AP Chemistry Lab #1: Density of an Unknown Alcohol

Purpose: Find the density of an alcohol/water solution with a known concentration. Use the class data to determine the concentration of an alcohol/water solution of an unknown concentration. Use correct sig figs on all measurements and calculation results. Create an excel graph using your data and find the standard deviation for your data.

Procedure:

Pre-lab:

Prepare a data table that will contain space for all the data and calculation results needed in the experiment. Check all your lab supplies in your lab drawer to be sure you

Materials

- Unknown Alcohol A
- Unknown Alcohol B
- Known solution (100%, 80%, 60%, 40%, 20%, or 0% EtOH)
- 250 mL Beaker
- Plastic container

Lab:

1. Each group will be assigned one alcohol/water mixture from the following list: 100% alcohol; 80% alcohol; 60% alcohol; 40% alcohol; 20% alcohol; 0% alcohol (just water). Each group will measure the density of unknown alcohol/water mixture A and unknown alcohol/water mixture B
2. Mass the plastic container using the balance.
3. You will begin with the solution that you were assigned. Choose a volume between 10-15 mL that is easy for you to measure and gives you 3 sig figs. Use a graduated pipet to measure the solution volume accurately to the 0.1 mL place. Add the volume to pre-weighed plastic container. Weigh the container and the solution and calculate the density of the solution.
4. Calculate the density of the liquid that you measured
5. Repeat the trails for the two unknowns.

Results/Discussion:

Analysis: To be answered in your lab notebook.

1. Each group needs to find the other group(s) who has the same solution. Find the average of the trials that were taken and write that average on the white board. Copy down the average densities from the other groups into your lab notebook.
2. Create a graph comparing percent alcohol to density with six data points (the known values). Use the graph to help you determine the percent of both the unknown alcohol/water mixtures. Clearly show all of your work in your lab notebook.
3. Determine your group's standard deviation from the average of the four trials ran on your solution using the equations below and all of your trials. Show all of your work in your lab notebook.

$$Standard\ Deviation = \sqrt{\frac{\sum (x - average)^2}{number\ of\ samples}}$$

Conclusion Questions: To be answered in your lab notebook.

1. What was the concentration of the two unknown solutions?
2. Were your individual results "accurate" (ie. did you have a very low standard deviation)?
3. What could have been some possible sources of error in this lab for your group?