

REACTION RATES

Chemical reactions involve **collisions** between reacting particles.

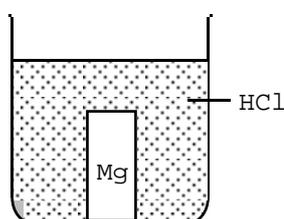
There are **FOUR** ways of speeding up reactions.

1. Increase the concentration of the reactants

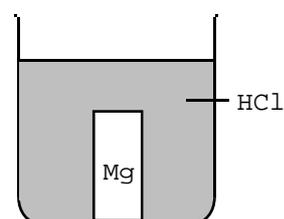
The more 'bunched together' the reactants the more often they will collide.



The reaction of Magnesium (Mg) with Hydrochloric acid (HCl) is faster if the concentration of the HCl is increased:



Dilute acid
Fewer collisions
Slower reaction



Concentrated acid
More collisions
Faster reaction

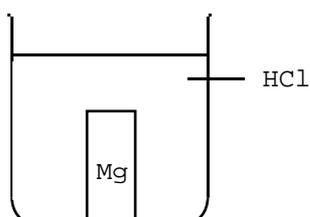
In everyday life, we know that charcoal in a barbecue burns much faster when you fan it. This is because a higher concentration of Oxygen in the air is then reacting with the charcoal.

2. Increase the surface area of reactants

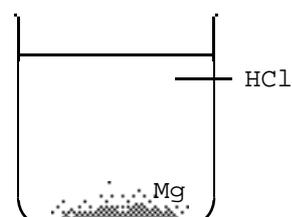
The Magnesium in the above reaction can only react with the HCl molecules on its surface.



If we make the Magnesium into a powder, the HCl can get round each little grain in the powder, increasing the number of collisions and therefore speeding up the reaction.



Magnesium block
Fewer collisions
Slower reaction



Powdered Magnesium
More collisions
Faster reaction

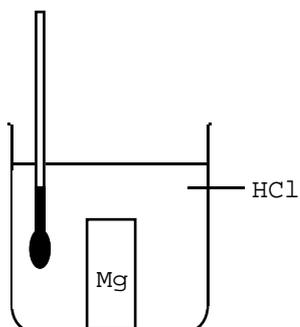
In everyday life, we know that potatoes will cook quicker if they are cut into small pieces.

3. Increase the temperature of the reaction mixture

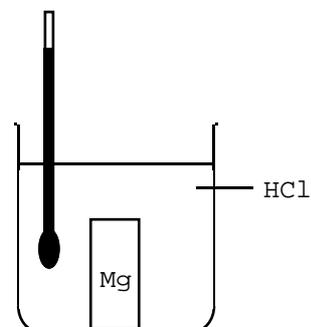
The higher the temperature the faster and more violent the collisions. Bonds are more likely to break and reactions are therefore faster.



Magnesium reacts faster with Hydrochloric acid when the temperature of the reaction mixture is increased:



Low temperature
Low energy collisions
Slower reaction



High temperature
High energy collisions
Faster reaction

In everyday life, we know that foods are kept in fridges to slow down the decomposition process.

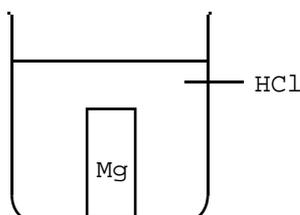
4. Use a catalyst

Catalysts are substances which speed up some reactions. They are not used up by the reactions and can be recovered and used again once the reaction is over.

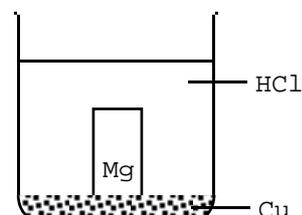
Example 1



Copper (Cu) speeds up the reaction between Magnesium and Hydrochloric acid:



Catalyst not present
Slower reaction



Catalyst present
Faster reaction

Example 2

A Platinum/Rhodium alloy is used in the catalytic converter to speed up the reaction between the exhaust gases in a car e.g.



Enzymes catalyse the chemical reactions which take place in living things - plants and animals. They find uses in the home and in industry:

- * Biological washing powders contain enzymes which speed up the reaction of protein stains (blood, egg etc) with Water.

- * In the brewing industry, plant enzymes are used to convert Starch into alcohol.