CHEMISTRY LAB: DENSITY

WHAT TO TURN IN:
Hypothesis, Data Table, Calculations, Error Analysis, Conclusion, Questions #1-6

OBJECTIVES

- To measure the mass and volume of samples of two different metals
- To calculate the density of unknown metals
- To compare calculated values with the standard densities.

INTRODUCTION

Mass is a measurement of the amount of matter in a sample, while volume is a measurement of the space occupied by a sample of matter. Mass measurements are made on different types of balances. An electronic balance is commonly used because it gives fast results on a digital display.

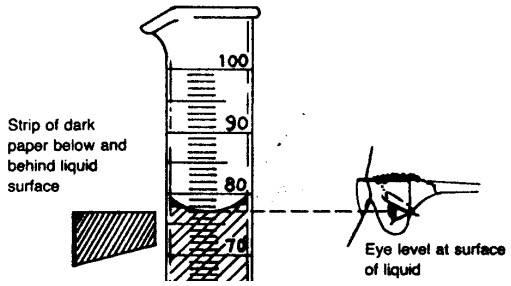
Volume measurements are made in different ways depending upon the physical state of the sample being measured. The volume of a liquid is commonly measured in a graduated cylinder. The surface of the liquid curves upward where it contacts the cylinder walls. This curved surface is called a *meniscus*. Measurement of volume in a graduated cylinder is always made by reading the mark at the bottom of the meniscus with the eye positioned at the level of the liquid surface.

The volume of a solid may be calculated from its dimensions (LxWxH), if the solid is regular and free of air space. However, if the solid is irregular or contains air space, its volume must be determined in another way, such as by *water displacement*.

PROCEDURE

1) Write a hypothesis. (How do you think the metal samples will differ in density?)
2) Obtain clean, dry samples of three different metals. In the data table, write the letter of which unknowns you have, as they correspond to the answer key.
3) Measure the mass of each metal, using the maximum number of decimal places allowed by the balance. Record in Data Table.
4) Measure the volume of each metal separately:

a) Fill a graduated cylinder halfway with sink water.
b) Tap out any air bubbles.
c) Record initial volume to one decimal place (0.1 mL) in Data Table.
d) Tilt the cylinder gently and slide the metal into it. It must be submerged.
e) Tap out any air bubbles.
f) Record final volume to one decimal place (0.1 mL) in Data Table.



5) When finished, carefully pour out the water and metal into your hand. Dry the metal samples and put them back in their original containers.

CALCULATIONS

1) Calculate the volume of *each* of the metals you tested:
   VOLUME of metal = (FINAL VOLUME) – (INITIAL VOLUME) in mL
2) Calculate the density of *each* metal by **DENSITY = MASS/VOLUME**.
   Use the proper units and sig.figs.
3) Record the standard density, given by the teacher, of the unknowns that you had.
   Calculate percent error of each:

$$\textbf{\% ERROR OF YOUR LAB GROUP} = \left| \frac{\textbf{STANDARD} - \textbf{GROUP DENSITY}}{\textbf{STANDARD}} \right| \times 100$$

DATA TABLE: MASS, VOLUME, DENSITY **DATE:_____**

	METAL ____	**METAL _____**	**METAL _____**
mass (g)	_____	_____	_____
initial volume of water (mL)	_____	_____	_____
final volume of water (mL)	_____	_____	_____
volume of metal (mL)	_____	_____	_____
density of metal (g/mL)	_____	_____	_____
standard density values (g/mL) from teacher:	_____	_____	_____
lab group percent error	_____	_____	_____

QUESTIONS

1) Why does a pure substance always have the same density?
2) What was the unit of mass used in this lab?
3) What was the unit of volume used in this lab?
4) Describe how water displacement works.
5) What is a meniscus?
6) Can density be used as identification for substances in lab? Why or why not?