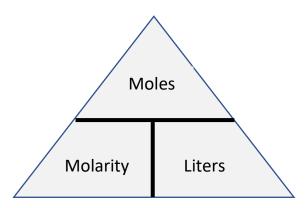# Molarity

<u>**Concentration**</u> is the amount of solute present in a certain amount of solution.

- <u>**High concentration**</u> means there is a <u>**large**</u> amount of solute.
- <u>**Low concentration**</u> means there is a <u>**small**</u> amount of solute.

Molarity is used to measure the concentration of a solution.

$$Molarity = \frac{moles\ of\ solute}{liters\ of\ solution} \qquad \left(M = \frac{mol}{L}\right)$$

Molarity example:

How many moles of sucrose are dissolved in 250 mL of solution if the solution concentration is 0.150 M?

$$250\ \cancel{mL}\ x\ \frac{1\ L}{1000\ \cancel{mL}} = 0.25\ L \qquad\qquad 0.150\ M = \frac{moles\ of\ solute}{0.25\ L}$$

Moles of solute = 0.038 mol sucrose

Molarity practice problems:

1.) To make a 4.00 M solution, how many moles of solute will be needed if you have 12.0 L of solution?

2.) What is the molarity of a solution of HNO_3 that contains 12.6 g HNO_3 on 1.0 L of solution?

3.) How many grams of potassium nitrate (KNO_3) are required to prepare 0.250 L of a 0.700 M solution?

Dilutions and Molarity:

Dilution is the process used to make a new solution that is less concentrated that the original solution by adding more solvent.

M_1 = initial molarity $\qquad$ M_2 = Final molarity $\qquad$ $M_1V_1 = M_2V_2$

V_1 = initial volume $\qquad$ V_2 = Final volume

Dilution example:

If water is added to 175 mL of a 0.45 M KOH solution until the volume is 250 mL, what will the molarity of the diluted solution be?

$M_1V_1 = M_2V_2 \longrightarrow$ (175 mL) (0.45 M) = 250 mL (M_2)

78.75 = 250 mL (M_2)

M_2 = 0.32 M

Dilution practice problems:

1.) What will the molarity of the diluted solution be if you add water to a 0.15 M of 100 mL of NaOH solution and you have a final volume of 150 mL?

2.) How much of 0.05 M HCl solution can be made by diluting 250 mL of 10.0 M HCl?

3.) How much 0.075 M NaCl solution can be made by diluting 450 mL of 9.0 M NaCl?

Molarity example answers:

1.) 48.0 mol solute

2.) 0.200 M HNO$_3$

3.) 17.7 g KNO$_3$

Dilution example answers:

1.) 0.100 M NaOH

2.) 50 L HCl

3.) 54 L NaCl