Molarity: A Calculation of Solution Concentration

Molarity describes the concentration of a solution in moles of solute divided by liters of solution. Masses of solute must first be converted to moles using the molar mass of the solute. This is the most widely used unit for concentration when preparing solutions in chemistry and biology. The units of molarity, mol/L, are usually represented by a scripted capital "$\mathcal{M}$". Calculate the concentration, in moles of solute per liter of solution, of each of the following:

Example:

10 grams of NaOH is dissolved in enough water to make 2 L of solution

Step #1 - Convert grams of solute to moles of solute:

$$\frac{10\,g\,NaOH}{}\left|\frac{1\,mol\,NaOH}{40\,g\,NaOH}\right.=0.250\,mol\,NaOH$$

Step #2 – Divide moles of solute by liters of solution:

$$\frac{0.250\,mol\,NaOH}{2\,L}=0.125\,M\,NaOH$$

Objective: Determine the concentration of each of the following solutions in terms of molarity.

Solution #1: 20 grams of NaOH is dissolved in enough water to make 1 liter of solution
Solution #2: 45 grams of glucose, $C_6H_{12}O_6$ is dissolved in enough water to make 0.500 liters of solution
Solution #3: 116 grams of KF is dissolved in enough water to make 4 L of solution
Solution #4: 63 grams of HNO_3 is dissolved in enough water to make 100 liters of solution
Solution #5: 280 grams of CaO is dissolved in enough water to make 10 L of solution

The following problems provide the volume of solution in milliliters. You will need to convert to liters before using these volumes of solution

Solution #6: 17 grams of NH_3 is dissolved in enough water to make 500 milliliters (mL) of solution
Solution #7: 10 grams of HF is dissolved in enough water to make 250 mL of solution
Solution #8: 22 g CO_2 is dissolved in enough water to make 200 mL of solution
Solution #9: 14 g of CaO is dissolved in enough water to make 500 mL of solution
Solution #10: 470 grams K_2O is dissolved in enough water to make 4000 mL of solution
