Density of Wood Species

Subject(s): Physical Science or Chemistry

Grade Level: 9^{th} - 11^{th}

Activity author: Al Lowande, Coeur d'Alene

Time Required: 1 class period

Lesson Objectives:

To quantitatively compare the densities of several wood species by 2 different methods:

-Relative buoyancies
-Measurements of actual volumes + masses and the formula:

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

Materials Needed:
Graduated cylinders, balances, rulers, rectangular samples of several species small enough to fit in graduated cylinder and marked at regular intervals.

Overview: In this lab you will compare the densities of different species of wood. In Method A, you will be simply comparing and ranking the woods from most dense to least dense. In Method B you will make actual measurements and calculate numerical values for the density of each wood. Record all results and answer all questions in your lab notebook.

Procedure: Method A (Buoyancy)

1. Fill the graduated cylinder with water to a depth of 7 inches. Place a wood sample into the cylinder (zero-end down) and immediately record the depth to which each sample sinks (the deeper it sinks, the more dense the sample).
2. Repeat for each species of wood supplied to you.
3. Use your results to rank the woods from most dense (#1) to least dense.
4. Why was it important to measure immediately after placing the wood in the water? (What would probably happen if you waited a while?)
5. Test your hypothesis in question #4 and record the result.

Method B (Measurement)

1. Get a new set of dry samples from the instructor.
2. Measure the mass of each sample on the balance and record it.
3. With the metric ruler, measure the length, width and height in millimeters for each sample and record.
4. Calculate the volume of each sample with the formula: Volume = length x width x height. Record these values with appropriate units.
5. Now calculate the density of each sample with the formula: $\text{Density} = \frac{\text{mass}}{\text{volume}}$. Record these values with appropriate units.
6. Do these values agree with your rankings from Method A?

Discussion:

1. Why was it important to get a whole new set of samples when beginning Method B? Explain.
2. Suppose the samples were not perfect rectangles. Try to describe a way to determine the volume of a sample if it were an odd shape.
3. Which method do you think is more accurate? Why?
4. Why would anyone care about wood density? (This would lead to another lab where strength is measured and then correlated with density.)