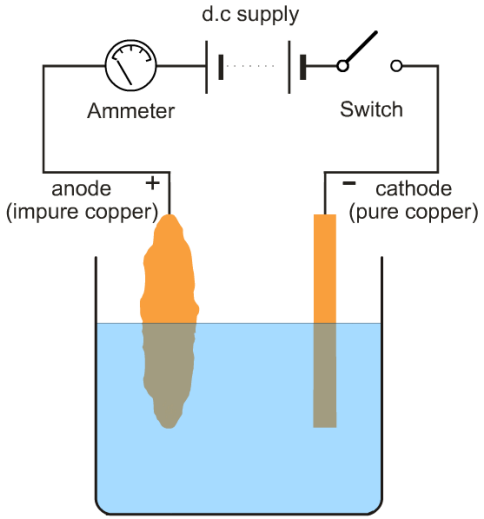
ELECTROLYSIS

POSITIVE CATIONS are attracted to the [—] cathode where they are reduced by the GAIN of electrons.

NEGATIVE ANIONS are attracted to the [+] anode where they are oxidized by the LOSS of electrons.

The electrolyte can be aqueous or molten (melted) – either way the IONS are free to move!



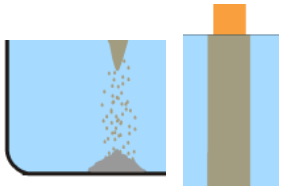
PURIFICATION OF COPPER BY ELECTROLYSIS

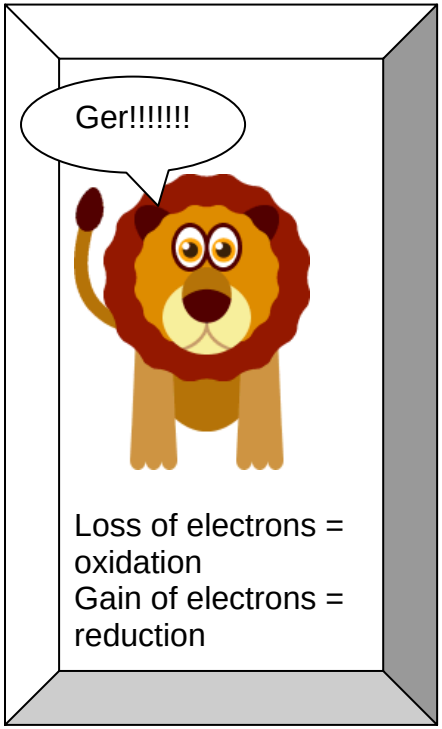
At anode: $Cu \rightarrow Cu^{2+} + 2e^-$

At cathode: $Cu^{2+} + 2e^- \rightarrow Cu$

In effect you move Cu from one electrode to the other! But as you do the impurites from the anode fall to the bottom of the cell as "anode sludge".

The cathode grows larger as it is coated in PURE Cu.





REDOX REVISION

Balancing half equations.

- Balance atoms that aren't H or O
- Balance O's by adding water, balance H's by adding H^+
- Balance charge by adding e^- to either side

Combining half equations.

- Multiply one or both by a number so the e^- will be the same and will cancel out. Combine the 2 equations. *Cancel out any species that now occur on both sides of the arrow (often H_2O or H^+).

Oxidation numbers Increase in oxidation number = oxidation, Decrease in oxidation number = reduction *Useful for working out what's been oxidised etc.*

Assigning Oxidation numbers: oxidation no. of element = 0. Sum of oxidation numbers in molecule = 0. Sum of oxidation numbers in ion = charge on that ion. H in compounds is always +1 (unless in a metal hydride). O in compounds is always -2 (unless in a peroxide). Oxidation of simple monatomic ions = their charge. Watch out for N, S, and Cl in particular which can vary a lot.

Electrolysis of water – splits water into H_2 & O_2 gas

anode: $2H_2O(l) + 2e^- \rightarrow H_2(g) + 2OH^-(aq)$

cathode: $2H_2O(l) \rightarrow O_2(g) + 4H^+(aq) + 4e^-$

Overall equation: $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$

The decomposition of water produces twice as much hydrogen gas as oxygen gas.