Activity 5-8 Molarity

Introduction

The molarity of a solution is the number of moles of solute per liter of solution. The symbol for molarity is M. Thus a 3.0 molar solution of nitric acid, abbreviated 3.0 M HNO₃, contains 3.0 moles of HNO₃ per liter of solution.

Sample Problem 1 What mass of sodium hydroxide is required to prepare 3.00 liters of 0.250 M solution?

Solution Given: volume of solution, molarity of solution

Find: mass of solute

3.00 L solution
$$\times \frac{0.250 \text{ mole NaOH}}{1 \text{ L solution}} \times \frac{40.0 \text{ g NaOH}}{1 \text{ mole NaOH}} = 30.0 \text{ g NaOH}$$

Sample Problem 2 What volume of 1.25 M sodium hydroxide solution can be prepared using 60.0 grams of sodium hydroxide?

Solution Given: mass of solute, molarity of solution

Find: volume of solution

60.0 g NaOH
$$\times \frac{1 \text{ mole NaOH}}{40 \text{ g NaOH}} \times \frac{1 \text{ L solution}}{1.25 \text{ mole NaOH}} = 1.20 \text{ L solution}$$

Practice problems

Solve the following problems. In the space below each problem, show a labeled setup. Do any necessary arithmetic on scrap paper. Use the reference tables in the Appendix as needed. Write your answers in the spaces at the right.

1. What mass of K₃PO₄ is required to prepare 4.00 liters of 1.50 M solution?

- 4 L 11.5 mol 212.39
- 2. What mass of CH₃OH is required to prepare 1.50 liters of 3.00 M solution?

- 1.5 L 3 mol 32.04 a
- 3. What volume of 0.750 M solution can be prepared using 90.0 grams of NH₄Cl?