# Density lab report

Science, Physics

Density is defined by its mass per unit volume, and is most often written in mathematical terms as; d = m / v

Mass is usually given in grams, g, and volume is given in cubic centimeters, g/cm3, or, grams per milliliter, g/mL. Density is not a property that depends upon the amount of substance present. For example, one gram of lead and one ton of lead have the same density. Density also does depend on temperature. For instance cold water is denser than warm water; ice is less dense than both. The method used for determining the density of a substance depends on the nature of the substance. In this lab the densities of unknown irregularly shaped solids and liquids was determined.

Accuracy and precision of the results will be estimated, and attention will be paid to the correct use of the significant figures. The experiment approach that will be used will tell the mass and volume of the metal and liquid determined by measuring these two quantities with a graduated cylinder and biuret. Procedure:

a) The density of metals

First I obtained a quantity of unknown metal. Recording the unknown number. I used only one type of metal for this part of the experiment.

The unknown metal that I was instructed to use was a chunk, therefore, I used a 50ml graduated cylinder. When using the 50ml cylinder, I filled it with water to approximately the 35ml mark. Then recorded the exact volume of water that was added. I placed the cylinder and water on the balance and recorded the mass to every 0. 1g. I added the metal to the graduated cylinder until the water level increased by approximately 2. 0ml. Being sure

to tap the sides of the cylinder to release any air bubbles. I then recorded the volume of the water plus metal to the nearest 0. 1mL.

Then recorded the total mass of the cylinder, water, and metal. I added more pieces of metal to the cylinder until the water level had increased by 2. 5ml. Then I recorded the exact volume of water plus metal and total mass of cylinder, water, and metal. I repeated the procedure twice more. Being careful not to go over the 50ml mark. And recording the data each time.

Calculations:

I determined the total volume of metal in the cylinder by subtracting the volume of water from the volume of water plus metal. Then found the corresponding mass of metal by subtracting the mass of the cylinder and water from the mass of the cylinder, water and metal. I plotted out the graph showing the total mass of metal on the y-axis, and the volume on the x-axis. I found the slope of the line by taking two random points from the graph, performing the slope formula and finding the density. From the table provided, I identified the unknown metal to be silver.

b). Determining the density of a water/ethanol mixture.

I obtained an unknown solution from the instructor. Then recorded the number of the solution.

Then I rinsed a buret with a little of the ethanol solution and filled the buret with that same solution. I read the buret level to the nearest 0. 05ml. Then weighed an empty 250ml Erlenmeyer flask. I turned the knob of the buret and put approximately 23. 4ml of solution into the flask. I read the buret again, to 0. 05ml and recorded.

Next I weighed the flask and its contents, by placing the flask on the balance and recording the temperature of the solution. I then determined the density of the solution by taking the mass of solution and dividing it by the volume of the solution. Repeating the procedure twice more using a clean flask and the same balance each time.

Calculations:

For each of the three trials, I calculated the density of the solution and determined the mean, average deviation from the mean, percent precision and the range. I then drew a calibration curve from the data given on page 17 of my Laboratory Manual.

Discussion:

Based on the value of my density, and based on the literature values given on page 16 of my Laboratory Manual, the unknown metal is silver. The density I had obtained from the slope of the graph was 9. 09g/mL. I then compared my density to the chart given, looking for a similar density. The density of my unknown metal was not exact with a particular metal given in the chart, but I kept in mind that the density of silver can vary depending of the state it is in.

Error Analysis:

The possible sources of error in finding the density of the unknown metal and liquid would have to be my consistency throughout the experiment. I had approximated with my bare eye and was not consistently exact. Therefore, there was an inaccuracy in reading the volume displaced from the graduated cylinder and the biuret.