

Molarity Review

Molarity - concentration; units = M, $\frac{\text{mol}}{\text{L}}$, or $\text{mol} \cdot \text{L}^{-1}$

$$\text{Molarity} = \frac{\text{mol solute}}{\text{liters solution}}$$

Dilutions

Add H_2O (or appropriate solvent) to reduce the concentration of a solution. Moles of solute before dilution = Moles of solute after dilution

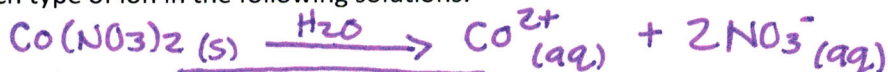
$$\therefore \boxed{M_1 V_1 = M_2 V_2} \leftarrow \text{Dilution Formula, where "1" = Before and "2" = After}$$

Practice Problems

1. Calculate the molarity of a solution prepared by dissolving 11.5 g of solid NaOH in enough water to make 1.50 L of solution.

2. Give the concentration of each type of ion in the following solutions:

a. 0.50 M $\text{Co}(\text{NO}_3)_2$



$$[\text{Co}^{2+}] = (1)(0.50 \text{ M}) = \boxed{0.50 \text{ M Co}^{2+}}$$

* For every 1 mol $\text{Co}(\text{NO}_3)_2$ there is one mol Co^{2+} and 2 mol NO_3^-

$$\begin{array}{l} \text{2 mol NO}_3^- \\ \hline \text{1 mol Co(NO}_3)_2 \end{array} \quad \begin{array}{l} \nwarrow \\ \uparrow \end{array} \quad \begin{array}{l} \text{1 ion of Co}^{2+} = \text{1 mol Co}^{2+} / \text{mol Co(NO}_3)_2 \\ \text{[NO}_3^-] = (2)(0.50 \text{ M}) = \boxed{1.0 \text{ M NO}_3^-} \end{array}$$

b. 1 M $\text{Fe}(\text{ClO}_4)_3$

3. Calculate the number of moles of Cl^- ions in 1.75 L of $1.0 \times 10^{-3} \text{ M ZnCl}_2$.

4. Typical blood serum is about 0.14 M NaCl. What volume of blood contains 1.0 mg of NaCl?
5. A chemist needs 1.00 L of an aqueous 0.200-M $\text{K}_2\text{Cr}_2\text{O}_7$ solution. How much solid $\text{K}_2\text{Cr}_2\text{O}_7$ must be weighed out to make this solution?
6. What volume of 16 M sulfuric acid must be used to prepare 1.5 L of a 0.10-M H_2SO_4 solution?

Answers

1. 0.192 M NaOH
2. Ion concentrations:
 - a. $[\text{Co}^{2+}] = 0.50 \text{ M}$; $[\text{NO}_3^-] = 1.0 \text{ M}$
 - b. $[\text{Fe}^{3+}] = 1 \text{ M}$; $[\text{ClO}_4^-] = 3 \text{ M}$
3. $3.5 \times 10^{-3} \text{ mol Cl}^-$
4. 0.12 mL
5. 58.8 g
6. $9.4 \times 10^{-3} \text{ L}$