

GCSE Electrolysis

Key Definitions

Electrolyte - ionic compounds in the molten state or dissolved in water

Electrolysis - a process in which electrical energy, from a direct current supply, decomposes electrolytes

Cation - a positive ion e.g. Na^+ or H^+

Cathode - a negative electrode

Anion - a negative ion e.g. Cl^-

Anode - a positive electrode

Inert - unreactive

Decompose - break apart

Ion - a charged atom or group of atoms

Oxidation

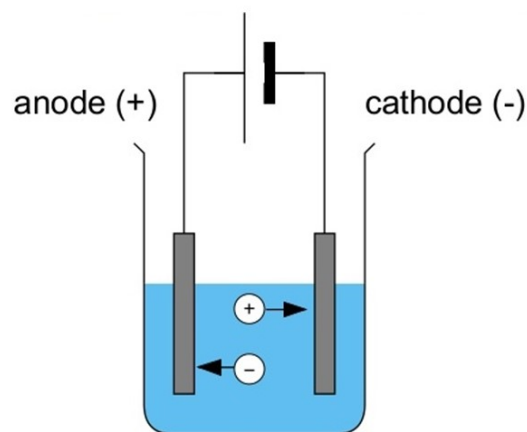
Is

Loss of electrons

Reduction

Is

Gain of electrons



Positively charged ions move to the negative electrode.

Metal ions and hydrogen ions are positively charged, so metals or hydrogen gas are produced at the negative electrode.

Negatively charged ions move to the positive electrode.

Non-metal ions such as oxide ions and chloride ions are negatively charged, so gases such as oxygen or chlorine are produced at the positive electrode.

Method for working out what is produced

- Split the substance into its ions and the water present if in solution
- Hydrogen is only produced at the cathode when a more reactive metal is present
- If a halogen is present then that is always produced at the anode
- If no halogen is present the water produces oxygen instead

Electrolyte	Electrodes	Reduction Reaction at Cathode (-)	Oxidation Reaction at Anode (+)
Copper chloride solution	Carbon	$\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu}(\text{s})$	$2\text{Cl}^-(\text{aq}) \rightarrow \text{Cl}_2(\text{g}) + 2\text{e}^-$
Sodium chloride solution	Carbon	$2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$	$2\text{Cl}^-(\text{aq}) \rightarrow \text{Cl}_2(\text{g}) + 2\text{e}^-$
Sodium sulphate solution	Carbon	$2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$	$4\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g}) + 4\text{e}^-$
Water acidified with sulfuric acid	Carbon	$2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$	$4\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g}) + 4\text{e}^-$
Molten lead bromide	Carbon	$\text{Pb}^{2+}(\text{l}) + 2\text{e}^- \rightarrow \text{Pb}(\text{s})$	$2\text{Br}^-(\text{l}) \rightarrow \text{Br}_2(\text{l}) + 2\text{e}^-$
Copper sulfate solution	Carbon	$\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu}(\text{s})$	$4\text{OH}^-(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g}) + 4\text{e}^-$
Copper sulfate solution	Copper	$\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu}(\text{s})$	$\text{Cu}(\text{s}) \rightarrow \text{Cu}^{2+}(\text{aq}) + 2\text{e}^-$