

### 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

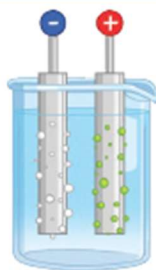
Gases may be given off or metals deposited at the electrodes. This is dependent on the reactivity of the elements involved.

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.

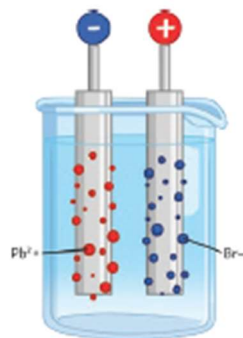
Aluminium is manufactured by the process of electrolysis. Aluminium oxide has a high melting point and melting it would use large amounts of energy and increase the cost of the process. Therefore, molten cryolite is added to aluminium oxide to lower the melting point and thus reduce the cost.



### 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 ( $Pb^{2+}$ )** 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  $Br_2$** .

