Solutions & dilution — Practice Worksheet

Six multistep problems · built to pair with the IntoChemistry Problem-Solving Studio

Name: _____ Date: _____

Instructions: Show your dimensional-analysis setup and units. Round your final result to an appropriate number of significant figures. For particles, use 6.022×10^{23} mol^{-1}.

1. Sodium chloride concentration

Dissolve 5.844 g of NaCl and add water to reach a final solution volume of 250 mL.

Molarity = moles solute ÷ liters of solution. Molar mass NaCl = 58.44 g/mol.

a. Convert 250 mL of solution to liters.

b. How many moles are in 5.844 g NaCl? (M = 58.44 g/mol)

c. Calculate the molar concentration of the final solution.

2. Potassium nitrate concentration

Dissolve 10.111 g of KNO_3 and add water to reach a final solution volume of 500 mL.

Molarity = moles solute ÷ liters of solution. Molar mass KNO_3 = 101.11 g/mol.

a. Convert 500 mL of solution to liters.

b. How many moles are in 10.111 g KNO_3? (M = 101.11 g/mol)

c. Calculate the molar concentration of the final solution.

3. Sodium hydroxide concentration

Dissolve 2 g of NaOH and add water to reach a final solution volume of 200 mL.

Molarity = moles solute ÷ liters of solution. Molar mass NaOH = 40.00 g/mol.

a. Convert 200 mL of solution to liters.

b. How many moles are in 2 g NaOH? (M = 40.00 g/mol)

c. Calculate the molar concentration of the final solution.

4. Dilute 2.00 M stock

Prepare 250 mL of a 0.5 M solution from a 2 M stock. Assume solute amount is conserved during dilution.

Dilution: $M_1V_1 = M_2V_2$; stock $M_1 = 2$ M; final $M_2 = 0.5$ M.

a. Convert final volume 250 mL into liters.

b. Calculate the moles of solute in the final 0.5 M solution.

c. What volume of 2 M stock is needed in milliliters?

5. Dilute 1.50 M stock

Prepare 100 mL of a 0.3 M solution from a 1.5 M stock. Assume solute amount is conserved during dilution.

Dilution: $M_1V_1 = M_2V_2$; stock $M_1 = 1.5$ M; final $M_2 = 0.3$ M.

a. Convert final volume 100 mL into liters.

b. Calculate the moles of solute in the final 0.3 M solution.

c. What volume of 1.5 M stock is needed in milliliters?

6. Dilute 0.800 M stock

Prepare 500 mL of a 0.2 M solution from a 0.8 M stock. Assume solute amount is conserved during dilution.

Dilution: $M_1V_1 = M_2V_2$; stock $M_1 = 0.8$ M; final $M_2 = 0.2$ M.

a. Convert final volume 500 mL into liters.

b. Calculate the moles of solute in the final 0.2 M solution.

c. What volume of 0.8 M stock is needed in milliliters?