

HONORS CHEMISTRY SUMMER ASSIGNMENT

SUMMER 2012

Welcome to Honors Chemistry! Interpreting graphs is a skill that is often used in honors chemistry. The goal of this assignment is to give you practice interpreting a solubility graph. The assignment consists of reading the information about Solutions and A Solubility Chart given in this packet. Using the graph called “solubility curves” you are to answer the 16 questions that are on the last page of this packet in the spaces provided.

This summer assignment needs to be completed and turned in to your teacher on the first day of school. This should be done by only you with help from no one. When you are finished, sign your name indicating that you have followed the guidelines given. Also, print your name on the line below your signature. On the line marked time, indicate how long you spent on this activity.

We look forward to meeting you in August. Enjoy your summer!

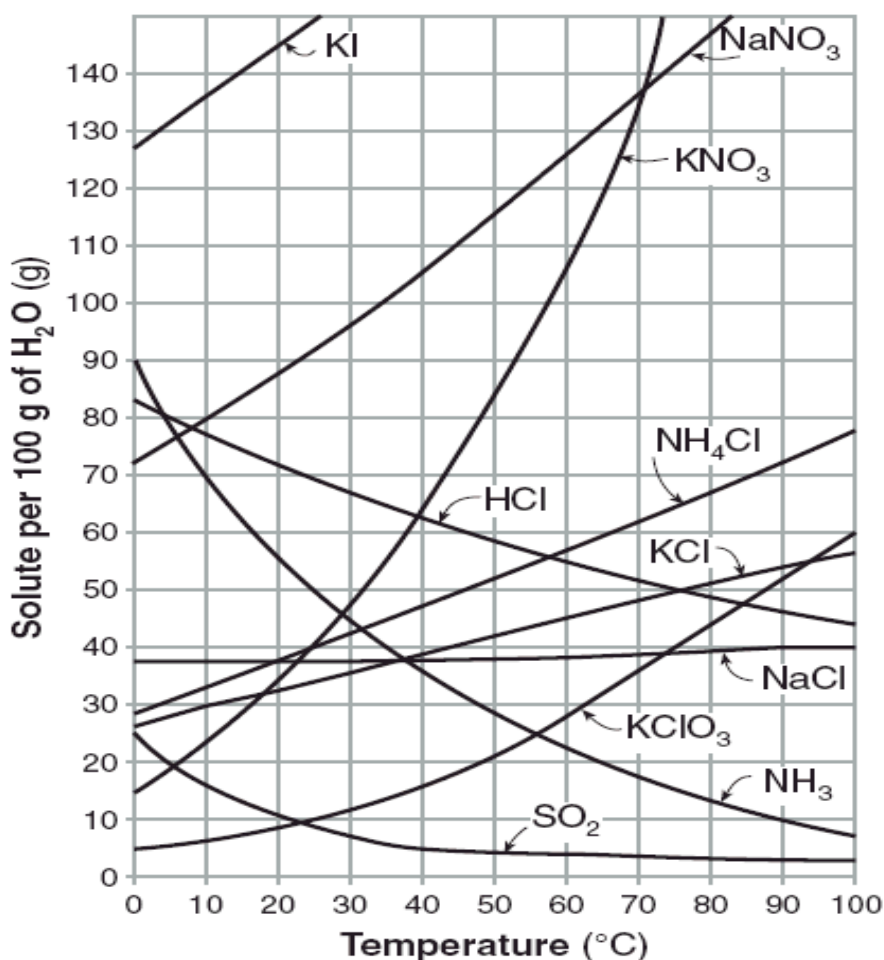
Mrs. Rose and Mrs. Obert

SOLUTIONS AND A SOLUBILITY CHART

Solutions are homogeneous mixtures of two or more pure substances. Solutions contain a **solute**, the substance that is dissolved, and usually the substance that there is less of, and a **solvent**, the substance that does the dissolving. Solutes and solvents can be in various states of matter, but for this activity, the solvent will be water, H_2O , in the liquid state, and the solutes will be mostly solids and some gases. In this activity, you are asked to interpret a graph that contains some solubility curves. Solubility graphs usually have the temperature of the solution indicated on the x-axis and how many grams of a given substance will dissolve in 100 g of H_2O at that temperature, on the y-axis. The curve for the solute indicates how many grams of the pure solute can be dissolved in 100 g of H_2O . When this occurs, the solution is said to be **saturated**. If the solution contains fewer grams of the solute than it can hold at a given temperature, the solution is **unsaturated**.

1. The curve shows the number of grams of solute in a saturated solution containing 100 g of water at a certain temperature. (Note: 100 grams of water has a volume of 100 mL)
2. Any amount of solute below the line indicates the solution is unsaturated at a certain temperature.
3. If the amount of solute is above the line, but has not all dissolved, the solution is saturated and the grams of solute settled on the bottom of the container is found by subtracting the number of grams of solute dissolved in the saturated solution at that temperature, (obtained from the curve), from the total grams of solute added.

Table G Solubility Curves



You are NOT expected to know the chemical names of the formulas listed on the graph.

Sample Questions:

Hint: Use proportions to solve the problems.

1. How many grams of KNO_3 will dissolve in 100 g of H_2O at 40°C ? Answer: 65 grams
2. How many grams of KCl will dissolve in 200 g of H_2O at 40°C ? Answer: 78 grams
3. How many grams of NaCl will dissolve in 50 g of H_2O at 90°C ? Answer: 20 grams
4. How many grams of solid NH_4Cl would remain undissolved if 70 g of NH_4Cl was mixed with 100 grams of H_2O at 50°C ? Answer: 18 grams
5. How many grams of NaNO_3 will dissolve in 60 mL of water at 10°C ? Answer: 48 grams

Use this space for any calculations needed to answer the questions below.

QUESTIONS REFERRING TO THE SOLUBILITY GRAPH

1. Which of the substances shown on the graph is the least soluble in water at 10°C ? _____
2. Which of the salts shown on the graph has the greatest increase in solubility as the temperature increases? from 30 to 60°C ? _____
3. Which of the salts has its solubility affected the least by a change in temperature? _____
4. At 20°C , a saturated solution of NaNO_3 contains 88 grams of solute in 100 mL of water. How many grams of NaNO_3 must be added to the solution to saturate at 50°C ? _____
5. At what temperature do saturated solutions of KNO_3 and NaNO_3 contain the same mass of solute per 100 mL of water? _____
6. What two substances have the same degree of solubility at approximately 19°C ? _____

7. How many grams of KClO_3 must be added to 500 g of water to produce a saturated solution at 50°C ? _____
8. A saturated solution of KNO_3 is prepared at 60°C using 100 mL of water. How many grams of solute will fall out of solution if the temperature is suddenly cooled to 30°C ? _____

9. What is the average rate of increase for the solubility of KNO_3 , in grams per 100 mL per $^{\circ}\text{C}$, in the temperature range of 60°C to 70°C ? _____
10. If 50. mL of water that is saturated with KClO_3 at 25°C is slowly evaporated to dryness, how many grams of the dry KClO_3 would be recovered? _____
11. Thirty grams of KCl are dissolved in 100 mL of water at 45°C . How many additional grams of KCl are needed to make the solution saturated at 80°C ? _____
12. What is the smallest volume of water, in mL, required to completely dissolve 39 grams of KNO_3 at 10°C ? _____
13. What is the lowest temperature at which 30. grams of KCl can be dissolved in 100. mL of water? _____

14. Are the following solutions saturated, or unsaturated?
 - a. 40. g of KCl in 100 mL of water at 80°C ? _____
 - b. 100. g of KNO_3 in 100 mL of water at 60°C ? _____
 - c. 80. g of NaNO_3 in 100 mL of water at 10°C ? _____
15. From the graph, what is the trend for the solubility of gases such as NH_3 , SO_2 , and HCl in a liquid?

16. From the graph, what is the general trend for the solubility of solids in H_2O ? _____

Signature _____

Name Printed _____

Time Spent on this Activity _____ hrs. _____ minutes