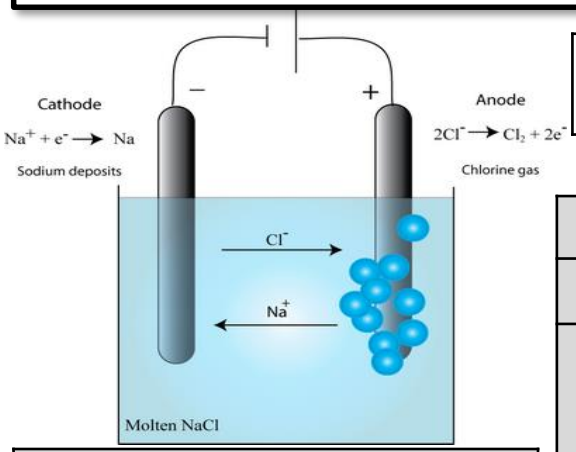
AQA C4b Electrolysis
Combined Higher
RP – Electrolysis



Opposite Charges Attract

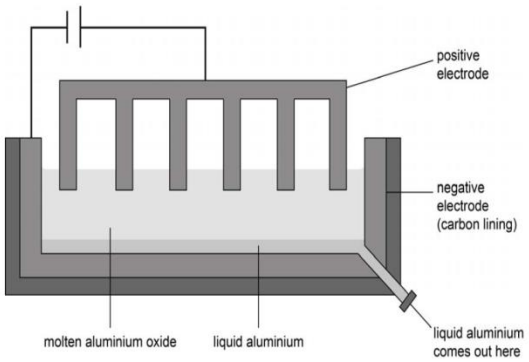
Electrolysis		
Process of electrolysis	***Splitting up using electricity***	When an ionic compound is melted or dissolved in water, the ions are free to move These are then able to conduct electricity and are called electrolytes Passing a current though electrolytes causes the ions to move to the electrodes
Electrodes	***Anode & Cathode***	The positive electrode is called the anode **(+)** The negative electrode is called the cathode **(-)**
Where do the ions go?	***Cations & Anions***	**Cations** are positive ions and they move to the negative cathode **Anions** are negative ions and they move to the positive anode

Extracting metals using electrolysis

Metals can be extracted from molten compounds using electrolysis.

This process is used when the metal is too reactive to be extracted by reduction with carbon.

The process is expensive due to large amounts of energy needed to produce the electrical current.
Example: aluminium is extracted in this way.



Mixed with cryolite to reduce melting point

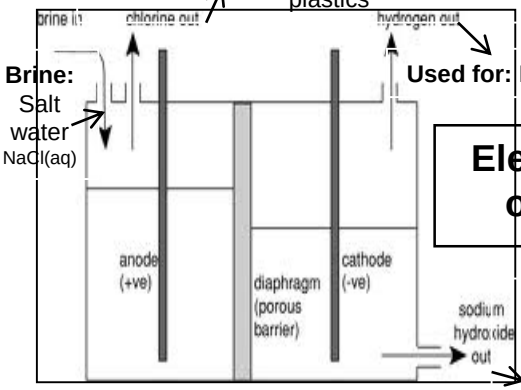
Electrolysis of solutions

In water (aqueous solution): $H_2O\ (l) \rightleftharpoons H^+\ (aq) + {}^-OH\ (aq)$

At the negative electrode	1. The metal will be produced on the electrode if it is less reactive than hydrogen. 2. Hydrogen will be produced if the metal is more reactive than hydrogen.
At the positive electrode	If you have a halide ion (Cl^-, I^-, Br^-) then you will get chlorine, bromine or iodine formed. Otherwise oxygen is formed at positive electrode from the hydroxide ion $4{}^-OH\ (aq) \rightarrow 2H_2O\ (l) + O_2\ (g) + 4e^-$

Order of discharge : Halide > Hydroxide > Others

Used for: Disinfectants, bleach and plastics



Brine: Salt water NaCl(aq)

Used for: Margarine and HCl

Electrolysis of Brine

Used for: Bleach, paper and soap

Extracting Aluminium

Aluminium Oxide → Aluminium + Oxygen

$2Al_2O_3\ (l) \rightarrow 4Al\ (l) + 3O_2\ (g)$

Aluminium forms at the negative electrode (cathode)

$Al^{3+}\ (l) + 3e^- \rightarrow Al\ (l)$

Oxygen forms at the negative electrode (anode)

$2O^{2-}\ (l) \rightarrow O_2\ (g) + 4e^-$

Oxygen reacts with the carbon electrodes to produce carbon dioxide

$C\ (s) + O_2\ (g) \rightarrow CO_2\ (g)$

OIL RIG - Oxidation Is Loss (of electrons), Reduction Is Gain (of electrons)

Ionic Half Equations

Sodium chloride solution (brine)

↓

Hydrogen + Chlorine + Sodium hydroxide

Anode: $2Cl^-(aq) \rightarrow Cl_2(g) + 2e^-$

Cathode: $2H^+(aq) + 2e^- \rightarrow H_2(g)$

In solution: $Na^+(aq) + {}^-OH(aq) \rightarrow NaOH(aq)$

Don't P.A.N.I.C. : Positive Anode, Negative Is Cathode