

## 4 • Acids, Bases, and Salts

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### M O L A R I T Y

Concentration can be measured in terms of molarity (M). The simple equation is:

$$\text{Molarity} = \frac{\text{moles of solute}}{\text{Liters of solution}} \quad \text{also} \quad \text{moles of solute} = (\text{Molarity}) \times (\text{Liters of solution})$$

**Example:**

What is the molarity of a solution in which 3.65 g of HCl are dissolved in 0.500 L of solution?

ex.  $3.65 \text{ g HCl} \times \frac{1 \text{ mole HCl}}{36.46 \text{ g HCl}} = 0.100 \text{ mole HCl}; \quad \text{Molarity} = \frac{0.100 \text{ mol HCl}}{0.500 \text{ L solution}} = 0.200 \text{ M HCl solution}$

1. What is the molarity of a solution in which 1.00 mol of HCl is dissolved in 2.00 L of solution?
2. What is the molarity of a solution in which 2.00 mol of HNO<sub>3</sub> is dissolved in 500. mL of solution?
3. What is the molarity of a solution when 15.0 g HNO<sub>3</sub> is dissolved in 2.00 L of solution?  
MM HNO<sub>3</sub> = 63.02 g/mol
4. What is the molarity of a solution when 25.2 grams HCl is dissolved in 250. mL of solution?  
MM HCl = 36.46 g/mol
5. How many grams of H<sub>2</sub>SO<sub>4</sub> are needed to prepare 100. mL of a 1.00 M solution?  
MM H<sub>2</sub>SO<sub>4</sub> = 98.09 g/mol

## Dilution Problems

Acids are usually acquired from chemical supply houses in concentrated form. These acids are diluted to the desired concentration by adding water. Since moles of acid before dilution = moles of acid after dilution, and moles of acid =

Molarity x Volume then,  $V_i \times M_i = V_f \times M_f$

6. How much concentrated 18 M sulfuric acid is needed to prepare 250 mL of a 6.0 M solution?
7. How much concentrated 12 M hydrochloric acid is needed to prepare 100. mL of a 2.0 M solution?
8. To what volume should 25 mL of a 15 M nitric acid solution be diluted to prepare 3.0 M solution?
9. To how much water should 50. mL of 12 M hydrochloric acid be added to produce a 4.0 M solution?
10. To how much water should 100. mL of 18 M sulfuric acid be added to prepare a 1.5 M solution?