Molarity Review

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

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

Dilutions

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

$\therefore \boxed{M_1V_1 = M_2V_2}$ ← 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 $Co(NO_3)_2$

$Co(NO_3)_{2\,(s)} \xrightarrow{H_2O} Co^{2+}_{(aq)} + 2NO_3^-_{(aq)}$

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

* For every 1 mol $Co(NO_3)_2$ there is one mol Co^{2+} and 2 mol NO_3^-

1 ion of Co^{2+} = 1 mol Co^{2+}/mol $Co(NO_3)_2$

$\frac{2\ mol\ NO_3^-}{1\ mol\ Co(NO_3)_2}$ $[NO_3^-] = (2)(0.50\ M) = \boxed{1.0\ M\ NO_3^-}$

   b. 1 M $Fe(ClO_4)_3$

3. Calculate the number of moles of Cl^- ions in 1.75 L of 1.0×10^{-3} 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 $K_2Cr_2O_7$ solution. How much solid $K_2Cr_2O_7$ 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. $[Co^{2+}] = 0.50$ M; $[NO_3^-] = 1.0$ M
    b. $[Fe^{3+}] = 1$ M; $[ClO_4^-] = 3$ M
3. 3.5×10^{-3} mol Cl^-
4. 0.12 mL
5. 58.8 g
6. 9.4×10^{-3} L