Chemistry Lab 12-1   Solubility of a Salt   _____

name

Objective-
Collect data and construct a solubility curve for potassium chlorate in water.

Background-
The solubility of a pure substance in a particular solvent is the quantity of that substance that will dissolve in a given amount of water. Solubility varies with the temperature of the solvent. Thus, solubility must be expressed as quantity of solute per quantity of solvent at a given temperature. For many ionic solids in water the solubility varies directly with temperature.

In this experiment you will study the solubility of the salt potassium chlorate ($KClO_3$) in water. You will dissolve different quantities of the salt in a given amount of water at a temperature close to water's boiling point. Each solution will be observed as it cools, and the temperature at which crystallization occurs will be noted and recorded. The start of crystallization indicates that the solution has become saturated. At this temperature the solution contains the maximum quantity of solute that can be dissolved in the amount of solvent.

Procedure-
1. Set up a 90°C hot water bath in a 400 ml beaker.
2. Number test tubes 1-4 and place them in a test tube rack
3. On the balance (using tared weighing paper) measure out 1.0 g. of $KClO_3$ and place it in test tube #1
4. Repeat this step to add the following quantities to tube 2-4
5. Add exactly 10.0 ml of water to each tube
6. Place all tubes in the eater bath and stir each mixture with a thermometer
7. Remove the first dissolved tube from the water bath and hold it up to the light and determine when crystallization starts. Record the temp.
8. Rinse the thermometer and repeat for each tube

9. If doubtful results are obtained, the tube can be reheated in the hot water bath to redissolve the solute.

OBSERVATIONS AND DATA

test tube	grams $KClO_3$ in 10.0 ml H_2O	crystallization temperature	conversion to g $KClO_3$ / 100 mL H_2O
#1	1.0 grams	30 °C	------------------------
#2	2.0 grams	50 °C	_____
#3	3.0 grams	70 °C	_____
#4	4.0 grams	80 °C	_____

GRAPH Plot mass of solute per 100 mL of water on the y axis and temperature in ° C on the x axis. Title, labels and units are to be included.

CONCLUSIONS AND QUESTIONS

1. **Use your graph** to determine how many grams of $KClO_3$ can be dissolved in 100 mL of H_2O at the following temperatures.   a) 30 o C   b) 60 o C   c) 70 o C

2. **Define** the terms saturated, unsaturated, and supersaturated

3. **Use your graph to classify** the following solutions as saturated, unsaturated or supersaturated

a) 2 g / 100 mL H_2O at 40 o C   b)   6 g / 100 mL H_2O at 50 o C

10 g

4. Do the solubilities of all ionic substances increase with temperature?

5. How does the solubility of a gas change with increasing temperature? **Draw** a rough sketch showing the general shape of a solubility curve of a gas