WORKSHEET 9
CHEMISTRY 110

Set-ups must be shown where applicable. You will not receive credit for only answers shown. Problem sets are due within the first five minutes of lecture on the due date.

1) Solubility

Using the above solubility curve answer the following questions:

a] What is the solubility of \( \text{K}_2\text{Cr}_2\text{O}_7 \) at 55 °C? approximately \( 36 \) g/100 ml

b] What is the maximum number grams of \( \text{K}_2\text{Cr}_2\text{O}_7 \) that will dissolve in 35 grams of water at 30°C?

\[
\text{H}_2\text{O} \times \frac{14\text{g K}_2\text{Cr}_2\text{O}_7}{100\text{g H}_2\text{O}} = 4.9 \text{ g}
\]

approximately \( 4.9 \) g

c] If \( \text{K}_2\text{Cr}_2\text{O}_7 \) 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°C is cooled to 20°C (30-8)= \( 22 \) g

d] For each of the following, indicate what kind of solution exists.......
   (a) saturated, (b) unsaturated
   -If the solution contains 2 g \( \text{K}_2\text{Cr}_2\text{O}_7 \) in 10 g water at 40°C
   -If the solution contains 20 grams in 50 g water at 60°C
   -If the solution contains 90 g in 300 g water at 70°C

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.

\[
\frac{2.42 \times 10^{-6} \text{g}}{0.200 \text{g sample}} (100) = 1.21 \times 10^{-3} \%
\]

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

\[
250.0 \text{g soln} \times \frac{1.00 \text{g AgNO}_3}{100 \text{g soln}} = 2.50 \text{g AgNO}_3
\]

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?

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4.00g Na$_2$C$_2$H$_3$O$_2$ \times \frac{1\text{mol Na}_2\text{C}_2\text{H}_3\text{O}_2}{82.0g \text{Na}_2\text{C}_2\text{H}_3\text{O}_2} \times \frac{1\text{L soln}}{2.00\text{mol Na}_2\text{C}_2\text{H}_3\text{O}_2} \times \frac{1\text{ml}}{10^{-3}\text{L}} = 24.4\text{ml 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]

\[ V_f = 25 \text{ ml} + 75 \text{ ml} = 100 \text{ ml} \]

\[ M_2 = \frac{25\text{ml} \times 0.50\text{M}}{100\text{ml}} = 0.13\text{M} \]

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

\[ 20.0\text{g NaCl} \times \frac{1\text{mol NaCl}}{58.5\text{g}} = 0.342 \text{ mol} \]

\[ 225\text{g H}_2\text{O} \times \frac{1\text{Kg H}_2\text{O}}{10^3\text{g H}_2\text{O}} = 0.225 \text{ Kg} \]

\[ m = \frac{0.342\text{mol NaCl}}{0.225\text{Kg H}_2\text{O}} = 1.52 \text{ m} \]

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

\[ 25 \text{ ml soln} \times \frac{2.37\text{moles AlCl}_3}{1000\text{ml}} \times \frac{3\text{mol Cl}}{1\text{mol AlCl}_3} \times \frac{35.5\text{g Cl}}{1\text{mol}} = 6.3 \text{ g Cl} \]

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

\[ V_1 = \frac{355\text{ml} \times 0.50\text{M}}{3.5\text{M}} = 51 \text{ ml} \]

9] 14 grams of methanol, CH$_3$OH, are dissolved in 100.0 g of water

a) Find the molality of the solution.

\[ 14\text{g CH}_3\text{OH} \times \frac{1\text{mol CH}_3\text{OH}}{32.0\text{g}} = 0.44 \text{ mol CH}_3\text{OH} \]

\[ 100.0\text{g H}_2\text{O} \times \frac{1\text{Kg H}_2\text{O}}{10^3\text{g}} = 0.1000 \text{ Kg H}_2\text{O} \]

\[ m = \frac{0.44\text{mol CH}_3\text{OH}}{0.1000\text{Kg H}_2\text{O}} = 4.4 \text{ m} \]

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

\[ \text{g soln} = 14\text{g CH}_3\text{OH} + 100\text{g H}_2\text{O} = 114 \text{ g soln} \]

\[ \% \text{ mass} = \frac{14\text{g CH}_3\text{OH}}{114\text{g soln}} \times 100 = 12.3 \% \]