

Name _____
Period _____ Date _____

Density of Various Liquids and Solids

Introduction and Objectives: This lab will allow you to improve your skills in the various areas:

- 1) practice with density calculations (including those involving liquid displacement)
- 2) practice making measurements with as much accuracy and precision as your equipment and your eyesight will allow
- 3) practice rounding answers from calculations to the appropriate number of significant figures.

Materials and Equipment: 10 mL graduated cylinder balance
 liquids of various densities solid bars of various densities

Procedure:

1. Mass your 10 mL graduated cylinder and record. Pour 4-8 mL of one of the colored liquids into the cylinder and mass it again. Read the volume. Record the mass and volume in the data table.
2. Rinse the graduated cylinder thoroughly with water. Mass the empty graduated cylinder, add 4-8 mL of another colored liquid and re-mass it. Read the volume and record the measurements in the data table.
3. Repeat Step 2 for each of the remaining colored liquids.
4. Calculate the density of each of the liquids (show your work for each) rounding each answer to the appropriate number of significant figures.

Data Table for Various Colored Liquids

Color of Liquid				
Mass of cylinder + liquid (grams)				
Mass of empty cylinder (grams)				
Mass of colored liquid (grams)				
Volume of colored liquid (mL)				
Your work...				
Density of colored liquid (g/mL)				

5. Take metal bar #1 from one of the numbered beakers and mass it. Record its mass and number in your data table.
6. Place 4-6 mL of water in your 10 mL graduated cylinder and read the volume as accurately as possible. Try to estimate to the 0.01 mL and record this volume.
7. Carefully slide the metal bar into your graduated cylinder. Be careful not to let any water splash out. Record the new volume, again reading the volume of the cylinder as accurately as possible.
8. Remove the metal bar from the graduated cylinder by pouring it and the liquid out...be careful not to lose the object down the sink. Dry it and return it to its beaker.
9. Repeat steps 5-8 using two more metal bars.
10. Repeat step 5-8 using one of the plastic bars.
11. Calculate the density of each of the bars, using the rules for significant figures.

Data Table for Various Solids

	Metal #1	Metal #	Metal #	Plastic #
Final volume of liquid (mL)				
Initial volume of liquid (mL)				
Volume of bar (mL)				
Mass of bar (grams)				
Your work...				
Density of bar (g/mL)				

Questions:

**use Table 3.7 on pg. 69 to help answer a couple of these questions!*

- The solutions for this lab (the same ones we used for "4 Colors and a Straw") are simply water with food coloring and varying amounts of salt added. One of the colored liquids, however, is merely water with food color added. Which one it is most likely to be? Explain why you believe so.

- Some types of plastics may have a low density and tend to float. What error may be introduced when measuring the volume of a floating object by liquid displacement?

- Metal bar #1 was made of aluminum.
 - According to the book, what is the density of aluminum? _____ *we will consider this the "theoretical" value
 - What was your calculated value for the density of bar #1? _____ *we will consider this the "actual" value
 - What is the % error in your lab results? Show your work below.

$$\% \text{ error} = \frac{|\text{actual value} - \text{theoretical value}|}{\text{theoretical value}} \times 100$$