**Lab #1: Density and Measurement**



**Background:** In this lab we will be studying density, as well as the importance of measuring accurately. Your objective will be threefold: calculate the density of an unknown block, calculate the density of an unknown metal, and calculate the thickness of a piece of aluminum foil. At the same time we will be looking at the importance of measuring accurately.

Before starting, read through the experiment to determine what **measurements** you will need to take and construct a data table in the appropriate space. Your data table does not need to include calculations so show only direct measurements like length or mass, do not include density in your data table. (Use a ruler and include headings with units). Then answer the pre-lab questions in the space provided.

**Part One:**

In this section you will determine the density of an unknown block. Measure very carefully, you will be ask to identify this based on its density.

1. Obtain a block from your teacher. Make a note of the ID letter from your block and write it in your data table.

2. Using only a ruler and a balance, calculate the density of your block of wood. (As a part of your pre-lab, you should have given some thought as to what measurements this would require). Record all measurements in your data table. When measuring with the ruler, you will need to interpolate (estimate) one additional digit.

3. There is some variety in the density of the blocks based on the conditions under which the block was manufactured. Because of this, we will be looking for an average density. Find a second block with the same ID letter and calculate the density for this block as well. Record only measurements (not calculations) in your data table.

**Part Two:**

1. In this section you will calculate the density of an irregularly shaped cylinder of metal.

2. Obtain a sample of metal from your teacher. Make a note of the ID letter of your metal.

3. The cylinder might require a different method for calculating volume. Using only a graduated cylinder (and water) and a balance, measure as needed to obtain the density of your metal sample. When measuring with the graduated cylinder, remember to interpolate one additional digit.

4. While pure metal samples of the same metal should be consistent regarding density, repeat using one more sample of the same metal so that you can average the two densities. This will help with any random error.

**Part Three:**



1. In this section, calculate the thickness, in mm, of a piece of aluminum foil. You may use a ruler and a balance. It may be helpful to know that the density of aluminum is

2.700 g/cm3. Do your calculations below and state your answer here.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Signature for cleanup**

**DATA TABLE(S): USE A RULER**

For any data table(s), read the lab to see what data is measured and then draw a table(s) to include that data. Always use a ruler for your data table. Make sure to include proper sig figs and units on all data. Caution: In this lab, not all measurements are stated in the procedure. Calculations are **NEVER** to be included in the data table(s), only data. Use a separated piece of paper if more space is needed.

**PRELAB QUESTIONS: COMPLETE PRIOR TO COMING TO LAB**

1. What is the formula for density? (do NOT abbreviate variables)

2. Based on what is available in the lab, what measurements will you need to make to calculate the density of your blocks.

3. What measurements will you need to make to calculate the density of your metal cylinders.

4. Suppose that in the lab you used a ruler marked only in centimeters. If you were measuring the length of a block, which of these measurements would be more precise: 35.4 cm or 35 cm. Why?

5. What does it mean to interpolate?

6. When using a digital balance we do not interpolate. Is this the same as saying the mass measurement is exact? Explain.

7. In this lab you use two different methods for finding volume. If you were interested in finding the density for a rock I found in your backyard, which method would you use? Why?