Molar Concentration of Solutions

1. What is the molarity of a solution made by dissolving 3.00 moles of NaCl in enough water to make 6.00 liters of solution?

2. What is the molarity of KCl solution containing 1.70 moles of KCl in 3.00 liters of solution?

3. What is the molarity of a solution containing 4.20 moles of sulfuric acid in 300.0 mL of solution?

Suppose we want to know the number of moles when given the volume and molarity.

If Molarity = \( \frac{\text{moles of solute}}{\text{liters of solution}} \)

then rearranging we find that

\( \text{moles of solute} = \text{Molarity} \times \text{liters of solution} \)

4. How many moles of NaOH are in 55.0 liters of a 3.00 M solution?

5. How many moles of NaOH are in 10.0 mL of a 3.00 M solution?

6. Calculate how many grams of chemical would be required to prepare the following solutions. Hint: First calculate moles required, second convert moles to grams.
   a) 600.0 mL of 0.150 M NaF
   b) 4.0.0 liters of 8.00 M \( \text{NH}_4\text{NO}_3 \)
Molar Concentration of Solutions

1. What is the molarity of a solution made by dissolving 3.00 moles of NaCl in enough water to make 6.00 liters of solution?

\[
\text{Molarity} = \frac{\text{Moles of Solute}}{\text{Liters of Solution}} = \frac{3.00 \text{ moles NaCl}}{6.00 \text{ L of Solution}} = 0.500 \text{ M NaCl}
\]

2. What is the molarity of KCl solution containing 1.70 moles of KCl in 3.00 liters of solution?

\[
\text{Molarity} = \frac{\text{Moles of Solute}}{\text{Liters of Solution}} = \frac{1.70 \text{ moles KCl}}{3.00 \text{ L of Solution}} = 0.567 \text{ M KCl}
\]

3. What is the molarity of a solution containing 4.20 moles of sulfuric acid in 300.0 mL of solution?

\[
\text{Molarity} = \frac{\text{Moles of Solute}}{\text{Liters of Solution}} = \frac{4.20 \text{ moles H}_2\text{SO}_4}{0.300 \text{ L of Solution}} = 14.0 \text{ M H}_2\text{SO}_4
\]

Suppose we want to know the number of moles when given the volume and molarity.

If \( \text{Molarity} = \frac{\text{moles of solute}}{\text{liters of solution}} \), then rearranging we find that

\[
\text{moles of solute} = \text{Molarity} \times \text{liters of solution}
\]

4. How many moles of NaOH are in 55.0 liters of a 3.00 M solution?

\[
\frac{3.00 \text{ moles NaOH}}{\text{Liter}} \times 55.0 \text{ Liters} = 165 \text{ moles NaOH}
\]

5. How many moles of NaOH are in 10.0 mL of a 3.00 M solution?

\[
\frac{3.00 \text{ moles NaOH}}{\text{Liter}} \times 0.010 \text{ Liters} = 0.030 \text{ moles NaOH}
\]

6. Calculate how many grams of chemical would be required to prepare the following solutions. Hint: First calculate moles required, second convert moles to grams.

a) 600.0 mL of 0.150 M NaF

\[
\frac{0.150 \text{ moles NaF}}{\text{Liter}} \times 0.600 \text{ Liters} = 41.99 \text{ g NaF/mole} = 3.78 \text{ g NaF}
\]

b) 4.00 liters of 8.00 M NH\(_4\)NO\(_3\)

\[
\frac{8.00 \text{ moles NH}_4\text{NO}_3}{\text{Liter}} \times 4.00 \text{ Liters} = 80.054 \text{ g NH}_4\text{NO}_3/mole = 2,560 \text{ g NH}_4\text{NO}_3
\]