Concentration of Solutions

Molarity – concentration or strength of a solution

Molarity is often described as “molar”

$$\text{Molarity (M)} = \frac{\text{Amount of Solute (Mol)}}{\text{Volume of Solution (L)}}$$

$$M = \frac{\text{Mol}}{\text{L}}$$

Concentration of Solutions

You have a 3.50 L of solution that contains 90.0 g of sodium chloride, NaCl. What is the molarity of that solution?

$$90.0\ \cancel{g}\ \text{NaCl}\left[\frac{\text{mol}}{58.5\ \cancel{g}}\right] = 1.54\ \text{mol NaCl}$$

$$\frac{1.54\ \text{mol}}{3.50\ \text{L}} = 0.44\ \text{M NaCl}$$

Concentration of Solutions

You have a 0.8 L of a 0.5 M HCl solution. How many moles of HCl does the solution contain?

$$\left[\frac{\text{X mol}}{0.8\ \text{L}}\right] = 0.5\ \text{M HCl} \quad (\text{M} = \text{mol} / \text{L})$$

Multiply both sides by 0.8 L

$$\text{X mol} = (0.5\ \text{M HCl})(0.8\ \text{L})$$

$$= 0.4\ \text{mol HCl}$$

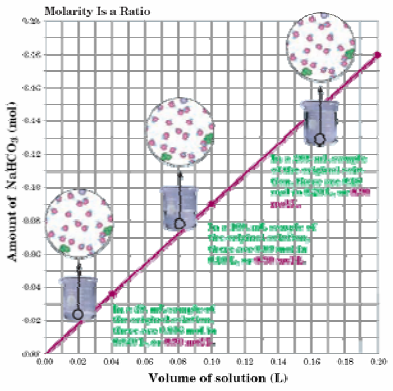
Concentration of Solutions

Changes in molarity of volume:

If volume is changed the concentration will change. By adding more water (solvent), the concentration can be decreased.

$$M_1V_1 = M_2V_2$$

Moles Solute vs. Volume



Concentration of Solutions

You have 250mL of a 6 molar (M) solution of HCl. A lab calls for a 1.5 molar solution. What should the new volume be?

$$M_1V_1 = M_2V_2$$

$$(6\ \cancel{M}\ \text{HCl})(250\ \text{mL}) = (1.5\ \text{M HCl})(V_2)$$

Divide both sides by 1.5 M HCl

$$\frac{(6\ \cancel{M}\ \text{HCl})(250\ \text{mL})}{1.5\ \cancel{M}\ \text{HCl}} = \frac{(1.5\ \text{M}\ \cancel{\text{HCl}})(V_2)}{1.5\ \text{M HCl}}$$

$$V_2 = 1000\ \text{mL Solution}$$