Name Answer Key Hour _____

# Molality & Percent Solutions

**Honors Chemistry**

1. Calculate the molality when 8.6-g of KCl was added to 100-g of water.

$$\frac{8.6\text{-g KCl}}{74.5\text{-g}} \times \frac{1\text{ mole}}{} = .115\text{ mol}$$

$$\frac{.115\text{ mol KCl}}{.100\text{-Kg } H_2O} = \boxed{1.15\text{ mol/Kg}}$$

2. If you added 65.3-g of $NaNO_3$ to 750.0-mL of water, what is the molality?

$$\frac{65.3\text{-g } NaNO_3}{85\text{-g}} \times \frac{1\text{ mole}}{} = .768\text{ mol}$$

$$\frac{.768\text{ mol } NaNO_3}{.750\text{-Kg } H_2O} = \boxed{1.02\text{ mol/Kg}}$$

3. Calculate the molality when 4.32-g of $CaCl_2$ was added to 0.765-L of water?

$$\frac{4.32\text{-g } CaCl_2}{111\text{-g}} \times \frac{1\text{ mole}}{} = .039\text{ mol}$$

$$\frac{.039\text{ mol}}{.765\text{-Kg } H_2O} = \boxed{.051\text{ mol/kg}}$$

4. What is the mole fraction of HCl in an aqueous solution containing 41.7% HCl by mass?

$$\frac{41.7\text{-g HCl}}{36.5\text{-g}} \times \frac{1\text{ mol}}{} = 1.14\text{ mol HCl}$$

$$\frac{58.3\text{-g } H_2O}{18\text{-g}} \times \frac{1\text{ mol}}{} = 3.24\text{ mol } H_2O$$

$$X_{HCl} = \frac{1.141\text{ mol HCl}}{(1.14 + 3.24)} = \frac{1.14}{4.38} =$$

$$\boxed{X_{HCl} = .260}$$

5. What is the mole fraction of NaOH in an aqueous solution containing 27.6% NaOH by mass?

$$\frac{27.6\text{-g NaOH}}{40\text{-g}} \times \frac{1\text{ mol}}{} = .69\text{ mol NaOH}$$

$$\frac{72.4\text{-g } H_2O}{18\text{-g}} \times \frac{1\text{ mol}}{} = 4.02\text{ mol } H_2O$$

$$X_{NaOH} = \frac{.69}{(.69 + 4.02)} = \frac{.69}{4.71}$$

$$\boxed{X_{NaOH} = .146}$$

6. What is the percent volume of ethanol if a 500.0-mL solution contains 23.75-mL of ethanol?

$$\% \text{ by Volume} = \frac{23.75\text{-mL Ethanol}}{500.0\text{-mL Solution}} \times 100 = \boxed{4.75\ \%\ v/v}$$

7. A 2.50-L solution of methanol contains 450-mL of methanol? What is its percent volume of methanol?

$$\% \text{ by Volum} = \frac{450\text{-mL methanol}}{2500\text{-mL Solution}} \times 100 = \boxed{18\%\ v/v}$$

8. What is the percent mass of glucose if a 600.0-mL solution contains 18.0-g of glucose?

$$\% \text{ by Mass} = \frac{18\text{-g Glucose}}{600\text{-g Solution}} \times 100 = \boxed{3\%\ m/m}$$

9. A solution contains 2.0-g of copper sulfate in a 200.0-mL solution? What is the percent mass?

$$\% \text{ by Mass} = \frac{2.0\text{-g Copper}}{200.0\text{-g solution}} \times 100 = \boxed{1\%\ m/m}$$

10. A solution is made by adding 2.3 moles of KCl to 1000.0-g of water. What is the percent mass of KCl?

$$2.3\text{ mol KCl} \left| \frac{74.5\text{-g}}{1\text{ mol}} \right. = 171.4\text{-g}$$

$$\% \text{ by Mass} = \frac{171.4\text{-g KCl}}{1171.4\text{-g Solution}} \times 100$$

$$= \boxed{14.6\ \%\ m/m}$$

11. What mass of water must be added to 343.0-g of NaCl to make a 19.6% salt water solution?

$$.196 = \frac{343.0\text{-g NaCl}}{\text{g of Solution}}$$

Total mass of Solution = 1750-g

Subtract mass of solute − 343.0-g

$$\boxed{\text{Mass of Water} = 1407\text{-g}}$$

12. How much 1.40-*M* $BaCl_2$ stock solution is needed to prepare 600-mL of 3.00% (m/m) aqueous $BaCl_2$?

1.) Find Molarity $\quad .03 = \frac{\text{Mass of } BaCl_2}{600\text{-g Solution}}$

$$18\text{-g } BaCl_2 \left| \frac{1\text{ mole}}{208\text{-g } BaCl_2} \right. = \frac{.087\text{ mol}}{.6\text{-L}} = .145\text{-M}$$

2.) Dilution Formula

$$V_1 = \frac{M_2 \times V_2}{M_1} = \frac{.145\text{-M} \times .6\text{-L}}{1.40\text{-M}}$$

$$\boxed{V_1 = .062\text{-L}}$$