Worksheet 1.1: Percentage Yield Calculations

ChemistrySheets

Specification: GCSE Chemistry (AQA 5.3.2.2 / Edexcel SC14 / OCR Gateway C6.1)

Core Formula:

Percentage Yield $= \frac{\text{Actual Yield}}{\text{Theoretical Yield}} \times 100$

Rearranged Forms:

Actual Yield $= \frac{\text{Percentage Yield} \times \text{Theoretical Yield}}{100}$

Theoretical Yield $= \frac{\text{Actual Yield} \times 100}{\text{Percentage Yield}}$

Units:

Actual Yield: grams (g) or moles (mol)

Theoretical Yield: grams (g) or moles (mol)

Percentage Yield: percentage (%)

Section A: Understanding the Formula

A1. Variables & Units: For each term in the percentage yield formula, state its common unit(s) and symbol.

(i) Actual Yield: _____

(ii) Theoretical Yield: _____

(iii) Percentage Yield: _____

A2. Rearranging the Formula: Write down the rearranged forms of the percentage yield formula to solve for:

(i) Actual Yield: _____

(ii) Theoretical Yield: _____

A3. Essential Conversions & Calculations: Complete the following. (Relative atomic masses: Mg=24, C=12, O=16, H=1, S=32, Na=23)

(i) Convert 250 cm^3 to dm^3: _____

(ii) Calculate the M_r of $MgCO_3$: _____

(iii) How many moles are in 4.9 g of H_2SO_4 ($M_r = 98$)? _____

(iv) What mass is 0.2 mol of NaOH ($M_r = 40$)? _____

Section B: Practice Calculations

B1. A reaction has a theoretical yield of 15.0 g. If the actual yield obtained is 12.0 g, calculate the percentage yield.

B2. In an experiment, 2.50 mol of product was expected, but only 1.80 mol was collected. What is the percentage yield?

B3. A chemical process has a percentage yield of 75%. If the theoretical yield is 200 g, what is the actual yield obtained?

B4. An experiment produced 35.0 g of product, which represents a 70% yield. Calculate the theoretical yield for this reaction.

Section C: Challenge Context

C1. Magnesium reacts with oxygen to form magnesium oxide according to the equation: $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$ If 6.0 g of magnesium (Mg = 24) is completely reacted and 8.0 g of magnesium oxide (MgO = 40) is produced, calculate the percentage yield.

C2. In a practical, 10.0 g of calcium carbonate ($CaCO_3$, $M_r = 100$) is heated to produce calcium oxide (CaO, $M_r = 56$) and carbon dioxide (CO_2, $M_r = 44$). The reaction is: $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ If the percentage yield of calcium oxide is 85%, what mass of calcium oxide would be expected to be collected?

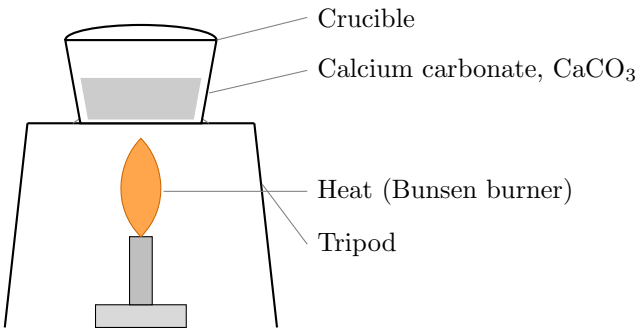

Figure 2: Heating calcium carbonate