Reading a Solubility Chart

1) The curve shows the # of grams of solute in a saturated solution containing 100 mL or 100 g of water at a certain temperature.

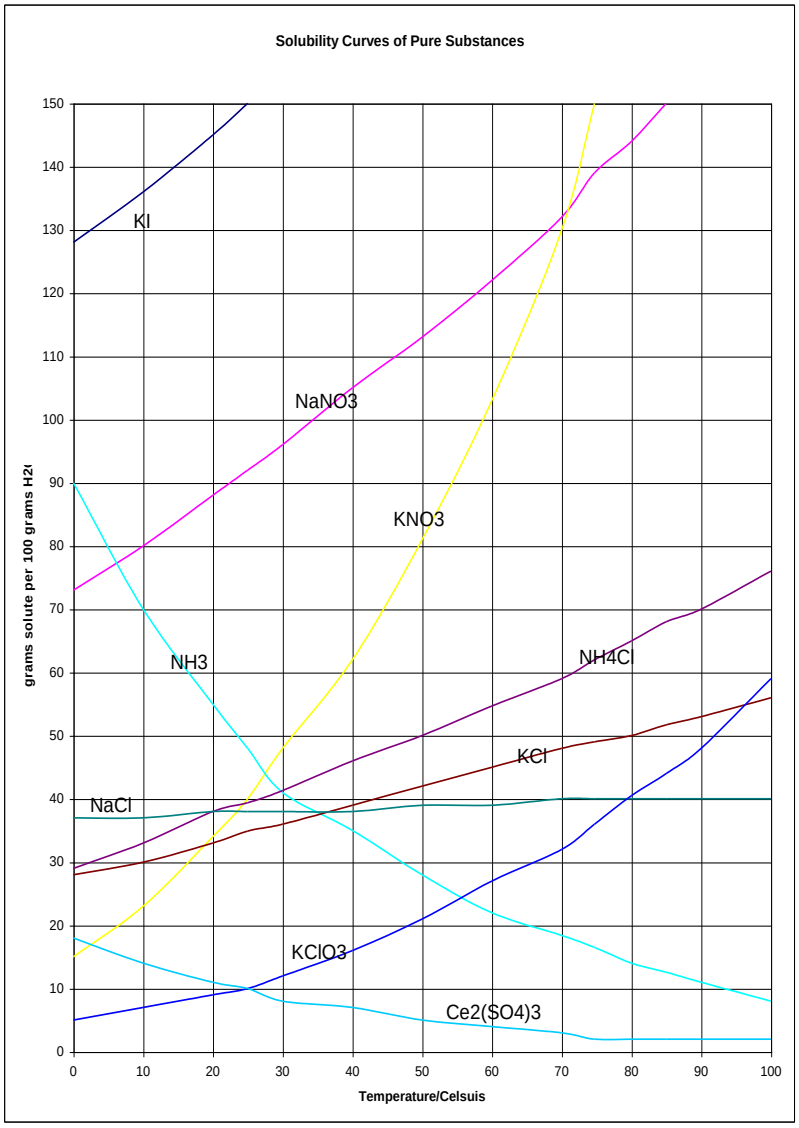
2) Any amount of solute below the line indicates the solution is unsaturated at a certain temperature

3) Any amount of solute above the line in which all of the solute has dissolved shows the solution is supersaturated.

4) 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 = total # g in solution – # g of a saturated solution at that temperature. (according to the curve)

5) Solutes whose curves move upward w/ increased temperature are typically solids b/c the solubility of solids increases w/ increased temperature.

6) Solutes whose curves move downward w/ increased temperature are typically gases b/c the solubility of gases decreases with increased temperature.



Solubility Problems to solve

1. At 10°C, 80 g of $NaNO_3$ will dissolve in 100 mL (a saturated solution)

2. To find the # grams needed to saturate a solution when the volume is NOT 100 mL use the following strategy to find answer:

Start w/ known vol. x Solubility/100mL at set temp. = amount of Solute needed to saturate

Ex. 60 mL H_2O x $\frac{80\text{ g }NaNO_3}{100\text{ mL }H_2O}$ = 48 g $NaNO_3$ needed to saturate solution

or if the chart is in units of 100 g of H_2O use the density of water conversion 1mL H_2O= 1 g H_2O

Ex. 60 mL H_2O x $\frac{1\text{ g }H_2O}{1\text{ mL }H_2O}$ x $\frac{80\text{ g }NaNO_3}{100\text{ g }H_2O}$ = 48 g $NaNO_3$

WS - Reading the Solubility Chart Problems

1. Which of the salts shown on the graph is the least soluble in water at 10^oC?
2. Which of the salts shown on the graph has the greatest increase in solubility as the temperature increases from 30 degrees to 60 degrees?
3. Which of the salts has its solubility affected the least by a change in temperature?
4. At 20^oC, a saturated solution of sodium nitrate contains 100 grams of solute in 100 ml of water. How many grams of sodium nitrate must be added to saturate the solution at 50^oC?
5. At what temperature do saturated solutions of potassium nitrate and sodium nitrate contain the same weight of solute per 100 mL of water?
6. What two salts have the same degree of solubility at approximately 19^oC?
7. How many grams of potassium chlorate must be added to 1 liter of water to produce a saturated solution at 50^oC?
8. A saturated solution of potassium nitrate is prepared at 60^oC using 100.mL of water. How many grams of solute will precipitate out of solution if the temperature is suddenly cooled to 30^oC?
9. What is the average rate of increase for the solubility of KNO_3 in grams per 100 mL per degree Celsius in the temperature range of 60^oC to 70^oC?
10. If 50. mL of water that is saturated with $KClO_3$ at 25^oC is slowly evaporated to dryness, how many grams of the dry salt would be recovered?
11. Thirty grams of KCl are dissolved in 100 mL of water at 45^oC. How many additional grams of KCl are needed to make the solution saturated at 80^oC?
12. What is the smallest volume of water, in mL, required to completely dissolve 39 grams of KNO_3 at 10^oC?
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, unsaturated or supersaturated (assume that all three could form supersaturated solutions)
    a. 40. g of KCl in 100 mL of water at 80^oC
    b. 120. g of KNO_3 in 100 mL of water at 60^oC
    c. 80. g of $NaNO_3$ in 100 mL of water at 10^oC
15. Assume that a solubility curve for a gas such as ammonia, at one atmosphere of pressure, was plotted on the solubility curve graph. Reading from left to right, would this curve would _____
    a. slope upward b. slope downward c. go straight across