

# Concentration of Solutions

## Concentration of Solutions

**Molarity** – concentration or strength of a solution  
Molarity is often described as “molar”

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

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

## 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?

Step 1 – Find moles of solute

$$90.0 \text{ g NaCl} \left( \frac{\text{mol}}{58.5 \text{ g}} \right) = 1.54 \text{ mol NaCl}$$

Step 2 – Find moles of solute per liter of solution

$$\frac{\text{Moles}}{\text{Liter of Solution}} = \frac{1.54 \text{ mol}}{3.50 \text{ L}} = 0.44 \text{ M NaCl}$$

## Concentration of Solutions

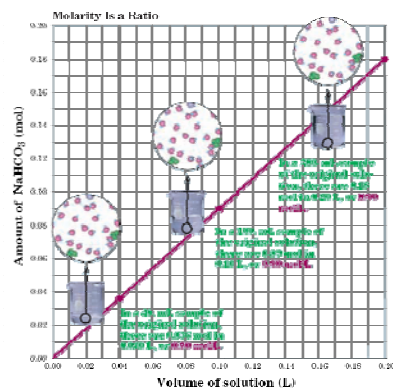
You have a 0.8 L of a 0.5 M HCl solution. How many moles of HCl does the solution contain?

$$\frac{\text{Mole of Solute}}{\text{Mole Solvent}} = \left( \frac{X \text{ mol}}{0.8 \text{ L}} \right) = 0.5 \text{ M HCl} \quad (M = \text{mol} / L)$$

Solve for X, Multiply both sides by 0.8 L

$$X \text{ mol} = (0.5 \text{ M HCl})(0.8 \text{ L}) = 0.4 \text{ mol HCl}$$

## Moles Solute vs. Volume



## Molarity and Volume Relationship

### Changes in molarity or volume:

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

$$M_1 V_1 = M_2 V_2$$

## 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?

$$M_1 V_1 = M_2 V_2$$

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

Divide both sides by 1.5 M HCl

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

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