Changing concentrations

• Concentrations are measured in molarity or mol/L

• To dilute a concentration we ADD SOLVENT
  • changes the volume
  • moles of solute stays the same
The Dilution Equation

- $M_1V_1 = M_2V_2$
  - $M$ is the molarity of the solution
  - $V$ is the volume of the solution
  - $M_1$ & $V_1$ are the initial values
  - $M_2$ & $V_2$ are the final values
Example

\[ M_1V_1 = M_2V_2 \]

- Given 0.750L of a 12 M HCl solution, what volume of 5.00M HCl could you make?

\[
\begin{align*}
V_1 & = 0.750 \text{L} \\
M_1 & = 12 \text{M} \\
M_2 & = 5.00 \text{M} \\
V_2 & = ? \text{L}
\end{align*}
\]

\[
\frac{(0.750 \text{L})(12 \text{M})}{5.00 \text{M}} = 1.8 \text{L}
\]

\[ V_2 = 1.8 \text{L} \]
Practice

\[ M_1V_1 = M_2V_2 \]

You are given 575ml of a 0.200M solution of NaOH and are adding 600 ml of water. What is the new concentration?

\[
V_2 = 575 \text{mL} + 600 \text{mL} = 1175 \text{mL}
\]

\[
(0.2 \text{M}) (575 \text{mL}) = M_2 (1175 \text{mL})
\]

\[
\frac{1175 \text{mL}}{1175 \text{mL}} = M_2 = 0.09 \text{M}
\]
Practice

\[ \text{M}_1V_1 = \text{M}_2V_2 \]

What volume of 2.00 M \( \text{CaCl}_2 \) stock solution would you use to make 0.50 L of 0.300 M \( \text{CaCl}_2 \)?

\[
V_1 = \frac{(2.0 \text{ M})(0.3 \text{ M})(0.5 \text{ L})}{2.0 \text{ M}} = 0.0755 \text{ L}
\]