Just a reminder that everything you do related to lab should be entered directly into your lab notebook.

Thermometry*

Objectives:

After completing this lab, you should be able to:
- Assemble items of common laboratory equipment and collect experimental data
- Analyze and present data using a spreadsheet
- Begin to develop an understanding of how physical variables such as temperature and volume are related
- Write the Introduction section of a formal laboratory report

Resources:

Lab Text – Chapters I, XI
Purdue University Chemistry Lab Resources

Safety:

Eye protection should be worn at all times in the lab. Exercise caution when inserting the pipet through the hole in the rubber stopper; consult your lab text (Chapt. I) for the proper way of doing this. All of the liquids used in this experiment, with the exception of water, are flammable. No open flames should be used in the lab at any time. Ethanol and acetone are classified as irritants in case of skin and eye contact and toxic when ingested. MSDS sheets for all of the compounds used in this experiment are available in the lab.

Introduction:

One of the necessary requirements of any scientific experiment is that it be reproducible by others. It was only when the early alchemists began keeping track of quantitative data, rather than simple qualitative observations, that the science of chemistry began to flourish. Among the most important physical variables in alchemical procedures and preparations was temperature. A temperature too high or too low often meant the difference between success and failure, a fact that many modern chemists are acutely aware. Any device therefore, that could provide a quantitative measure of hot and cold would be an extremely valuable piece of laboratory equipment. The history of thermometry is replete with interesting characters as well as a lot of broken glass! In this lab, you will explore the fundamental principle on which many thermometers operate.

Procedure:

Assemble an apparatus similar to the one shown in Figure 1. Think about the details of your setup in terms of what you are trying to accomplish. Changing the temperature of the water bath is best accomplished by starting at the high end of the temperature range and adding ice to lower the temperature in small increments.

Give it Some Thought:
If you start collecting data at the high end of the temperature range, will the height of the liquid column increase or decrease as ice is added to the water bath?

Keep in mind that it may take several minutes for the temperature of the liquid and height of the column to stabilize after each addition of ice. A stir bar in the Erlenmeyer flask may help to expedite a more uniform temperature throughout the liquid sample.

Give it Some Thought:
Will the presence of air bubbles in the Erlenmeyer flask or the pipet have any effect on the outcome of the experiment?

Figure 1: Experimental setup.

Using water as the liquid, collect at least five data points of temperature vs column height. Although the temperature increments do not necessarily need to be equal, it is a good idea to distribute them fairly evenly throughout the temperature range.

Repeat the procedure using ethanol and acetone as the liquids.

Clean Up:

Please place the used liquids in the appropriate waste container for reuse/recycle. Rinse all glassware with deionized water, including the pipet, and leave on the bench top to dry.

Pre-Lab Preparation:

In your own words, briefly describe your view of the “Big Picture” for this experiment; that is, what are you trying to accomplish and how are you going to accomplish it. Remember, this should be written directly in your lab notebook.
Assessment:

Pre-Lab Preparation responses – 20 pts. (Due at the **beginning** of the lab period)
Successful completion of procedure – 40 pts.
Final Lab notes – 40 pts. (Due at the **end** of the lab period)