

Introduction to solutions

Molarity

Concentration of ions

Problem

1. (Brown129) How many grams of Na_2SO_4 are required to make 0.350L of 0.500M Na_2SO_4 ?

$M = \frac{m}{L}$ $M \cdot L = m$ $\text{Na}_2\text{SO}_4 = 141.95 \text{ g/mol}$
 $0.5 \text{ M} \cdot 0.350 = 0.175 \text{ mol} \cdot \frac{141.9}{1 \text{ mol}} = 24.8 \text{ g}$

2. (brown131) How many milliliters of 3.0M H_2SO_4 are required to make 450 mL of 0.10M H_2SO_4 ?

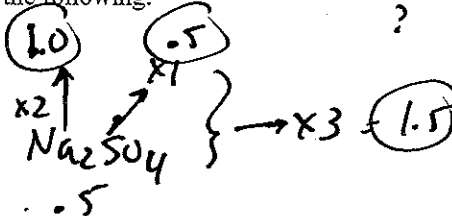
$M_1 V_1 = M_2 V_2$ Keep units
 $3.0 \cdot ? = 450 \cdot 0.1 = 15 \text{ mL}$

3. How much water needs to be added to 12M NaOH if one is making a 3.0M 500 mL solution.

$M_1 V_1 = M_2 V_2$ $V_1 = 125$ $V_2 = V_1 + \text{add}$
 $12 \cdot 125 = 3 \cdot 500$ $500 = 125 + ? \Rightarrow ? = 375 \text{ mL}$

4. If a Na_2SO_4 solution is .5M determine the following.

- a. concentration of Na^+
 b. concentration of SO_4^{2-}
 c. concentration of ions



5. If a .5 M AlCl_3 solution of 500mL is added to a solution of .5M NaCl of 500mL determine the following concentrations in the new solution

- a. Al^{+3}
 b. Na^+
 c. Cl^-

AlCl_3 NaCl
 $.5 = \frac{x}{.5} \Rightarrow x = .25$ $.5 = \frac{x}{.5} \Rightarrow x = .25$
 $1.5 = \frac{x}{.5} \Rightarrow x = 0.75$ $\text{Cl} = .5$
 Calc. moles $0.75 + .25 = 1.0$
 $\div \text{new volume } 1 \text{ L} = 1 \text{ M}$
 This is NOT dilution.

6. Determine the concentration of the following ions if these two solutions are mixed.

solution 1: .2M NaNO_3 of 200mL
 solution 2: .2M NaCl of 500mL

Na^+
 NO_3^-
 Cl^-

$0.2 = \frac{x}{.2} \Rightarrow x = 0.04$
 $0.2 = \frac{x}{.5} \Rightarrow x = 0.1$

$\frac{0.04}{.7} = \frac{0.2 \text{ M}}{1}$

* adding

$0.2 \text{ to } 0.2 = 0.2 \text{ M}$

Note
 volumes
 equal

Volumes
 not
 equal