Chemistry 101 – Unit 9
Practice Problem Answers

1. 161 grams of Na_2CO_3 are dissolved in enough water to make 4.6 L of solution.

a. What is a solution? **Homogenous Mixture**

b. What is the solute in this example? **Na_2CO_3**

c. What is the solvent in the example? **Water**

d. How many moles of Na_2CO_3 are being dissolved in this example?

$$161 \text{ g } Na_2CO_3 \times \frac{1 \text{ mole } Na_2CO_3}{105.99 \text{ g}} = 1.52 \text{ moles}$$

e. What is the molarity (M) of the solution prepared in this example?

$$\frac{1.52 \text{ moles}}{4.62 \text{ L}} = 0.33 \text{ M}$$

f. If 225 mL of this example solution are poured into a flask, how many moles of Na_2CO_3 have been put into the flask?

$$225 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{0.33 \text{ moles}}{1 \text{ L}} = 0.074 \text{ moles}$$

2.

a. How many grams of $CaCl_2$ must be added to water to make 200. mL of a solution that is 0.875 M $CaCl_2$?

$$\frac{0.875 \text{ mol } CaCl_2}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 200 \text{ mL} \times \frac{110.98 \text{ g } CaCl_2}{1 \text{ mol}} = 19.4 \text{ g}$$

b. What is the solvent in this example? **Water**

c. What is the solute in this example? **$CaCl_2$**

d. How many moles of $CaCl_2$ would be in 68.9 mL of the 0.875 M solution?

$$\frac{0.875 \text{ mol } CaCl_2}{1 \text{ L}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times 68.9 \text{ mL} = 0.0603 \text{ moles}$$

3. What volume, in mL, of 0.4050 M calcium chloride reacts completely with 25.00 mL of 0.2800 M silver nitrate?

$$2\ AgNO_3 + CaCl_2 \rightarrow 2\ AgCl + Ca(NO_3)_2$$

Given: **25.00 mL of $AgNO_3$ solution**

Wanted: **# mL 0.4050 M $CaCl_2$ solution**

Path: **mL $AgNO_3$ → L $AgNO_3$ → mol $AgNO_3$ → mol $CaCl_2$ → L $CaCl_2$ → mL $CaCl_2$**

Factors: $\frac{1\ L}{1000\ mL}$ $\frac{1\ mol\ CaCl_2}{2\ mol\ AgNO_3}$

$$\frac{0.2800\ Mole\ AgNO_3}{1\ L\ AgNO_3} \times \frac{1\ L}{1000\ mL} \times 25.00\ ml \times \frac{1\ mole\ CaCl_2}{2\ mole\ AgNO_3} \times \frac{1\ L}{0.4050\ mole\ CaCl_2} \times \frac{1000\ mL}{1\ L} = 8.642\ m$$

4. For $2\ AgNO_3 + MgBr_2 \rightarrow 2\ AgBr(s) + Mg(NO_3)_2$

a. How many grams of AgBr can be prepared when 58.0 mL of 0.264 M $AgNO_3$ react with excess $MgBr_2$?

Path: **mL $AgNO_3$ → mol $AgNO_3$ → mol AgBr → g AgBr**

$$\frac{0.264\ mole\ AgNO_3}{1\ L} \times \frac{1\ L}{1000\ mL} \times 58.0\ mL \times \frac{2\ mol\ AgBr}{2\ mol\ AgNO_3} \times \frac{187.8\ g}{1\ mole\ AgBr} = 2.88\ g$$

b. How many mL of 0.833 M $AgNO_3$ are required to react with 73.1 mL of 0.552 M $MgBr_2$?

Path: **mL $MgBr_2$ → mol $MgBr_2$ → mol $AgNO_3$ → mL $AgNO_3$**

$$\frac{0.552\ moles\ MgBr_2}{1000\ mL} \times 73.1\ mL \times \frac{2\ moles\ AgNO_3}{1\ mole\ MgBr_2} \times \frac{1000\ mL}{0.833\ mole\ AgNO_3} = 96.9\ mL$$

c. If 205 mL of a $MgBr_2$ solution react completely with 42.95 mL of 0.439 M $AgNO_3$ solution, what must be the molarity of the $MgBr_2$ solution?

Given: 205 mL of $MgBr_2$ solution and 42.95 mL of 0.439M $AgNO_3$

Wanted: Molarity $MgBr_2$ solution

Path: **mL $AgNO_3$ sol'n → mol $AgNO_3$ → mol $MgBr_2$ → mole/ L $MgBr_2$**

$$\frac{0.439 \text{ moles } AgNO_3}{1000 \text{ mL}} \times 42.95 \text{ mL} \times \frac{1 \text{ mole } MgBr_2}{2 \text{ mole } AgNO_3} \times \frac{1}{205 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 0.0460 \text{ M}$$