

Moles, isotopes and chemical formulas

AP Chemistry · Lab

Name: _____ Date: _____ Class: _____

A mixture of sodium hydrogencarbonate and sodium chloride loses mass when heated because only the first compound decomposes. You use that mass loss to find the composition of the mixture.

Level: AP Chemistry · **Curriculum:** AP Chem Unit 1

Aim

To find the mass percent of sodium hydrogencarbonate in a mixture with sodium chloride by measuring the mass lost on heating.

Equipment

- Crucible with lid, tripod, pipe-clay triangle and Bunsen burner
- Balance reading to 0.001 g
- Tongs and heat-proof mat
- Sample of the mixture

Safety

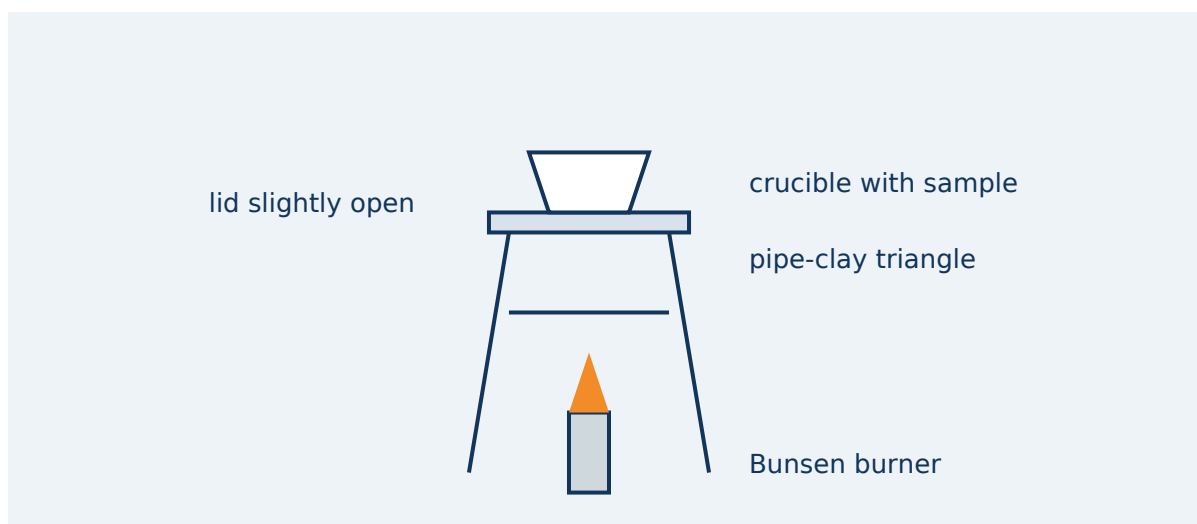
Safety

Wear goggles. The crucible stays hot for several minutes, so use tongs and place it on the heat-proof mat. Do not heat strongly at the start or the solid may spit.

Method

1. Weigh the empty crucible with its lid.
2. Add about 2.5 g of the mixture and reweigh.
3. Heat gently for 3 minutes, then strongly for 5 minutes with the lid slightly open.
4. Cool on the mat and reweigh.
5. Reheat for 2 minutes, cool and reweigh until two readings agree within 0.002 g.

The reaction is $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$. Sodium chloride does not change.



Set-up for heating the mixture to constant mass.

Results

Measurement	Mass (g)
Crucible + lid	24.318
Crucible + lid + mixture	26.818
After first heating	26.206
After second heating	26.198
After third heating	26.198

Analysis questions

Question 1 Mass of mixture and mass lost

Calculate the mass of the mixture and the total mass lost.

Question 2 Why constant mass?

Explain why the sample is heated to constant mass.

Question 3 Gas lost per mole

State the mass of $\text{CO}_2 + \text{H}_2\text{O}$ lost when 2 mol of NaHCO_3 ($M = 84.006 \text{ g/mol}$) decompose, using $M(\text{CO}_2) = 44.009$ and $M(\text{H}_2\text{O}) = 18.015 \text{ g/mol}$.

Question 4 Mass of sodium hydrogencarbonate

Use the mass lost to find the mass of NaHCO_3 in the sample.

Question 5 Mass percent

Calculate the mass percent of NaHCO_3 in the mixture, and the moles of NaHCO_3 .

Question 6 Effect of an error

Some solid spat out of the crucible during the first heating. Explain whether the reported percent would be too high or too low.

Question 7 Improvement

Suggest one change that would make the result more reliable.