

10.2 Stoichiometric Calculations

Foundation

All stoichiometric calculations MUST begin with a balanced chemical equation.



Process Overview

Resource Page 6 shows this general procedure:

Mass Known → Moles Known → Mole Ratio → Moles Seeking → Mass Seeking

If you're given mass, start here!

If you're given moles, start here!

If you must find moles, end here!

If you must find mass, end here!

You can stop at any point in the process.

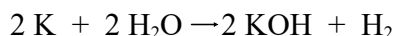
Template:

$$\text{Mass (Known)} \times \frac{1 \text{ Mole (Known)}}{\text{Mol. Mass (Known)}} \times \frac{\text{Moles (Seeking)}}{\text{Moles (Known)}} \times \frac{\text{Mol. Mass (Seeking)}}{1 \text{ Mole (Seeking)}} = \text{Mass (Seeking)}$$

1. Mole to Mole Guided Example

Potassium and water react, producing potassium hydroxide and hydrogen gas.

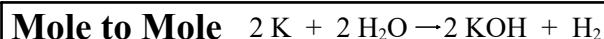
Step 0: Balance the equation!



How many moles of hydrogen gas will be produced from 0.04 moles of potassium?

What is known? 0.04 mol K

What are you seeking? mol H₂



What mole ratio will you use?

You want hydrogen, you know potassium (0.04 mol).

Use $\frac{1 \text{ mol H}_2}{2 \text{ mol K}}$: moles of potassium cancel out.

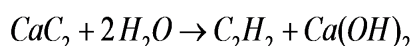
Result:

$$0.04 \cancel{\text{ mol K}} \cdot \frac{1 \text{ mol H}_2}{2 \cancel{\text{ mol K}}} = 0.02 \text{ mol H}_2$$

2. Mass to Mass Guided Example

Calcium carbide (CaC₂) and water react, producing acetylene (C₂H₂) and calcium hydroxide (Ca(OH)₂).

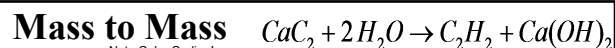
Step 0. – Balanced reaction:



How many grams of acetylene can be produced by reacting 2.50 grams of calcium carbide with water?

What is given? 2.50 g CaC₂.

What do you seek? Mass C₂H₂



Note Color Coding!
A. Insert molar mass of CaC₂ (64.10 g/mol):

B. Insert mole ratio from mol CaC₂ to mol C₂H₂:

$$\frac{1 \text{ mol C}_2\text{H}_2}{1 \text{ mol CaC}_2}$$

C. Insert molar mass C₂H₂ (26.04 g/mol):

Finally, cancel units and compute.

$$2.50 \text{ g CaC}_2 \cdot \frac{1 \text{ mol CaC}_2}{64.10 \text{ g CaC}_2} \cdot \frac{1 \text{ mol C}_2\text{H}_2}{1 \text{ mol CaC}_2} \cdot \frac{26.04 \text{ g C}_2\text{H}_2}{1 \text{ mol C}_2\text{H}_2} = 1.02 \text{ g C}_2\text{H}_2$$

Homework

10.2 Booklet Problems.
Due Next Class.