Densities of Metals

Theory:

Purpose: In this experiment, you will determine the density of different metals and find the relationship between mass and volume via density.

Background Information:

The study of chemistry involves not only observing changes in matter, but also measuring these changes. In fact, most chemical principles can't be fully understood without obtaining and analyzing some quantitative data. The techniques of data collection, data analysis, and measurement are important parts of chemistry.

Careful attention should be given to the degree of uncertainty in your measurements. Record only those digits which are significant, and use only those digits in your calculations. (See page 4 for a discussion of significant digits.)

The accuracy of your methods can be reported with your results in terms of percent of error. The percent error in calculations and measurement is a comparison of the differences between experimental results and theoretical values, expressed as a percentage. Percentage error can be determined as follows:

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

A useful way of comparing two substances is to compare their densities. By carefully measuring the mass and volume of two substances, their densities can be calculated as follows:

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Procedure:

1. Obtain 2 different samples of metals. Be sure that samples are clean and dry. Record the appearance in your data table.
2. Weigh each sample to the nearest .01 g. Record.
3. Find the volume of each metal sample by water displacement. (Refer to L, M, and V lab). Record in the data table.
4. Dry Metals and return then. Also, return any glassware that was used other that "Drawer" glassware.

Data:

1. Set up a data table with the following labels: appearance, mass, volume of water alone, volume of water + metal, volume of metal, density of metal.
2. Make another data table for class data with the following labels: Lab #, Mass Volume. Each station will have 2 meals. (8 stations total).
3. Using class data, plot a graph relating mass and volume for your 2 metals (2 graphs). Plot mass on the y-axis, and volume on the x-axis. Choose a scale that will give you a graph that will take up 1 page. Use a ruler to draw the best "fit" straight line for each metal (splits points in 1/2). All points may not lie on the line.

Calculations:

1. Your densities -
2. Calculate the slopes for each line. In the graph that you have plotted, y/x is = to mass/volume. The slopes of the lines you have drawn represent the densities of metals. Derive the density of each of the metals studied from the slope of the line drawn for that metal.
3. Calculate the % error in the densities you calculated for YOUR two samples (experimental). Get the accepted value for the CRC.
4. Calculate the % error in the densities you obtained from the slopes of the lines in your graph.

Error Analysis:

Conclusion: