Part II: The Mole – A Solution to Every Problem

- A Solution is a homogeneous mixture: the properties are the same no matter what part of the sample one examines.
- Solution concentration is usually expressed in terms of molarity (M), i.e., the number of **moles** of solute per **liter** of solution.

$$M = \frac{mol}{L}$$

- Molarity has the units of M, mol / L, or: mol L^{-1}

3.) ~~2.~~ You prepare solution by dissolving 48.05 g of $Fe_2(SO_4)_3$ in enough water to make 800. mL of solution.

a. What is the molarity of Fe^{3+}?

$$48.05\ g\ Fe_2(SO_4)_3 \times \frac{1\ mol\ Fe_2(SO_4)_3}{399.88\ g\ Fe_2(SO_4)_3} \times \frac{2\ mol\ Fe^{3+}}{1\ mol\ Fe_2(SO_4)_3} = 0.2403\ mol\ Fe^{3+} / 0.800\ L$$

$$= \boxed{0.300\ M\ Fe^{3+}}$$

b. How many iron (III) ions are found in this solution?

$$0.2403\ mol\ Fe^{3+} \times \frac{6.022E23\ Fe^{3+}\ ions}{1\ mol\ Fe^{3+}} = \boxed{1.447 \times 10^{23}\ Fe^{3+}\ ions}$$

c. What fraction of the total number of ions are sulfate ions?

$$2\ Fe^{3+} + 3\ SO_4^{2-} = 5\ total\ ions \Rightarrow SO_4^{2-} = \boxed{\frac{3}{5}}$$

4.) ~~3.~~ How many OH^- ions are contained in 2.5 L of a 0.52 M $Ca(OH)_2$ solution?

$$2.5\ L \times 0.52\ \underbrace{M}_{\frac{mol}{L}} = 1.3\ mol\ Ca(OH)_2 \times \frac{2\ mol\ OH^-}{1\ mol\ Ca(OH)_2} \times \frac{6.022E23\ OH^-\ ions}{1\ mol\ OH^-}$$

$$= \boxed{1.6 \times 10^{24}\ OH^-\ ions}$$