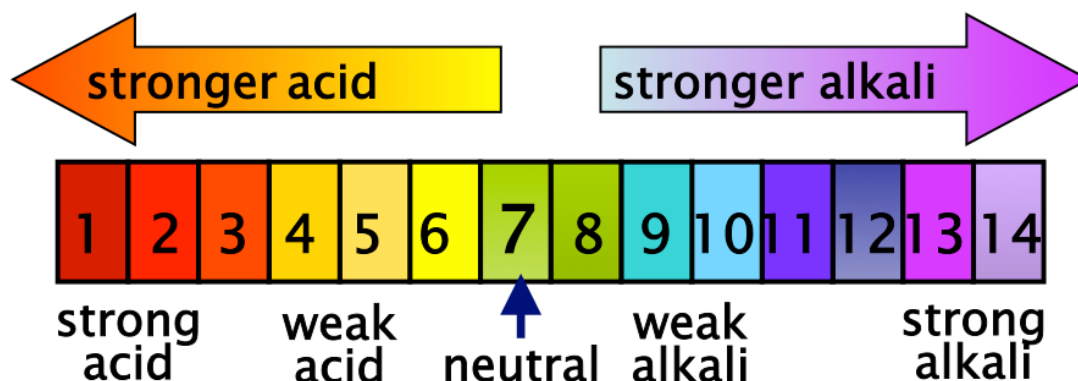


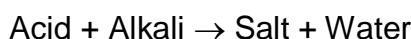
## Chemical Reactions Key Notes



### Neutralisation

The chemical reaction between an acid and alkali is called neutralisation

If you add just the right amount of acid and alkali together a neutral solution is formed (the pH value gets close to pH 7 - neutral)



E.g. a bee sting is acidic, and can be neutralised with just the right amount of the alkali bicarbonate of soda

A wasp sting is alkaline, and can be neutralised with just the right amount of the acid vinegar

### Chemical & Physical Changes

Chemical reactions happen anywhere that new substances are made

There are usually some obvious changes during a chemical reaction, including

- A change in colour
- A gas coming off (you may see fizzing or bubbling)
- A change in temperature (the reaction mixture may get hotter)
- A solid may be formed when two solutions are mixed together

Ice melting into water is an example of a physical change - no new substances are formed during physical changes

Chemical Changes	Physical Changes
New substances are formed	No new substances are formed
Changes are usually permanent (irreversible)	Changes are usually not permanent (reversible)

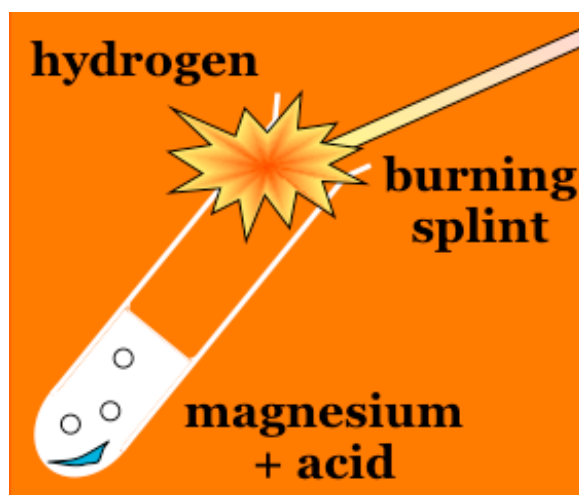
## Acid + Metal (Including H<sub>2</sub> Test)

Many metals react with acids – producing the gas hydrogen

A burning splint is the test for this, producing a *squeaky pop* when it ignites

There are 3 tests we can do to find out what gas it is: -

- If it is carbon dioxide it will put out a lit splint / turn limewater cloudy when it is bubbled through
- If it is oxygen, it will relight a glowing splint
- If it is hydrogen, it will ignite with a squeaky pop



## Acid + Carbonates (Including CO<sub>2</sub> Test)

When a metal carbonate reacts with acid, it fizzes and seems to disappear

The carbonate and the acid have reacted, producing a salt, water and carbon dioxide



There are 3 tests we can do to find out what gas it is: -

- If it is carbon dioxide it will put out a lit splint / turn limewater cloudy when it is bubbled through
- If it is oxygen, it will relight a glowing splint
- If it is hydrogen, it will ignite with a squeaky pop

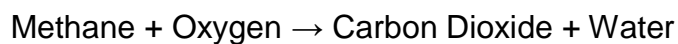
## Combustion

Combustion is the scientific name for burning

Combustion is the reaction when a substance burns and reacts with oxygen, producing heat and light energy

Combustion results in the formation of both carbon dioxide & water

When substances burn, reacting with oxygen, the new products formed are called *oxides*



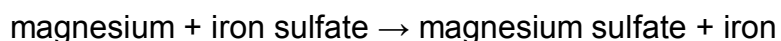
For a fire to take place there are three essential components: -

- Heat
- Oxygen
- Fuel

### Displacement reactions

Displacement reactions involve a metal and a solution containing a salt of a different metal. A more reactive metal will displace a less reactive metal from its compounds.

For example, magnesium is more reactive than iron. When a piece of magnesium is dipped into iron sulfate solution, iron is displaced and coats the surface of the magnesium:



No reaction is seen if iron is dipped into magnesium sulfate solution, because iron is not reactive enough to displace magnesium.

The table below shows the results obtained in a series of experiments involving four metals and solutions of their salts. A tick shows where a reaction is seen and a cross shows where there is no reaction.

	Solution used				
Metal used	magnesium sulfate	zinc sulfate	iron sulfate	tin sulfate	number of reactions
magnesium	x	✓	✓	✓	3
zinc	x	x	✓	✓	2
iron	x	x	x	✓	1
tin	x	x	x	x	0

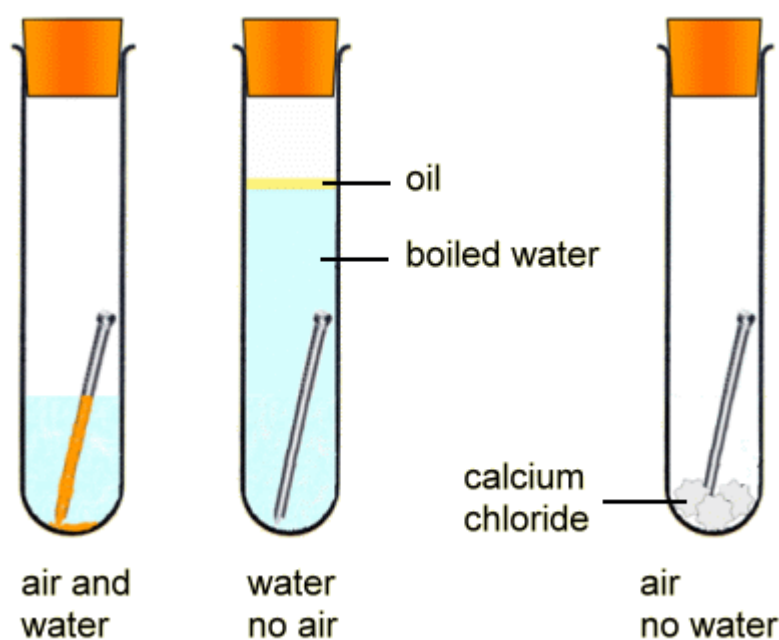
Magnesium displaces three metals, zinc displaces two metals, iron displaces one metal and tin does not displace any of the other three metals. So, the **order of reactivity** - starting with the most reactive first – is as follows:

- magnesium
- zinc
- iron
- tin

Make sure you can recall the order of reactivity of these four metals, and can explain whether or not a displacement reaction will happen.

### Rusting / Corrosion

Iron and steel rust when they come into contact with water and oxygen. Both water and oxygen are needed for rusting to occur. In the experiment below, the nail does not rust when air - containing oxygen - or water is not present:



Calcium chloride absorbs water in the right-hand test tube

Salt dissolved in water does not cause rusting, but it does speed it up, as does acid rain.

Aluminium does not rust - corrode. Its surface is protected by a natural layer of aluminium oxide. This prevents the metal below from coming into contact with air and oxygen.

Unlike rust, which can flake off the surface of iron and steel objects, the layer of aluminium oxide does not flake off.

## Rusting - higher

Rusting is an **oxidation** reaction. The iron reacts with water and oxygen to form **hydrated iron(III) oxide**, which we see as rust. Here is the word equation for the reaction:

iron + water + oxygen → hydrated iron(III) oxide