

Making Sense of Density

Problem

Does the density of a material vary with volume?

Skills Focus

drawing conclusions, measuring, controlling variables

Materials

- balance
- water
- paper towels
- metric ruler
- graduated cylinder, 100-mL
- wooden stick, about 6 cm long
- ball of modeling clay, about 5 cm wide
- crayon with paper removed

Procedure

1. Use a balance to find the mass of the wooden stick. Record the mass in a data table like the one shown above right.
2. Add enough water to a graduated cylinder so that the stick can be completely submerged. Measure the initial volume of the water.
3. Place the stick in the graduated cylinder. Measure the new volume of the water.
4. The volume of the stick is the difference between the water levels in Steps 2 and 3. Calculate this volume and record it.
5. The density of the stick equals its mass divided by its volume. Calculate and record its density.
6. Thoroughly dry the stick with a paper towel. Then carefully break the stick into two pieces. Repeat Steps 1 through 5 with each of the two pieces.
7. Repeat Steps 1 through 6 using the clay rolled into a rope.
8. Repeat using the crayon.

Data Table			
Object	Mass (g)	Volume Change (cm ³)	Density (g/cm ³)
Wooden stick			
Whole			
Piece 1			
Piece 2			
Modeling clay			
Whole			
Piece 1			
Piece 2			
Crayon			
Whole			
Piece 1			
Piece 2			

Analyze and Conclude

1. **Measuring** For each object you tested, compare the density of the whole object with the densities of the pieces of the object.
2. **Drawing Conclusions** Use your results to explain how density can be used to identify a substance.
3. **Controlling Variables** Why did you dry the objects in Step 6?
4. **Communicating** Write a paragraph explaining how you would change the procedure to obtain more data. Tell how having more data would affect your answers to Questions 1 and 2 above.

Design an Experiment

Design an experiment you could use to determine the density of olive oil. With your teacher's permission, carry out your plan.