Worksheet #2 ~ Molarity

1. How do you make 3.5 L of a 4.5 M solution of $Mg(OH)_2$.

$L \cdot M = \frac{moles}{L} \cdot L$

$moles = M \cdot L$

$= (4.5M)(3.5L)$

$= 15.75 mole \cdot \frac{58.33g}{1 mole} = 919g\ Mg(OH)_2$

2. How do you make 2.1 L of a .75 M solution of $Al(NO_3)_3$.

$L \cdot M = \frac{mole}{L} \cdot L$

$moles = M \cdot L$

$= (0.75M)(2.1L)$

$= 1.575 mole \frac{213.01g}{1 mole} = 335g\ Al(NO_3)_3$

3. How do you make .35 L of a 1.5 M solution of $BaCl_2$.

$L \cdot M = \frac{mole}{L} \cdot L$

$mole = M \cdot L$

$= (1.5M)(0.35L)$

$= 0.525 mole \frac{208.23g}{1 mole} = 109g\ BaCl_2$

4. 3.4 g of NaCl is dissolved in 500 mL of water. What is the molarity?

$3.4g\ NaCl \frac{1 mole}{58.44g} = 0.058 mole$

$500mL \frac{1L}{1000mL} = 0.500L$

$M = \frac{mole}{L} = \frac{0.058 mole}{0.500L} = 0.116M$

5. 7.6 g of NaOH is dissolved in 350 mL of water. What is the molarity?

$7.6g\ NaOH \frac{1 mole}{40.00g} = 0.19 moles$

$350mL \frac{1L}{1000mL} = 0.350L$

$M = \frac{moles}{L} = \frac{0.19 moles}{0.350L} = 0.54M$

Worksheet #3: Molarity and Dilutions

Solve the molarity problems below.

1. What is the molarity of a solution in which 58 g of NaCl are dissolved in 1.0 L of solution?

$58\text{ g NaCl} \times \frac{1\text{ mole}}{58.44\text{ g}} = 0.99\text{ moles}$

$M = \frac{\text{moles}}{L} = \frac{0.99\text{ moles}}{1.0\text{ L}} = 0.99\text{ M}$

2. What is the molarity of a solution in which 10.0 g of $AgNO_3$ is dissolved in 500 mL of solution?

$10.0\text{ g } AgNO_3 \times \frac{1\text{ mole}}{169.88\text{ g}} = 0.059\text{ moles}$

$500\text{ mL} \times \frac{1\text{ L}}{1000\text{ mL}} = 0.500\text{ L}$

$M = \frac{\text{moles}}{L} = \frac{0.059\text{ moles}}{0.500\text{ L}} = 0.118\text{ M}$

3. How many grams of KNO_3 should be used to prepare 2.00 L of a 0.500 M solution?

$L \cdot M = \text{moles}, L$

$\text{moles} = M \cdot L$

$= (0.500\text{ M})(2.00\text{ L})$

$= 1.00\text{ moles} \times \frac{101.11\text{ g}}{1\text{ mole}} = 101.11\text{ g}$

4. To what volume should 5.0 g of KCl be diluted in order to prepare a 0.25 M solution?

$5.0\text{ g KCl} \times \frac{1\text{ mole}}{74.55\text{ g}} = 0.067\text{ moles}$

$L \cdot M = \text{moles}, L$

$\frac{\text{moles}}{M} = \frac{M \cdot L}{M}$

$L = \frac{\text{moles}}{M} = \frac{0.067\text{ moles}}{0.25\text{ M}} = 2.68\text{ L}$

5. How many grams of $CuSO_4 \cdot 5H_2O$ are needed to prepare 100 mL of a 0.10 M solution?

$100\text{ mL} \times \frac{1\text{ L}}{1000\text{ mL}} = 0.100\text{ L}$

$L \cdot M = \text{moles}, L$

$\text{moles} = M \cdot L$

$= (0.10\text{ M})(0.100\text{ L})$

$= 0.0100\text{ mole} \times \frac{249.69\text{ g}}{1\text{ mole}} = 2.5\text{ g}$

Solve the dilution problems below. Acids are usually acquired from chemical supply houses in concentrated form. These acids are diluted t the desired concentration by adding water Since moles of acid before dilution = moles of acid after dilution, and moles of acid = M x V, then $M_1 \times V_1 = M_2 \times V_2$.

1. How much concentrated 18 M sulfuric acid is needed to prepare 250 mL of a 6.0 M solution?

$M_1 V_1 = M_2 V_2$

$\frac{(18\,M)(x)}{18\,M} = \frac{(6.0\,M)(250\,mL)}{18\,M}$

$x = 83.3\ mL$

2. How much concentrated 12 M hydrochloric acid is needed to prepare 100 mL of a 2.0 M solution?

$M_1 V_1 = M_2 V_2$

$\frac{(12\,M)(x)}{12\,M} = \frac{(2.0\,M)(100\,mL)}{12\,M}$

$x = 16.7\ mL$

3. To what volume should 25 mL of 15 M nitric acid be diluted to prepare a 3.0 M solution?

$M_1 V_1 = M_2 V_2$

$\frac{(15\,M)(25\,mL)}{3.0\,M} = \frac{(3.0\,M)(x)}{3.0\,M}$

$x = 125\ mL$

4. To how much water should 50 mL of 12 M hydrochloric acid be added to produce a 4.0 M solution?

$M_1 V_1 = M_2 V_2$

$\frac{(12\,M)(50\,mL)}{4.0\,M} = \frac{(4.0\,M)(x)}{4.0\,M}$

$x = 150\ mL$

5. To how much water should 100 mL of 18M sulfuric acid be added to prepare a 1.5 M solution?

$M_1 V_1 = M_2 V_2$

$\frac{(18\,M)(100\,mL)}{1.5\,M} = \frac{(1.5\,M)(x)}{1.5\,M}$

$x = 1200\ mL$