**Dilution Problems:** Note, in a dilution problem you are adding solvent. That is, you are not changing the moles of solute, just the volume of the solution.

\[ \text{Initial Moles} = \text{Final Moles} \]
\[ n_i = n_F \]
\[ M_iV_i = M_iV_f \]

Trick: Assign your knowns, identify unknowns, and algebraically solve the equation,

II.a) What is the concentration of sodium chloride if 50.0 mL of 0.400M is diluted to 150.0 mL.

\[ M_iV_i = M_fV_f \]
\[ M_f = M_i \left( \frac{V_i}{V_f} \right) = 0.400M \left( \frac{50.0mL}{150.0mL} \right) = 0.133M \]

II.b) What volume do you need to dilute 50.0 mL of 0.800M Aluminum chloride to with solvent if you want a solution which is:

i. 0.400M in aluminum chloride?

\[ M_iV_i = M_fV_f \]
\[ V_f = V_i \left( \frac{M_i}{M_f} \right) = 50.0mL \left( \frac{0.800MAICl_3}{0.400MAICl_3} \right) = 100.mL \]

ii. 0.400M in aluminum ion?

\[ M_iV_i = M_fV_f \]
\[ V_f = V_i \left( \frac{M_i}{M_f} \right) = 50.0mL \left( \frac{0.800MAICl_3}{0.400\frac{molAl^{3+}}{L}} \left( \frac{molAlCl_3}{1molAI^{3+}} \right) \right) = 100.mL \]

iii. 0.400M chloride?

\[ M_iV_i = M_fV_f \]
\[ V_f = V_i \left( \frac{M_i}{M_f} \right) = 50.0mL \left( \frac{0.800MAICl_3}{0.400\frac{molCl^-}{L}} \left( \frac{molAlCl_3}{3molCl^-} \right) \right) = 300.mL \]