

High School Chemistry: Stoichiometry & Mole Ratio Calculations



Use the matching sheet ID when checking answers.

Part A: Stoichiometric Calculations. Solve each quantitative chemical problem using balanced reaction ratios.

1. Consider the balanced synthesis of water: $2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O}$. How many moles of H_2O are produced when 4.0 moles of O_2 react completely with excess hydrogen gas?

Answer: C. 8.0 moles H_2O

From the balanced coefficients, the mole ratio of H_2O produced to O_2 consumed is 2 mol H_2O / 1 mol O_2 . Therefore:
 $4.0 \text{ mol O}_2 \times (2 \text{ mol H}_2\text{O} / 1 \text{ mol O}_2) = 8.0 \text{ moles H}_2\text{O}$.

2. What is the molar mass of Calcium Carbonate (CaCO_3), given atomic masses: Ca = 40.08 g/mol, C = 12.01 g/mol, O = 16.00 g/mol?

Answer: B. 100.09 g/mol

Molar mass = $40.08 + 12.01 + 3(16.00) = 40.08 + 12.01 + 48.00 = 100.09 \text{ g/mol}$.

3. In an experiment, the calculated theoretical yield of Aspirin is 25.0 grams. However, the student synthesizes and recovers an actual yield of 20.0 grams in the laboratory. What is the percent yield of the reaction?

Answer: B. 80%

Percent Yield = $(\text{Actual Yield} / \text{Theoretical Yield}) \times 100\% = (20.0 \text{ g} / 25.0 \text{ g}) \times 100\% = 80\%$.

Part B: Stoichiometric Pathway Roadmap. Match each chemical calculation step with its operational definition.

Sort these items: Grams of Known Substance -> Moles of Known; Divide by Molar Mass (g/mol) of the given reactant; Moles of Known -> Moles of Desired Unknown; Multiply by the Mole Ratio from balanced reaction coefficients; Moles of Desired Unknown -> Grams of Product; Multiply by Molar Mass (g/mol) of the synthesized compound

Calculation Step	Conversion Factor / Operation
Grams of Known Substance -> Moles of Known; Moles of Known -> Moles of Desired Unknown; Moles of Desired Unknown -> Grams of Product	Divide by Molar Mass (g/mol) of the given reactant; Multiply by the Mole Ratio from balanced reaction coefficients; Multiply by Molar Mass (g/mol) of the synthesized compound