Nº.		JAB chem	National 5 Chemistry Chemical Reactions Summary		✓

1 Indicators of Chemical Reaction

Colour Change	Gas Given Off	Solid Being Formed	Energy Change

Every chemical reaction forms at least one new substance.

2 Combustion

A reaction where molecules break up and join up with oxygen

$$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$$

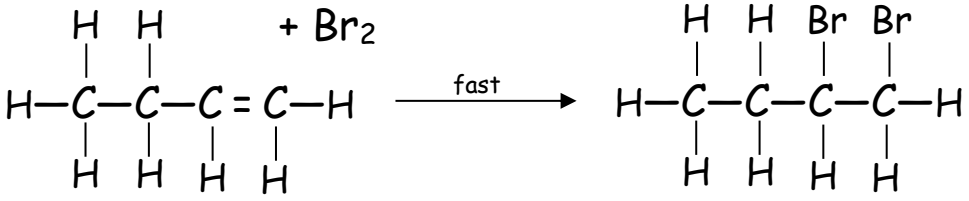
3 Exothermic Reactions

A chemical reaction which gives off energy, usually heat energy.

- Reactions which take in heat from the surroundings are called endothermic

4 Addition

This occurs when a molecule *adds* itself across a C=C double bond

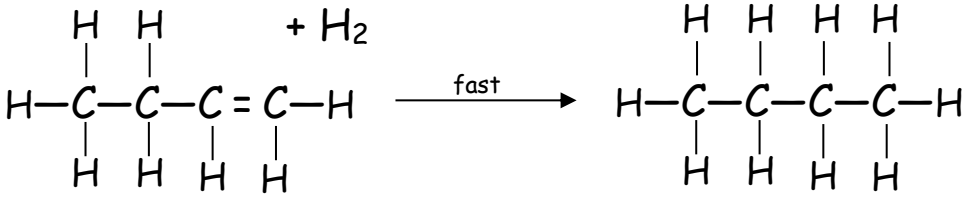


Molecules which can perform addition reactions:

F_2	Cl_2	Br_2	I_2	H_2	H_2O	HCl	HF	HBr	HI
Only one product produced by addition reaction					Can produce two products by addition reaction				

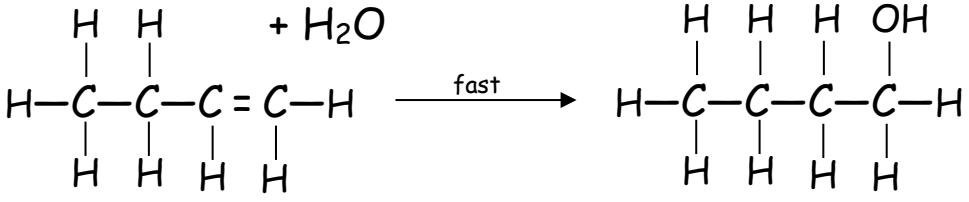
5 Hydrogenation

An addition reaction where hydrogen is added across a C=C double bond.



6 Hydration

An addition reaction where water is added across a C=C double bond.



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Electrolysis

A reaction where electrical energy breaks down a compound back to its original elements.

This can be achieved by molten or solution electrolysis

Positive electrode	Negative electrode
$2Cl^- \longrightarrow Cl_2 + 2e^-$	$Na^+ + e^- \longrightarrow Na$

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Reactions of Acids

Neutralisation

acid + metal oxide ⟶ salt + water

acid + metal hydroxide (alkali) ⟶ salt + water

acid + metal carbonate ⟶ salt + water + carbon dioxide

Redox

acid + metal ⟶ salt + hydrogen

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Reduction

Reduction reactions are when there is a *gain* of electrons by the reactant

$Cl + e^- \longrightarrow Cl^-$

chlorine atom 2,8,7 + electron ⟶ Chlor**ide** ion 2,8,8

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Oxidation

Oxidation reactions are when there is a *loss* of electrons by the reactant

$Na \longrightarrow Na^+ + e^-$

sodium atom 2,8,1 ⟶ Sodium ion 2,8 + electron

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Redox

Redox reactions occur when both reduction and oxidation occur together.

- Redox reactions involve the transfer of electrons between reactants but the equations themselves do not have electrons in them

$Mg(s) + Cu^{2+}(aq) \longrightarrow Mg^{2+}(aq) + Cu(s)$

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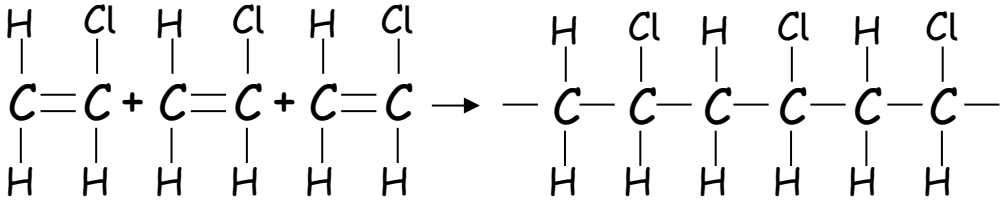
Addition Polymerisation

This is when small monomers like ethene join up to make large polymer molecules like poly(ethene)

- C=C double bonds break and join up into a long line of C–C single bonds.



chloroethene — poly(chloroethene)

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Haber Process

The process where ammonia is made from nitrogen gas and hydrogen gas.

$$N_2 + 3H_2 \xrightarrow[\text{catalyst}]{Fe} 2NH_3$$

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Ostwald Process

The process where ammonia is turned into NO.

- the NO reacts with oxygen and is dissolved in water to make nitric acid
- fertilisers made by neutralisation of nitric acid

$$4NH_3 + 5O_2 \xrightarrow[\text{catalyst}]{Pt} 4NO + 6H_2O$$

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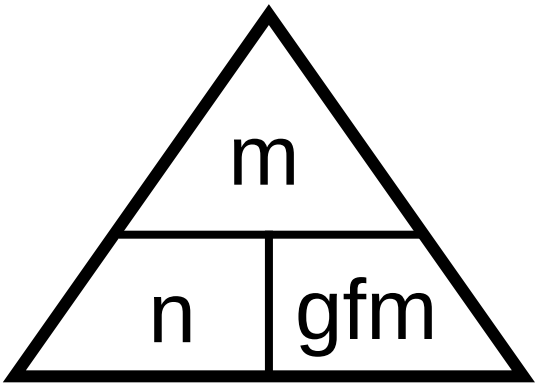
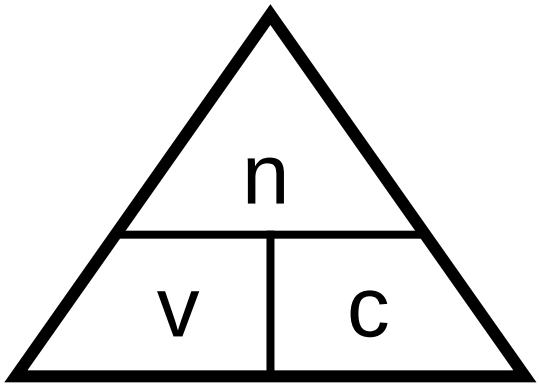
Equations



where

m = mass (g)
n = number of moles (mol)
gfm = gram formula mass



where

n = number of moles (mol)
v = volume *(litres)*
c = concentration (in *mol* l^{-1})