-----------------|------------------------------------|----------------------------------|--|-------------------------------------|
|        |                 |                                    |                                  |  |                                     |
|        |                 |                                    |                                  |  |                                     |
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|        |                 |                                    |                                  |  |                                     |

### Reading

The specific gravity (also called the “s.g.” or “SG”) of a mineral or rock is how we compare the weight of the sample with the weight of an equal volume of water. Low specific gravity substances, like pumice (0.9), are not very dense. High specific gravity substances, like for gold (19.3), are very dense. If the specific gravity is less than 1, it will float on water.

Density is a way to measure two different minerals that might be exactly the same size, but their weights are different. Minerals with a metallic luster tend to be heavier. You’ll find variations for SG within the same minerals due to impurities of the mineral. Along those lines, this test can’t be done for material that is embedded within a rock, only for a single sample.

Here are a few examples for you to compare your samples with:

- Amber 1.1
- Quartz 1.5
- Obsidian 2.5
- Amethyst 2.6
- Diamond 3.5
- Hematite 5.05
- Pyrite 5.1
- Gold 19.3

## Exercises

1. In your data table, which number was the same for every trial run?
2. What is the equation for finding density?
3. How did you find the volume of the rock?

**Answers to Exercises: Density**

1. In your data table, which number was the same for every trial run? (Initial Volume of Water)
2. What is the equation for finding density? ( $\rho = m/V$ )
3. How did you find the volume of the rock? (When the rock is submerged in water, the water level rises by the amount of volume of that rock. With careful measurements of the water level before and after, we can easily find the volume of the rock.)