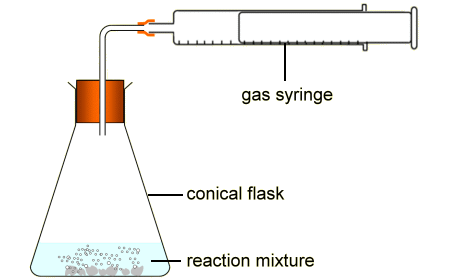
How to measure the rate of reaction using a **gas syringe**

This method measures the gas product of the reactants. The gas syringe has marks along its length which allow the volume of collected gas to be measured.

The increase in volume can be timed, and a graph of volume against time can be plotted. This shows the rate of the reaction.



Equipment: a gas syringe, rubber bung, conical flask, stand, clamp, 25ml hydrochloric acid, 2g medium sized calcium carbonate pieces, a clamp stand and a stopwatch.

Method;

1) The gas syringe should be set up horizontally by an attachment to the stand, by the clamp. The tubing should be positioned well on the rear end of the gas syringe.

2) Place calcium carbonate in conical flask, and quickly pour in hydrochloric acid. The rubber bung should be placed extremely fast after this process, as well as the starting of the timer. The gas molecule products produced from the reactants in the flask are transferred from the flask to the gas syringe by the tubing by the movement of gas. The gas products are carbon dioxide and calcium chloride.

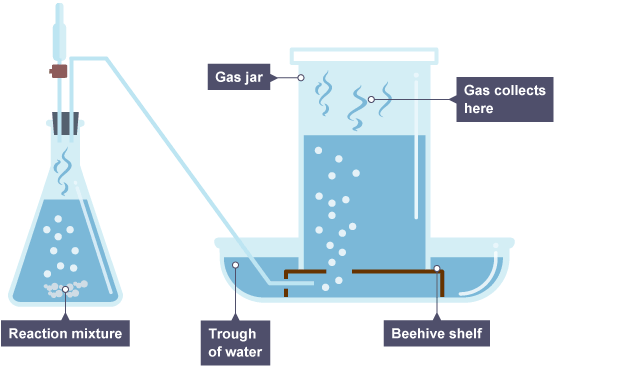
The pressure in the gas syringe is built up because of the air-quality of the gas syringe, where it is air tight. This pressure is realised by a push forced onto the plunge inside of the gas syringe, which shows the exact ml of product produced to be visible by the scale of measurements on the outside of the gas syringe.

3) Record the volume of gas collected every 10 seconds for 2 minutes.

How to measure the rate of reaction using a **beehive shelf and a measuring cylinder.**

This method measures the gas product of the reactants. A measuring cylinder allows the volume of collected gas to be measured.

The volume of gas made in a reaction can be measured. The gas may be collected over water using upturned measuring cylinder positioned on a beehive shelf.



Use a measuring cylinder here

Equipment: a measuring cylinder, conical flask, beehive shelf, bowl of water, delivery tube with rubber bung attached, 25ml hydrochloric acid, 2g medium sized calcium carbonate pieces and a stopwatch.

Method:

1) Fill the measuring cylinder with water before turning upside down over a trough of water. Rest the measuring cylinder on the beehive shelf.

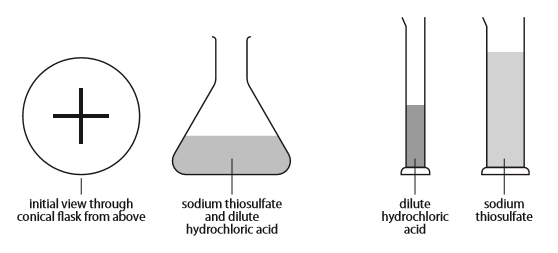
2) Place calcium carbonate in conical flask, and quickly pour in hydrochloric acid. The rubber bung should be placed extremely fast after this process, as well as the starting of the timer. Calcium chloride and carbon dioxide gas are produced. As the gas bubbles in, it pushes the water out. The water level is then read off the scale on the burette or measuring cylinder.

3) Record the water level every 10 seconds for 2 minutes.

How to measure the rate of reaction when a **precipitate is formed**.

Equipment: 250 cm3 Conical flask 100 cm3 Measuring cylinder Sodium thiosulfate solution 50 g dm–3 (Low hazard) Hydrochloric acid 2 mol dm–3 (Irritant)

In this experiment, the effect of the concentration of sodium thiosulfate on the rate of reaction is investigated.



Method:

1) Put 50 cm3 of sodium thiosulfate solution in a flask.

2) Measure 5 cm3 of dilute hydrochloric acid in a small measuring cylinder.

3) Add the acid to the flask and immediately start the clock. Swirl the flask to mix the solutions and place it on a piece of paper marked with a cross.

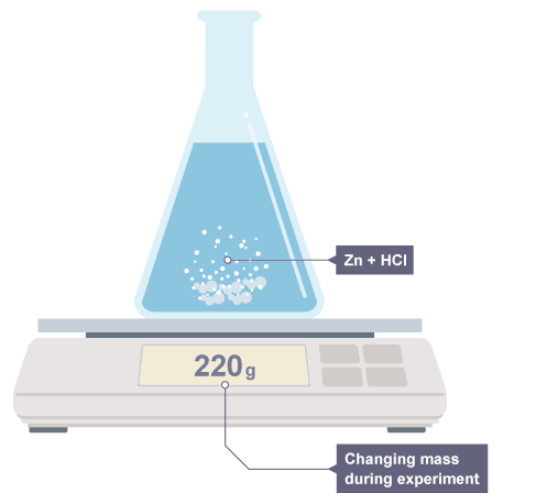
4) Look down at the cross from above. When the cross disappears stop the clock and note the time.

5) Repeat this using different concentrations of sodium thiosulfate solution. Make up 50 cm3 of each solution so the volume remains the same.\az

e.g. use 40cm3 of sodium thiosulfate solution and add 10cm3 of water or 30cm3 of sodium thiosulfate solution and 20cm3 of water. (The volume of acid is always 5cm3)

Measuring the rate of reaction with **a balance** when there is a change in the mass of the reactants or products

Dilute hydrochloric acid reacts with zinc metal, zinc chloride and hydrogen gas are produced.



Equipment: a conical flask, balance, measuring cylinder, 25ml hydrochloric acid, 2g of zinc and a stopwatch

If the reaction is set up on a balance as shown, the mass of the apparatus can be monitored throughout the reaction. As hydrogen bubbles escape, the apparatus will lose mass.

Method:

1) Measure out the hydrochloric acid using the measuring cylinder, Place in the conical flask.

2) Place on the balance and record the mass.

3) Add the zinc and start the stop watch.

4) Record the mass every 10 seconds for 2 minutes.