

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.

Initial Moles = Final Moles

$$\begin{aligned} n_i &= n_f \\ M_i V_i &= M_f V_f \end{aligned}$$

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.

$$M_i V_i = M_f V_f$$

$$M_f = M_i \left(\frac{V_i}{V_f} \right) = 0.400M \left(\frac{50.0mL}{150.0mL} \right) = 0.133M$$

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?

$$M_i V_i = M_f V_f$$

$$V_f = V_i \left(\frac{M_i}{M_f} \right) = 50.0mL \left(\frac{0.800MAlCl_3}{0.400MAlCl_3} \right) = 100.mL$$

ii. 0.400M in aluminum ion?

$$M_i V_i = M_f V_f$$

$$V_f = V_i \left(\frac{M_i}{M_f} \right) = 50.0mL \left(\frac{0.800MAlCl_3}{0.400 \frac{molAl^{+3}}{L} \left(\frac{molAlCl_3}{1molAl^{+3}} \right)} \right) = 100.mL$$

iii. 0.400M chloride?

$$M_i V_i = M_f V_f$$

$$V_f = V_i \left(\frac{M_i}{M_f} \right) = 50.0mL \left(\frac{0.800MAlCl_3}{0.400 \frac{molCl^-}{L} \left(\frac{molAlCl_3}{3molCl^-} \right)} \right) = 300.mL$$