LEARNING ACTIVITY:

Density of Minerals

Grade Level: 6-9

Materials

- One 1-2 liter graduated cylinder with gradations of no more than 10 mL scale capable of weighing about 1-200 grams
- Samples of several different identified minerals of various densities
- Supplemental materials: Complete density activity, density worksheet, density chart found at www.MineralsEducationCoalition.org/ESW (see sidebar)

Source: Minerals Education Coalition; Society for Mining, Metallurgy, and Exploration. Adapted with permission.

Density is an intrinsic physical property of minerals that relates to the composition of the mineral and to the pattern in which the mineral's atoms are arranged. "Intrinsic" means that the property is the same for the mineral, no matter what the size or shape of the sample.

In this activity, students will measure and compare the densities of minerals.

Procedure

1. **Estimating density:** You can determine the relative density of minerals by comparing their size (estimated by sight) to how heavy they feel in your hand. Record your results.

2. **Measuring density:** Measure the mass (in grams) of each mineral sample available to you. The mass of each sample is measured using a balance or electronic scale. Record mass on a chart.

   The volume of each sample can be measured by the amount of water displaced by the sample in a graduated cylinder. Half-fill the graduated cylinder with water. Note the volume of the water and record it. Drop each mineral sample into the cylinder and record the level of the water in the graduated cylinder for each sample. Calculate the volume of each sample by subtracting the initial water volume from the volume after the sample was added. Record the volume of each sample on your chart in milliliters (mL).

   Measure density by dividing the mass or weight of a sample by its volume. Written out, the formula for calculating density is: D = M/V, where D = density (g/mL), M = mass (g), and V = volume (mL). Record the density of each sample on your chart in grams per milliliter (g/mL).

3. **Analysis of results:** How do your density data compare to your estimates of the relative densities of the minerals? Compare your results to those obtained by other groups for the same mineral samples. If there are differences in the densities for the same mineral, suggest reasons for the variation.

4. **Application of analysis:** What are some applications in industry or daily life where differences in the densities of various materials might be useful?

This activity has been adapted with permission from the Nevada Mining Association. For more information on the importance of mining and minerals in everyday life, visit www.MineralsEducationCoalition.org/ESW.

GOLD PANNING

Early U.S. settlers panned for alluvial deposits of gold. Gold panning is the separation process of gold flakes and nuggets from the surrounding dirt. Gold panning works because the density of gold is six times that of the dirt in which it's found. Find all the materials needed for gold panning in your classroom at www.MineralsEducationCoalition.org/ESW.

Densities of some common minerals and metals, in grams/cubic centimeter, g/cc		
	Actual density from reference books	Measured density (from your calculations of mass/volume)
ice	0.9	
sulfur	2.1	
halite	2.2	
gypsum	2.3	
graphite	2.3	
feldspar	2.6	
calcite	2.7	
quartz	2.7	
magnesite	3.1	
fluorite	3.2	
diamond	3.5	
corundum (ruby, sapphire)	4.0	
chalcopyrite	4.2	
barite	4.5	
pyrite	5.0	
magnetite	5.2	
zinc metal	7.1	
galena	7.5	
nickel	8.8	
copper	8.9	
native silver	10.5	
gold	19.3	

MINERAL DENSITY WORKSHEET

PREDICTED RELATIVE DENSITY (LIST MINERAL ID NUMBERS FROM LEAST DENSE TO MOST DENSE)	MASS OF SAMPLE (in GRAMS)	VOLUME OF SAMPLE (in MILLILITERS = CUBIC CENTIMETERS)	DENSITY OF MINERAL (Mass / Volume) g/cc	NAME AND CHEMICAL FORMULA OF EACH MINERAL (LOOK IT UP)	