Experiment 2 : Solubility of a Solid in Water

Concepts:

1. Setting up the thermocouple in order to read temperature versus time using the MicroLab analysis box.

2. Measurement of 5 different crystallization temperatures for different concentrations of KNO₃ in water solution.

3. Construction of a graph using the MicroLab software in order to find the molality of KNO₃ in water at 60 °C.
Experiment 2: Solubility of a Solid in Water

Part 1: Thermocouple Setup

Same as last week with calibration; use ice-water as the 0 °C point and boiling water as the 100 °C point.

Set up thermocouple versus time as in the previous experiment.

Try not to use the thermocouple as a stirrer as this may make your temperature measurements more difficult.
Part 2 : Temperature Measurements

Sample Preparation

Clean your large test tube and rinse it thoroughly with the distilled water. Shake the tube thoroughly to get rid of the excess water or dry it with a paper towel. Obtain a 2-hole stopper and insert one of the metal stirring rods into one of the holes. Then carefully insert the thermocouple into the other hole such that the bottom will be situated about half an inch from the bottom of the test tube. Set up a warm bath using your 400 ml beaker. Put about 300 ml of water into the beaker, place the beaker upon a wire gauze supported by a ring stand, and heat the water to boiling using a Bunsen burner. Maintain boiling throughout the experiment. While the water is boiling up, weigh about 15 g of KNO₃ on weighing paper to the nearest 0.001 g and transfer all of the salt to the test tube. Deposit 1000 ml of the heated water into the test tube. Clamp in an upright position in the water bath as shown below (Figures 1 and 2) and allow the salt to completely dissolve.

Part 3 : Construction of the Graph

Creating a Graph with MicroLab

Open the MicroLab program from the desktop and you should see:

- Click on: “Hand Enter” tab
- Click on: “MicroLab Experiment” icon
- Enter experiment name: “Solubility Experiment” in dialog box
- Click on: “OK” to accept changes and you should see:
The Setup: in the online material for Part 2

Before heating the KNO3 only dissolves slightly. Upon heating the solid will gradually dissolve.

Figure 1

Figure 2

As the sample heats up the solid will begin to dissolve. Be patient with this and use the stirrer as needed but be careful not to be too aggressive as you might break the test tube. Once the entire solid is dissolved in the hot water you are ready to acquire solubility data.

Supplemental instructions linked to the 1516L web page

For Next Lab Session:

- Get the lab manual if you haven’t already done so, and read the details of the next experiment from the 1516L web page.
- Read the corresponding web page to see if there are any modifications or suggestions for that experiment.
- Bring goggles, lab coat, paper towels, dishwashing gloves, handout from website.
- Email me with any concerns.