

Amt of solute per amount of solution

General Chemistry  
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Worksheet: Molarity Calculations

1. What is meant by "concentration" when we are talking about solutions? What is molarity? Which is more concentrated, 1 liter of an 0.500 M solution or 1 mL of an 0.500 M solution? Why?

Molarity = # mol solute per liter of solution.  
Same molarity, so same concentration.

2. Calculate the molarity of a solution which has a volume of 2.00 L and which contains 0.300 mol of dissolved solute.

$$M = \frac{n}{V} \quad M = \frac{0.300 \text{ mol}}{2.00 \text{ L}} = 0.150 \text{ M}$$

3. Calculate the molarity of 3.59 L of a solution in which 0.250 mol of NaCl has been dissolved.

$$M = \frac{0.250 \text{ mol}}{3.59 \text{ L}} = 0.0696 \text{ M}$$

4. Calculate the molarity of 0.833 L of a solution in which 35.3 g of table sugar has been dissolved. The formula for table sugar (sucrose) is  $C_{12}H_{22}O_{11}$ .

$$M = \frac{\# \text{ mol}}{\# \text{ L}} = \frac{0.103 \text{ mol}}{0.833 \text{ L}} = 0.124 \text{ M}$$

$$35.3 \text{ g } C_{12}H_{22}O_{11} \times \frac{1 \text{ mol}}{342 \text{ g}} = 0.103 \text{ mol}$$

$$\begin{array}{r} 12 \times 12 \\ 22 \times 11 \\ + 11 \times 16 \\ \hline 342 \end{array}$$

5. A scientist needs 569 ml of an 0.250 M solution of barium chloride ( $BaCl_2$ ).

- a. How many moles of barium chloride should she use to make the solution?  
b. How many grams of barium chloride should she use to make the solution?

$$M = \frac{n}{V} \quad n = 0.569 \text{ L} \times 0.250 \frac{\text{mol}}{\text{L}} = 0.142 \text{ mol}$$

$$0.142 \text{ mol} \times \frac{208.2 \text{ g}}{\text{mol}} = 29.6 \text{ g}$$

$$\begin{array}{r} Ba = 137.3 \\ Cl \times 2 = 35.45 \times 2 \\ = 70.9 \\ \hline 208.2 \end{array}$$

6. A solution of magnesium nitrate ( $Mg(NO_3)_2$ ) is needed for a lab experiment. The solution must have a concentration of 0.300 M. If the student who is making the solution has only 45.0 g of magnesium nitrate, what is the maximum volume of solution that the student can make? (If the student dissolves all of the  $Mg(NO_3)_2$ , how many liters of solution can be made?)

$$M = \frac{n}{V} \quad 45.0 \text{ g} \times \frac{1 \text{ mol}}{148.3 \text{ g}} = 0.303 \text{ mol}$$

$$V = \frac{n}{M} = \frac{0.303 \text{ mol}}{0.300 \frac{\text{mol}}{\text{L}}} = 1.01 \text{ L}$$

$$\begin{array}{r} Mg \times 1 = 24.3 \\ N \times 2 = 28 \\ O \times 6 = 96 \end{array}$$