

Edexcel Chemistry A-level

Practical 1

Finding the Molar Volume of a Gas

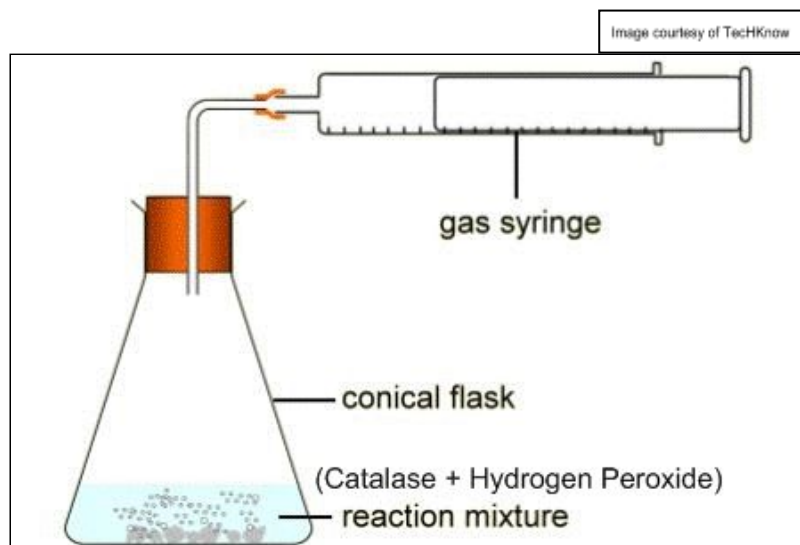


The **molar volume of any gas** at a given conditions of pressure and temperature **is the same** (Avogadro's law).

Method

1. Set up the equipment shown in diagram below.
2. Place 30 cm³ (excess) of ethanoic acid in test tube, add pre-weighed marble chips (CaCO₃) and quickly place the bung on.
3. Measure the volume of a gas produced with gas syringe.
4. Make a few measurements.
5. Repeat, increasing the mass of the marble chips by around 0.05g each time.

Diagram



Key points

- Overall equation:

$$\text{CaCO}_3 + 2\text{CH}_3\text{COOH} \rightarrow \text{Ca}(\text{CH}_3\text{COO})_2 + \text{CO}_2 + \text{H}_2\text{O}$$
- Wait until no effervescence is observed before weighing flask containing acid and marble chips (CaCO₃) to **minimise gas loss**.
- **Don't use too much CaCO₃** so you don't produce more gas than the measuring cylinder can fit.
- A **weak acid** is used so that the reaction is **slower**, meaning there is less gas loss between adding marble chips and attaching bung.
- An **alternative method** could involve attaching marble chips on a string to the bung, sealing the test tube with a bung, and then tipping the test tube so that the acid comes to the contact with the marble chip. This could reduce the loss of product.



Errors

- If using syringe, plunger may not be free moving. It may need a **lubricant**.
- CO_2 is **slightly soluble** in water, so the exact volume is not measured.
- Some **gas escapes** between addition of marble chips and sealing the test tube.
- Bung may not be **airtight**.
- **Transferring** the solid. It is important to weigh the tube containing marble chips before the addition and reweigh after the addition. This method is '**weighing by difference**' and ensures the amount of CaCO_3 that ends up in the reaction mixture is known..

