

**LAB 1****LABORATORY INVESTIGATION**

## Determining the Density of Liquids

### ◆ Pre-Lab Discussion

If you've ever carried bags of groceries, you know that some bags have greater mass than others, even though the volumes of the bags are the same. Mass and volume are general properties of all matter. Density is the ratio of mass to volume. The density of a specific kind of matter helps to identify it and to distinguish it from other kinds of matter. Liquids have density, and you determine their densities in grams per milliliter (g/mL).

In this investigation, you will develop a procedure for finding density and use it to determine the density of several liquids. You will compare the densities of liquids by using a wood float.

1. A rock sinks when placed in water. Which is more dense, the rock or the water?

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2. Liquid A has a mass of 32 grams and a volume of 20 milliliters. Liquid B has a density of 1.2 g/mL. Will Liquid B float on Liquid A? Explain your answer.

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### ◆ Problem

How can you determine the density of a liquid?

### ◆ Possible Materials

*(per group)*

4 graduated cylinders, 100 mL

balance

30 mL ethanol

salad oil

salt water

paper towels

4 wooden dowels, about 6 cm long

glass marker

salt

ruler

## DETERMINING THE DENSITY OF LIQUIDS *(continued)*

◆ **Safety**  Review the safety guidelines in your lab book.

Wear safety goggles and lab aprons. Never have an open flame in the same room as an open container of ethanol. Report any spills of oil or ethanol to the teacher. Ethanol is poisonous.

### ◆ Procedure

1. Read the entire lab before continuing with the procedure.
2. With your group, design a procedure to find the density of 30 mL of water. Think about what properties of water you need to know to find its density. Your procedure should include keeping the sample of water for Step 6. Write each step of your procedure on a separate sheet of paper.
3. Finish designing the Data Table in Observations to determine the density for water and three other liquids. Add headings and columns to organize the data you will need to find and record. Change the first column if you use other liquids.
4. **CAUTION:** *Wear safety goggles and lab aprons.* After the teacher has approved your plan and Data Table, find the density of the sample of water. What mathematical formula will you use to find density? Record all your data and the density of water in your Data Table.
5. **CAUTION:** *There should be no open flames in the room where you're using the ethanol. Ethanol is a poison, so keep it away from your face.* Use your procedure to find the density of 30-mL samples of ethanol, salad oil, and salt water or other liquids you are using. Record all your data and the density of these three liquids in your data table. **CAUTION:** *Report any oil or ethanol spills immediately.*
6. Set four graduated cylinders side by side, each containing 30 mL of one of the liquids you tested. See Figure 1. Think about their differences in density. Predict how high a wooden dowel will float in each liquid, compared to the other three.

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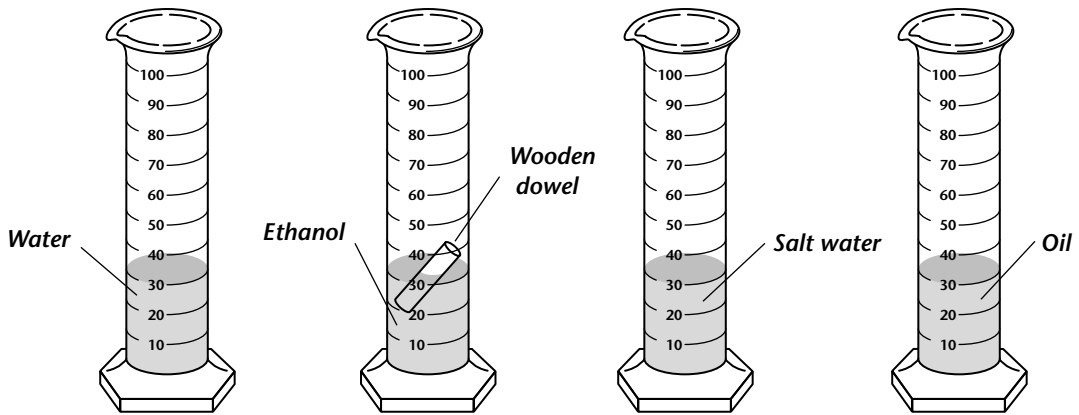
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7. On a separate sheet of paper, write a procedure for testing your prediction. Have the teacher approve your plan, and then carry it out.

**DETERMINING THE DENSITY OF LIQUIDS** *(continued)*



**Figure 1**

**◆ Observations**

**Data Table**

<i>Liquid</i>	
<i>Water</i>	
<i>Ethanol</i>	
<i>Salt water</i>	
<i>Oil</i>	

**◆ Analyze and Conclude**

1. List the four liquids that you used in this experiment, in order of increasing density.

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2. Were your predictions accurate? Make a statement that compares the density of a liquid to how high a wooden dowel will float in it.

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## DETERMINING THE DENSITY OF LIQUIDS *(continued)*

### ◆ Critical Thinking and Applications

1. Which has the greater mass, 1 L of water or 1 L of ethanol? Explain your answer in terms of density.

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2. Which takes up a greater volume, 1,000 g of water or 1,000 g of ethanol? Explain your answer in terms of density.

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3. Which is more dense, 1 mL of water or 50 L of water? Give a reason for your answer.

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4. Predict what would happen if you poured into one beaker all the liquids used in this lab.

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### ◆ More to Explore

Does the amount of salt in water affect the liquid's density? Write a procedure you would follow to answer this question. Have the teacher approve your procedure before you carry out the investigation. Use your results to explain why it is easier for a person to float in the Great Salt Lake than it is to float in a freshwater lake. Wear your safety goggles and apron and wash up afterward.