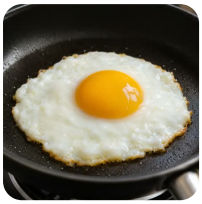
KS3 SCIENCE · CHEMISTRY

Chemical reactions revision sheet

Name _____

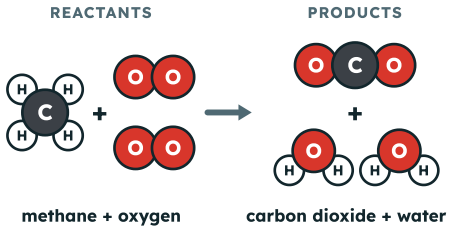


1. Physical and chemical changes

PHYSICAL CHANGE	CHEMICAL CHANGE (A CHEMICAL REACTION)
No new substance is made	A new substance is made
Usually easy to change back	Usually hard to change back
Melting, boiling, dissolving, breaking	Burning, rusting, cooking

- **Signs of a chemical reaction:** a gas is given off (bubbles or fizzing); the colour changes; energy is given out or taken in (it gets hot or cold, or gives out light); a solid, called a **precipitate**, appears when two solutions are mixed.
- Signs are clues, not proof. Boiling water bubbles, but no new substance is made.

2. Atoms rearrange



Methane burning. C is a carbon atom, H is hydrogen, O is oxygen

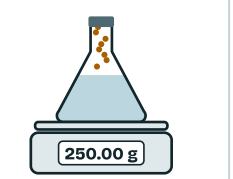
- In a chemical reaction the atoms are **rearranged**. They leave their old partners and join up in a new way.
- **Reactants** are the substances you start with. **Products** are the new substances that are made.
- No atom is made and no atom is destroyed. In the diagram there are 1 carbon atom, 4 hydrogen atoms and 4 oxygen atoms on each side of the arrow.

3. Word equations

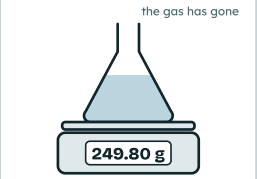
magnesium + oxygen → magnesium oxide

- The **reactants** go before the arrow and the **products** go after it. The arrow means “react to make”. It is not an equals sign.
- Only substances go in an equation. Leave out heat, light and flames.
- A metal reacting with oxygen makes a metal **oxide**: copper + oxygen → copper oxide.
- More to know: iron + sulfur → iron sulfide. zinc + hydrochloric acid → zinc chloride + hydrogen.
- A **symbol equation** uses formulae, and it must balance: $2Mg + O_2 \rightarrow 2MgO$ has 2 magnesium atoms and 2 oxygen atoms on each side.

4. Conservation of mass



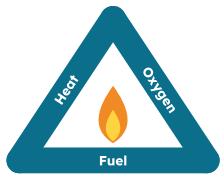
Sealed flask: the reading stays the same



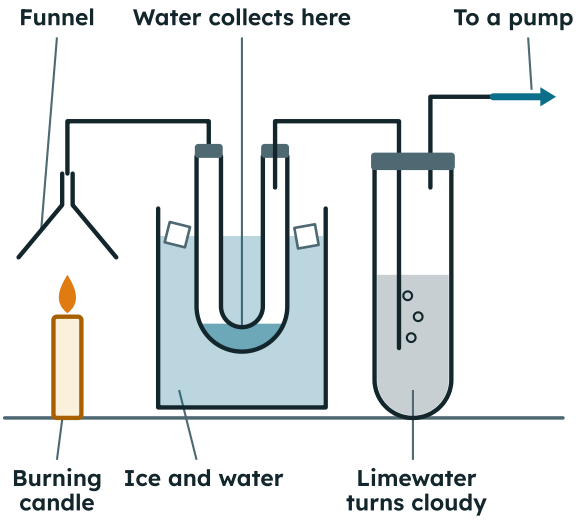
Open flask: gas escapes, so the reading falls

- **Conservation of mass:** the total mass of the reactants equals the total mass of the products.
- **Why?** No atoms are made or destroyed. The same atoms are there at the end, joined in a new way.
- Example: 12 g of carbon burns in 32 g of oxygen and makes 44 g of carbon dioxide.
- The mass can **seem to fall** when a product is a gas that escapes into the air.
- The mass can **seem to rise** when a solid joins with a gas from the air. Burning magnesium gains the mass of the oxygen it joins with.

5. Combustion



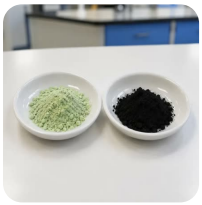
The fire triangle



Showing what a burning candle makes

- **Combustion** is burning. A fuel reacts with oxygen and gives out energy as heat and light.
- A **fuel** stores energy in a chemical store.
- A fire needs fuel, oxygen and heat. Take any one away and it goes out.

- Many fuels are **hydrocarbons**: compounds of hydrogen and carbon only. Burned in plenty of air, they make carbon dioxide and water: methane + oxygen → carbon dioxide + water.
- In the candle experiment, water collects in the cold tube, and carbon dioxide turns the limewater cloudy.



6. Thermal decomposition

copper carbonate → copper oxide + carbon dioxide

- In **thermal decomposition**, heat breaks one substance down into two or more simpler ones. There is only one reactant.
- Green copper carbonate turns into black copper oxide. The carbon dioxide turns **limewater** cloudy: that is the test for carbon dioxide.
- The solid loses mass as the gas leaves: 12.4 g of copper carbonate makes 8.0 g of copper oxide and 4.4 g of carbon dioxide.
- Many other metal carbonates do the same: zinc carbonate → zinc oxide + carbon dioxide.



7. Exothermic and endothermic

	EXOTHERMIC	ENDOTHERMIC
Energy	Given out to the surroundings	Taken in from the surroundings
Temperature	Goes up	Goes down
Examples	Burning a fuel, neutralisation, a hand warmer	Sherbet fizzing, thermal decomposition, an instant cold pack

- Breaking **bonds** between atoms takes energy in. Making new bonds gives energy out. A reaction is exothermic when more is given out than taken in.



8. Catalysts

- A **catalyst** speeds up a chemical reaction and is not used up. It is still there at the end, unchanged, so it can be used again.
- Hydrogen peroxide breaks down slowly: hydrogen peroxide → water + oxygen. With a catalyst the oxygen comes off much faster.
- A catalyst does not change how much product is made.
- Examples: the catalytic converter in a car exhaust helps harmful gases react to make less harmful ones. **Enzymes** are catalysts in living things.

Key words

Chemical reaction: a change in which a new substance is made

Reactant: a substance you start with in a reaction

Word equation: shows a reaction using the names of the substances

Combustion: burning: a reaction with oxygen that gives out heat and light

Fire triangle: fuel, oxygen and heat: the three things a fire needs

Hydrocarbon: a compound of hydrogen and carbon only, such as methane

Limewater: a clear solution that carbon dioxide turns cloudy

Endothermic: takes in energy, so the surroundings get colder

Chemical bond: the force that holds atoms together in a molecule

Physical change: a change in which no new substance is made

Product: a new substance made in a reaction

Conservation of mass: the total mass is the same before and after a reaction

Fuel: a substance that stores energy and is burned to release it

Oxide: a compound of an element joined with oxygen

Thermal decomposition: when heat breaks one substance down into simpler ones

Exothermic: gives out energy, so the surroundings get hotter

Catalyst: speeds up a reaction and is not used up

Pictures are illustrations made for this sheet, not real photographs.