# Things to know from Chem 1A for Chem 1B

These concepts are from Chem 1A, but we use them constantly in Chem 1B. You need to be able to do these things quickly and easily, without needing to think too hard about it!

**Molarity (M)**
Molarity means # moles of solute per liter of solution. Molarity is a unit of concentration. It is NOT the same as moles.

$$M = \frac{\#\text{ moles solute}}{1\text{ L of solution}}$$

**Using Molarity as a Conversion Factor**
Any given molarity can be rewritten as a conversion factor.
For example, 2.25 M $HCl_{(aq)}$ means:

$$\frac{2.25\text{ moles HCl}}{1\text{ L solution}} \quad \text{or} \quad \frac{1\text{ L solution}}{2.25\text{ moles HCl}}$$

**Calculating the number of moles from volume and molarity**
Just multiply volume by molarity. Volume must be in liters for this to work.
V×M = moles
(volume in liters)×(molarity in moles/liter) = moles of solute

**Determining the molarity of a solute in a solution**

$$\frac{\#\text{ moles solute}}{\#\text{ L solution}} = M \qquad \text{(just divide)}$$

**Converting liters to milliliters and vice versa**
Given # milliliters, divide by 1000 to get # L. (Move the decimal three places to the left.)
25.0 mL is the same as 0.0250 L.
Given # liters, multiply by 1000 to get # of milliliters. (Decimal moves 3 places to the right.)
0.561 liters is 561 mL.
And make sure your answer makes sense – milliliters are smaller than liters, so there should be more milliliters.

**Calculating molarities after mixing solutions**

This is like a dilution problem. Remember $M_1V_1 = M_2V_2$, where $M_1$ is the initial concentration, $V_1$ is the initial volume, $M_2$ is the concentration after mixing or diluting, and $V_2$ is the total final volume. When you are dealing with dilute aqueous solutions, $V_2$ is the sum of the volumes that were mixed.

Note that in this equation the volumes cancel. Therefore, it is actually okay to use both volumes in milliliters without first converting to liters. It will work as long as all volumes are in the same units.

Example: You mix 35.0 mL of 0.100 M $NaCl_{(aq)}$ with 25.0 mL of 0.200 M $AgNO_{3(aq)}$. What are the concentrations of these substances after mixing and before any reaction occurs?

Answer: $V_{total} = 35.0\text{ mL} + 25.0\text{ mL} = 60.0\text{ mL}$.

$M_1V_1 = M_2V_2$

$$M_2 = \frac{M_1V_1}{V_2} = \frac{(0.100\text{ M NaCl})(35.0\text{ mL NaCl})}{(60.0\text{ mL total})} = 0.0583\text{ M NaCl}$$

$$M_2 = \frac{M_1V_1}{V_2} = \frac{(0.200\text{ M AgNO}_3)(25.0\text{ mL AgNO}_3)}{(60.0\text{ mL total})} = 0.0833\text{ M AgNO}_3$$