



What I need to know

The reactivity series
 How metals react with acids
 How to name salts
 How acids react with bases
 The method to make a soluble salt
 How to carry out a titration

Key Vocabulary:

- Metal
- Reaction
- pH scale
- Strong acid
- Weak acid
- Alkali
- Base
- Salt
- Dissociate
- Reversible

Equations

Metal + oxygen → metal oxide
 Metal + water → metal hydroxide + hydrogen
 Metal + acid → salt + hydrogen
 Acid + metal oxide → salt + water
 Acid + metal hydroxide → salt + water
 Acid + carbonate → salt + water + carbon dioxide

Student reference point

The Process of Electrolysis

Electrolysis is the **splitting up** of an ionic substance using **electricity**.

On setting up an electrical circuit for electrolysis, two **electrodes** are required to be placed in the electrolyte. The electrodes are **conducting rods**. One of the rods is connected to the **positive** terminal and the other to the **negative** terminal.

The **electrodes** are **inert** (this means they do not react in the reaction) and are often made from **graphite** or **platinum**.

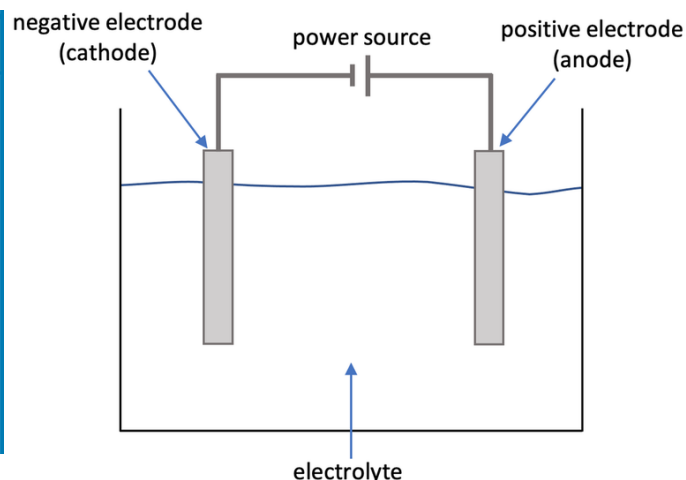
During the process of electrolysis, **opposites attract**.

The positively-charged ions will be attracted toward the negative electrode. The negatively-charged ions will be attracted towards the positive electrode.

When ions reach the electrodes, the charges are lost and they become elements.

The **positive** electrode is called the **anode**.

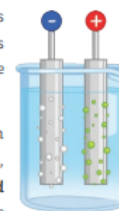
The **negative** electrode is called the **cathode**.



Electrolysis of Aqueous Solutions

Gases may be given off or metals deposited at the electrodes. This is dependent on the reactivity of the elements involved.

If the metal is **more reactive** than **hydrogen** in the reactivity series, then **hydrogen** will be **produced** at the **negative cathode**. At the **positive anode**, negatively charged ions **lose electrons**. This is called **oxidation** and you say that the ions have been oxidised.



Using Electrolysis to Extract Metals

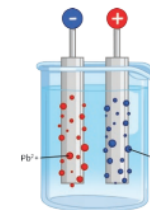
Metals are extracted by electrolysis if the metal in question reacts with carbon or if it is too reactive to be extracted by reduction with carbon. During the extraction process, large quantities of energy are used to melt the compounds.

Aluminium is manufactured by the process of electrolysis. Aluminium oxide has a high melting point and melting it would use large amounts of energy and increase the cost of the process. Therefore, molten **cryolite** is added to aluminium oxide to lower the melting point and thus reduce the cost.

Electrolysis of Molten Ionic Compounds - Lead Bromide

Lead bromide is an ionic substance. Ionic substances, when solid, are **not** able to conduct electricity. When molten or in solution, the ions are free to move and are able to carry a charge.

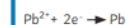
The **positive lead ions** are attracted toward the **negative cathode** at the same time as the **negative bromide ions** are attracted toward the **positive anode**.



Oxidation is the loss of electrons and reduction is the gaining of electrons. **OIL RIG (Higher Tier Only)**.

We represent what is happening at the electrodes by using **half equations (Higher Tier Only)**.

The lead ions are attracted towards the negative electrode. When the **lead ions (Pb²⁺)** reach the cathode, each ion **gains two electrons** and becomes a neutral atom. We say that the lead ions have been **reduced**.



The bromide ions are attracted towards the positive electrode. When the **bromide ions (Br⁻)** reach the anode, each ion **loses one electron** to become a neutral atom. Two bromine atoms are then able to bond together to form the **covalent molecule Br₂**.



Challenge question: For electrolysis of aqueous solutions of copper sulphate and sodium chloride, what would you observe at the negative electrode? (2 marks) Complete the table below (3 marks)

Molten compound electrolysed	Product at the negative electrode	Product at the positive electrode
Zinc chloride		
	Potassium	Iodine

Suggested reading: [Electrolysis - Summary notes, mind maps and exam questions - AQA Separate Chemistry - Physics and maths tutor](#)

Key Assessment Information: Students will be asked a range of questions from 1-6 marks on this process.