WJEC (Wales) Chemistry GCSE

Specified Practical 1.5a

Investigation of the factors that affect the rate of a reaction using a gas collection method

[Methods are adapted from the Royal Society of Chemistry and AQA GCSE Chemistry required practical handbook]

Gas Collection Method

Aim

Investigate the effect of **concentration** on the rate of reaction by observing the **volume of gas** produced.

Background

Magnesium reacts with dilute hydrochloric acid as follows:

$$Mg_{(S)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$$

The **rate of reaction** can be investigated by measuring the rate at which the hydrogen gas is produced.

Equipment List

- Magnesium ribbon cut into 3 cm length
- Dilute hydrochloric acid, 1.0 mol dm^{-3} and 1.5 mol dm^{-3}
- Safety goggles
- Conical flask (250 cm^3)
- Single-holed rubber bung and delivery tube to fit conical flask
- Water trough
- Two measuring cylinders (100 cm^3)
- Clamp stand, boss and clamp
- Stopwatch

Method

1. Using a measuring cylinder, measure 20 cm^3 of 1.0 mol dm^{-3} hydrochloric acid into the 250 cm^3 conical flask.
2. Set up the experiment as shown in the **diagram** below - make sure the measuring cylinder remains **filled with water** when it is clamped upside down.
3. You might need two sets of hands for this part. Add a 3 cm strip of **magnesium** ribbon to the flask and then **immediately** put the bung back into the flask. Ask your partner to start the **stopwatch** as soon as you have done this.
4. Record the volume of hydrogen gas collected for **every 10 second interval**. Stop when no more gas is being collected.
5. Now repeat steps 1-4 using a **different concentration** of hydrochloric acid
6. Plot your results onto a **graph**. Put 'volume of gas produced' on the y-axis and 'time' on the x-axis. Once you have plotted your points, you should see you have two curves: one for each concentration of acid.

Safety Precautions

- **Hydrochloric acid** is an **irritant** so safety goggles must be worn at all times. Wash hands immediately if any hydrochloric acid gets on them or wear laboratory gloves.

Diagram