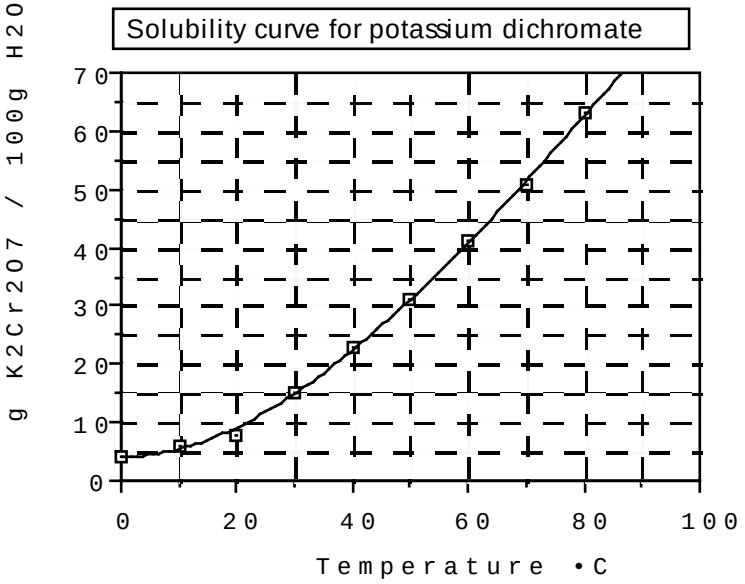
Solutions
Chemistry 110

1) Solubility



Using the above solubility curve answer the following questions:

a] What is the solubility of $K_2Cr_2O_7$ at 55 ^oC? **approximately __36_**g/100 ml

b] What is the maximum number grams of $K_2Cr_2O_7$ that will dissolve in 35 grams of water at 30^oC? **35g**

$$\mathbf{H_2O\ X\ \frac{14g\ K_2CrO_7}{100g\ H_2O}\ = 4.9\ g}$$ **approximately ___4.9 g____**

c] If $K_2Cr_2O_7$ does not supersaturate, tell how many grams will precipitate out per 100 g of solvent when a solution containing 30 g per 100 g of water at 60^oC is cooled to 20^oC **(30-8)g = __22g__**

d] For each of the following, indicate what kind of solution exists.....
(a) saturated, (b) unsaturated

-If the solution contains 2 g $K_2Cr_2O_7$ in 10 g water at 40^oC **_____b_____**

-If the solution contains 20 grams in 50 g water at 60^oC **_____a_____**

-If the solution contains 90 g in 300 g water at 70 ^oC **_____b_____**

2] A 0.200 g sample of tissue from a dead bald eagle is found to contain 2.42 µg of DDT. Express this DDT concentration as mass percent.

$$\mathbf{\frac{2.42\ x\ 10^{-6}g}{0.200g\ sample}\ (100)\ = 1.21\ x\ 10^{-3}\ \%}$$

3] How would you prepare 250.0 g of a 1.00% by mass of a silver nitrate solution?

$$\mathbf{250.0g\ soln\ X\ \frac{1.00g\ AgNO_3}{100g\ soln}\ = 2.50\ g\ AgNO_3}$$

Answer: Mix **___2.50___**g of silver nitrate with **___247.5__**g of water

4] How many milliters of solution are required to provide 4.00 g sodium acetate from a 2.00 M sodium acetate solution?

$$\mathbf{4.00g\ Na_2C_2H_3O_2\ X\ \frac{1mol\ Na_2C_2H_3O_2}{82.0g\ Na_2C_2H_3O_2}\ X\ \frac{1L\ soln}{2.00mol\ Na_2C_2H_3O_2}\ X\ \frac{1ml}{10^{-3}L}\ = 24.4ml\ soln}$$

5] After 25 ml of 0.50 M sulfuric is added to 0.075 liters of water, what is the molar concentration of the resulting solution? [Assume the volumes are additive]

V_f = 25 ml + 75 ml = 100 ml

$$M_2 = \frac{25ml \times 0.50M}{100ml} = 0.13M$$

6] What is the molality of a solution made by dissolving 20.0 g of sodium chloride in 225 g of water?

$$20.0g\ NaCl \times \frac{1mol\ NaCl}{58.5g} = 0.342\ mol$$

$$225g\ H_2O \times \frac{1Kg\ H_2O}{10^3g\ H_2O} = 0.225\ Kg$$

$$m = \frac{0.342mol\ NaCl}{0.225Kg\ H_2O} = 1.52\ m$$

7] How many grams of chloride are contained in 25 ml of a 2.37 M aluminum chloride solution?

$$25\ ml\ soln \times \frac{2.37moles\ AlCl_3}{1000ml} \times \frac{3mol\ Cl}{1mol\ AlCl_3} \times \frac{35.5g\ Cl}{1mol} = 6.3\ g\ Cl$$

8] How many milliters of 3.5 M KBr is needed to prepare 355 ml of 0.50 M solution?

$$V_1 = \frac{355ml \times 0.50M}{3.5M} = 51\ ml$$

9] 14 grams of methanol, CH_3OH, are dissolved in 100.0 g of water

a) Find the molality of the solution.

$$14g\ CH_3OH \times \frac{1molCH_3OH}{32.0g} = 0.44\ mol\ CH_3OH$$

$$100.0g\ H_2O \times \frac{1Kg}{10^3g} = 0.1000\ Kg\ H_2O$$

$$m = \frac{0.44mol\ CH_3OH}{0.1000Kg\ H_2O} = 4.4\ m$$

b) Find the percent alcohol by mass in this solution.

g soln = 14g CH_3OH + 100g H_2O = 114 g soln

$$\%\ mass = \frac{14g\ CH_3OH}{114g\ soln}(100) = 12.3\ \%$$