Warm-Up:

Molarity

When dealing with substances that have been dissolved into a solution, it is necessary to determine the amount of material that is present in a sample of solution. Molarity is the concentration of a solution given in moles of solute per liter of solution. A 1-molar solution of NaCl in water would have 1 mole of salt in 1 liter of solution. A 3-molar solution of NaCl would have 3 moles of salt in 1 liter of solution.

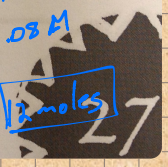
$M = \frac{\text{mole}}{\text{Liter}}$

Calculate the molarities of the following solutions.

a. 3.4 moles of salt in 4.0 liters of solution $\frac{3.4}{4.0} = 0.85\ M$

b. 5.0 moles of potassium chloride in 2.4 liters of solution $\frac{5}{2.4} = 2.08\ M$

c. If you have a 6.0 molar salt solution with a volume of 2.0 liters, how many moles of salt are in it? $6M = \frac{\text{mol}}{2\ L} = 12$ moles



- Many reactions occur in aqueous solution
  - → dissolved in H_2O
  - → Stoichiometry can include Molarity

Ex 1: $Cu_{(s)} + 2\,AgNO_{3(aq)} \rightarrow 2\,Ag_{(s)} + Cu(NO_3)_{2\,(aq)}$ (Excess; 85 mL, 0.1 M; g?)

$$85\text{ mL} \left|\frac{1\text{ L}}{1000\text{ mL}}\right| \frac{0.1\text{ mol } AgNO_3}{1\text{ Liter}} \left|\frac{2\text{ moles Ag}}{2\text{ mol } AgNO_3}\right| \frac{107.87\text{ g}}{1\text{ mol}} = 0.92\text{ g Ag}$$

Ex 2: $Pb(NO_3)_{2(aq)} + 2\,NaI_{(aq)} \rightarrow PbI_{2\,(s)} + 2\,NaNO_{3\,(aq)}$ (15.0 mL, 0.12 M; 35 mL, 0.15 M)

a) Find the moles of $Pb(NO_3)_2$ & NaI

$$\frac{0.12\text{ moles}}{\text{Liter}} \left|0.015\text{ L}\right. = 0.0018\text{ moles } Pb(NO_3)_2$$

$$\frac{0.15\text{ moles}}{\text{Liter}} \left|0.035\text{ L}\right. = 0.0052\text{ moles NaI}$$

b) Determine the limiting/excess reagents.

$$0.0018\text{ mol } Pb(NO_3)_2 \left|\frac{1\text{ mol } PbI_2}{1\text{ mol } Pb(NO_3)_2}\right. = 0.0018\text{ mol } PbI_2$$

$$0.0052\text{ mol NaI} \left|\frac{1\text{ mol } PbI_2}{2\text{ mol NaI}}\right. = 0.0026\text{ mol } PbI_2$$

c) Find grams of PbI_2 produced.

$$0.0018\text{ mol } PbI_2 \left|\frac{461.1\text{ g}}{1\text{ mol}}\right. = 0.83\text{ g } PbI_2$$