Keyword	Definition
Electrolysis	The composition (breakdown) of a compound into its elements using a direct electric current.
Electrode	A conductor used to make contact with the electrolyte. The negatively charged electrode is called the cathode. The positively charged electrode is called the anode.
Electrolyte	A molten or aqueous ionic compound
Ion	An atom that has lost electrons to become positively charged (AKA a cation) or gained electrons to become negatively charged (AKA an anion).
Aqueous	Dissolved in water
Oxidation	Loss of electrons
Reduction	Gain of electrons
Dissociation	The break up of an ionic compound into individual ions when dissolved in water.
Metal	An element from the left hand side of the periodic table that always forms a cation (a positively charged ion).
Inert	Non-reactive. Does not participate in a chemical reaction.

Naming electrodes

Electrodes are named after the ion that they attract. Positive cations are attracted to the negative cathode. Negative anions are attracted to the positive anode.

PANIC – Positive Anode Negative Is Cathode.

Electrolysis of molten compounds

The only source of ions are from the molten compound. Therefore a metal is always formed at the cathode and the non-metal always forms at the anode.

EG electrolysis of KBr will form K + Br_2

Electrolysis of aqueous compounds

Some water molecules will dissociate to form H^+ and OH^- ions. Therefore four ions will be present during electrolysis.

Cathode

If the metal present is less reactive than hydrogen (ie copper, silver or gold) that metal will form at the cathode. If the metal is more reactive than hydrogen, hydrogen gas will form at the cathode.

Anode

If there is a halogen present (F, Cl, Br or I) molecules of that gas will form at the anode, eg Cl_2

If no halogen is present molecules of oxygen will form at the anode ie O_2

Half-equations (HIGHER ONLY)

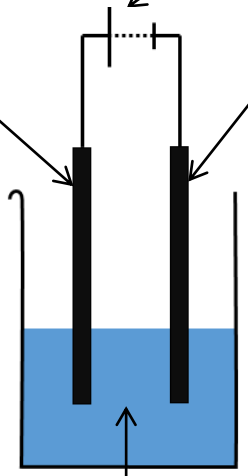
- Half-equations show us what is happening at each electrode during electrolysis
- Half-equations are balanced by adding or removing a number of electrons (e^-) equal to the total charge on the ion in the equation.
- For electrolysis - to the left of the arrow there is always an ion
- For electrolysis - to the right of the arrow there is always an element (uncharged) [sometimes a molecule]
- Electrons left of the arrow are added to the ion
- Electrons right of the arrow have been removed from the ion

EG Half equations for electrolysis of Al_2O_3: $Al^{3+} + 3e^- \rightarrow Al$ $2O^{2-} \rightarrow O_2 + 4e^-$

Electrolytes

Electrolysis can only take place when ions are free to move. Therefore covalent compounds (no ions present) and solid ionic compounds (ions cannot move) cannot undergo electrolysis.

Electrolysis of $CuSO_4$ with inert electrodes



Graphite anode
(positive terminal)
- Negative anions (hydroxide ions) attracted
- Anions LOSE electrons
- Therefore oxidised

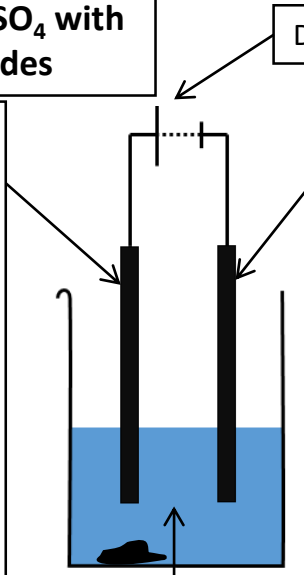
Observation
Bubbles of gas form (oxygen)

Graphite cathode
(negative terminal)
- Positive cations (copper ions) attracted
- Cations GAIN electrons
- Therefore reduced

Observation
Metal forms on electrode

Electrolyte
Aqueous copper sulfate, $CuSO_{4\,(aq)}$ (blue)

Electrolysis of $CuSO_4$ with non- inert electrodes



Copper anode
(positive terminal)
- Mass decreased
- Copper removed from anode
- Copper atoms turned into copper ions by **losing** electrons (oxidised)

Observation
Mass of electrode decreased
Impurities from electrode collect under anode

Copper cathode
(negative terminal)
- Mass increased
- Copper ions turned into copper atoms by **gaining** electrons (reduced)

Observation
Mass of electrode increased

Electrolyte
Aqueous copper sulfate, $CuSO_{4\,(aq)}$ (blue)