WS 18.1 KEY **Name:**_____ p.____

1. What is the molarity of a solution containing 1.00 grams of KNO_3 per 50.0 mL of solution?

$1.00\,g\ KNO_3\left(\frac{1\,mol}{101.10\,g}\right) = \frac{0.00989\,mol\ KNO_3}{0.0500\,L} = \boxed{0.198\ M\ KNO_3}$

2a. If you take 100. mL of a 1.50 M $CuCl_2$ solution, and add water to this solution until the total solution volume is 500.0 mL, what will be the new concentration of the solution?

$(100.mL)\left(1.50\,\frac{mol}{L}\right) = (500.mL)(M_2)$

$\boxed{M_2 = 0.300\ M\ CuCl_2}$

b. What do the variables represent in this formula?

$M_1V_1 = M_2V_2$ (initial, final)

M = molarity

V = volume

c. Solve problem 2**a** using the formula: $M_1V_1 = M_2V_2$.

3. A copper (II) nitrate solution with a volume of 80.0 mL has a concentration of 1.8 M.

a. If the 80.0 mL of solution are diluted to 225 mL, what will be the new concentration?

$(80.0mL)(1.8\ M) = 225\,mL\,(M_2)$

$\boxed{M_2 = 0.64\ M\ Cu(NO_3)_2}$

b. Suppose you wanted to make the original solution more concentrated (without adding more copper nitrate) by increasing its molarity to 3.0 M. What new volume would the solution have to have, and how would you accomplish this?

$(1.8\,M)(80.0mL) = (3.0M)(V_2)$

Evaporation

$\boxed{V_2 = 50.\bullet\ mL}$

4. If you have a stock solution of 18.0 Molar H_2SO_4 (VERY NASTY!!!), how many milliliters of this solution will you need to use, in order to make 2.00 liters of 3.00 Molar H_2SO_4?

(In class we will discuss some specific safety precautions for this procedure!)

$(18.0\,M)(V_1) = (3.00M)(2.00L)$

$V_1 = 0.333\,L = \bullet\ \boxed{333\ mL\ H_2SO_4}$

5. What is the molarity of sugar ($C_{12}H_{22}O_{11}$) in a soft drink that contains 35 grams of sugar per 355 mL of solution? (This is about what the numbers are for a coke)

35 grams = 0.10 mol

$\frac{0.10\,mol\ C_{12}H_{22}O_{11}}{0.355\,L} = \boxed{0.29\ M\ C_{12}H_{22}O_{11}}$

6. If 2.50 liters of 0.12 Molar $CuCl_2$ solution are boiled away, leaving just the copper (II) chloride crystals, how many grams of crystals would be found?

$2.50L\left(\frac{0.12\,mol}{L}\right) = 0.30\ mol\ CuCl_2\left(\frac{134.45\,g}{1\,mol\ CuCl_2}\right) = \boxed{40.\ g\ CuCl_2}$

7. "Mini-Lab": Making a solution of $NaHCO_3$. In lab, you will make100.0 mL of 0.150 Molar $NaHCO_3$ solution. a. Calculate how many grams of $NaHCO_3$ are needed to make 100.0 mL of 0.150 M $NaHCO_3$.

DO IN LAB

b. Describe how you will make the solution. Include what equipment you will use and what steps you will take.

342.30 g/mol

8. A solution was made by dissolving 30.0 grams of sugar ($C_{12}H_{22}O_{11}$) into 160. mL of water. The total solution volume came to 182.2 mL.

a. Determine the molarity of the solution.

$$\frac{0.0876 \text{ mol}}{0.1822 \text{ L}} = \boxed{0.481 \text{ M } C_{12}H_{22}O_{11}}$$

b. What is the total mass of the solution?

$$30.0 \text{ g} + 160. \text{ g} = \boxed{190. \text{ g}}$$

c. Determine the percent sugar in the solution.

$$\frac{30.0 \text{ g}}{190. \text{ g}} \times 100 = 15.8\% \text{ sugar by mass}$$

d. Determine the density of this solution.

$$\frac{190. \text{ g}}{182.2 \text{ mL}} = 1.04 \text{ g/mL}$$

9a. Determine how many grams of $CuSO_4$ you need to use, to make a 2.00 liter solution of 1.8 M $CuSO_4$.

$$\frac{1.8 \text{ mol } CuSO_4}{\text{L}} \cdot 2.00 \text{ L} = 3.6 \text{ mol } CuSO_4 \left(\frac{159.6 \text{ g}}{1 \text{ mol}}\right) = \boxed{570 \text{ g } CuSO_4}$$

b. Suppose that after you made the solution in (a), your lab partner measured out 65.0 mL of the solution and then added water until the new volume was 250.0 mL. What is the molarity of this new solution?

$$(1.8 \text{ M})(65.0 \text{ mL}) = M_2(250.0 \text{ mL})$$

$$\boxed{M_2 = 0.47 \text{ M } CuSO_4}$$