Equations for AQA Chemistry

Triple Award

You will have to learn each of the following equations off by heart for each examination paper, and know when and how to use them.

Equations required for the Higher Tier papers only are marked with the symbol **HT**.

Avogadro's number (**HT**)

There are 6.02×10^{23} particles of a substance in 1 mole.

The mole (**HT**)

$$\text{moles} = \frac{\text{mass}}{M_r \text{ (relative atomic mass)}}$$

Concentration in g/dm³

$$\text{concentration} = \frac{\text{mass (g)}}{\text{volume (dm}^3\text{)}}$$

Concentration in mol/dm³ (**HT**)

$$\text{concentration} = \frac{\text{moles (mol)}}{\text{volume (dm}^3\text{)}}$$

OR

moles = concentration x volume (in dm³)

Gas Volumes (**HT**)

1 mole of any gas has a volume of 24dm³
volume (dm³) = moles x 24dm³

Converting from cm³ to dm³

1dm³ = 1000cm³

Equations for AQA Chemistry

Triple Award

Percentage Yield (**HT**)

$$\frac{\text{Mass of product actually made}}{\text{Maximum theoretical mass of product}} \times 100$$

Atom Economy

$$\frac{\text{Relative formula mass of desired product from equation}}{\text{Sum of relative formula masses of all reactants from equation}} \times 100$$

Calculating energy changes (**HT**)

Energy change in a reaction = Total energy needed to break the bonds in reactants - Total energy released when bonds in the products are formed

Rate of reaction

$$\text{mean rate of reaction} = \frac{\text{quantity of reactant used}}{\text{time taken}}$$

$$\text{mean rate of reaction} = \frac{\text{quantity of product formed}}{\text{time taken}}$$

(Quantity usually measured as a mass or volume)

Chromatography

$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$

Equations for AQA Chemistry

Triple Award

Common Reactions you should be familiar with:

This list should help you to identify most the reactions that you will be expected to know about for the examination.

Note: this is not an exhaustive list, for example I have used examples of metals or acids which may be substituted for other metals or acids.

Combustion of carbon

Carbon + Oxygen	$\longrightarrow$	Carbon dioxide
$C_{(s)} + O_{2(g)}$	$\longrightarrow$	$CO_{2(g)}$

Combustion of hydrogen

Hydrogen + Oxygen	$\longrightarrow$	Water
$2H_{2(g)} + O_{2(g)}$	$\longrightarrow$	$2H_2O_{(g)}$

Combustion of hydrocarbons

Methane + Oxygen	$\longrightarrow$	Carbon dioxide + Water
$CH_4 + O_2$	$\longrightarrow$	$CO_2 + H_2O$

Oxidation of metals

Copper + Oxygen	$\longrightarrow$	Copper (II) oxide
$2Cu_{(s)} + O_{2(g)}$	$\longrightarrow$	$2CuO_{(s)}$

Reaction of metals with water

Sodium + Water	$\longrightarrow$	Sodium hydroxide + Hydrogen
$2Na_{(s)} + 2H_2O_{(l)}$	$\longrightarrow$	$2NaOH_{(aq)} + H_{2(g)}$

Equations for AQA Chemistry

Triple Award

Displacement of halogens

Sodium bromide + Chlorine → Bromine + Sodium chloride

$2NaBr_{(aq)} + Cl_{2(aq)} \longrightarrow Br_{2(aq)} + 2NaCl_{(aq)}$

Reaction of metal with acid

Magnesium + Hydrochloric acid → Magnesium chloride + Hydrogen

$Mg_{(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$

Reaction of metal oxide with acid

Copper (II) oxide + Hydrochloric acid → Copper (II) chloride + Water

$CuO_{(s)} + 2HCl_{(aq)} \longrightarrow CuCl_{2(aq)} + H_2O_{(l)}$

Displacement of metals

Copper (II) sulfate + Magnesium → Magnesium sulfate + Copper

$CuSO_{4(aq)} + Mg_{(s)} \longrightarrow MgSO_{4(aq)} + Cu_{(s)}$

(HT) Ionic equation for displacement

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

Neutralisation

Sodium hydroxide + Hydrochloric acid → Sodium chloride + Water

$NaOH_{(aq)} + HCl_{(aq)} \longrightarrow NaCl_{(aq)} + H_2O_{(l)}$

(HT) Ionic equation for neutralisation

$H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$

Marble chips (calcium carbonate) and acid

Calcium carbonate + Hydrochloric acid → Calcium chloride + Water + Carbon dioxide

$CaCO_{3(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$

Equations for AQA Chemistry

Triple Award

Electrolysis of molten ionic compounds

Lead bromide	⟶	(Molten) lead + Bromine (gas)
$PbBr_{2(l)}$	⟶	$Pb_{(l)} + Br_{2(g)}$

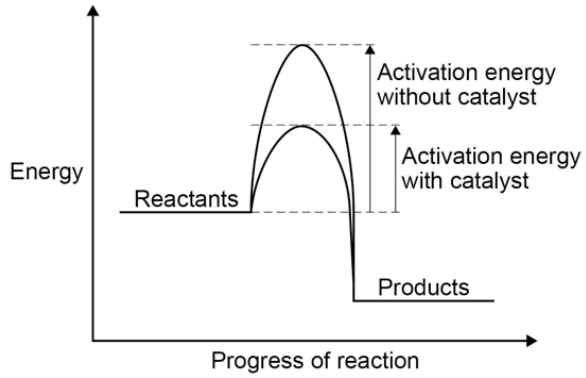
Electrolysis of aqueous ionic compounds (sodium chloride)

Sodium chloride + Water	⟶	Sodium hydroxide + Hydrogen + Chlorine
$NaCl_{(aq)} + H_2O_{(l)}$	⟶	$NaOH_{(aq)} + H_{2(g)} + Cl_{2(g)}$

(HT) Half equations for electrolysis

Cathode:	$2H^+_{(aq)} + 2e^-$	$H_{2(g)}$
Anode:	$2Cl^-_{(aq)}$	$Cl_{2(g)} + 2e^-$

Energy changes - reaction profile diagrams



Cracking

Decane	⟶	Pentene + Pentane
$C_{10}H_{22}$	⟶	$C_5H_{10} + C_5H_{12}$

Equations for AQA Chemistry

Triple Award

Bromine test for alkenes

Ethene + Bromine $\longrightarrow$ Dibromoethane

$C_2H_4 + Br_2 \longrightarrow C_2H_4Br_2$

The Haber process

Nitrogen + Hydrogen $\longleftrightarrow$ Ammonia

$N_{2(g)} + 3H_{2(g)} \longleftrightarrow 2NH_{3(g)}$