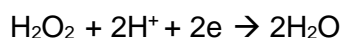


Electrochemical Cell

Reduction at the cathode:



The solution remains colourless as H_2O_2 and H_2O are both colourless.

This is a reduction reaction as the oxidation number of O decreases from -1 in H_2O_2 to -2 in H_2O . A decrease in oxidation number corresponds to reduction.

Each H_2O_2 gains two electrons. Gaining of electrons corresponds to reduction.

Oxidation at the anode:



The solution turns from pale green Fe^{2+} to orange Fe^{3+} .

This is an oxidation reaction as the oxidation number of Fe increases from +2 in Fe^{2+} to +3 in Fe^{3+} . An increase in oxidation number corresponds to oxidation.

Each Fe^{2+} loses 1 electron, losing electrons corresponds to oxidation.

E°

An electrochemical cell is an apparatus that uses a spontaneous oxidation-reduction reaction to produce an electric current. It consists of two half cells connected by a conducting wire and a salt bridge.

For this reaction:

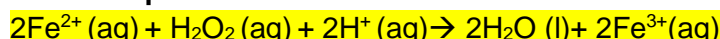
$$E^\circ_{\text{cell}} = E^\circ_{\text{red}} - E^\circ_{\text{ox}} = +1.77 \text{ V} - 0.77 \text{ V} = +1.00 \text{ V}$$

As E°_{cell} is positive, the reaction is spontaneous.

The most positive E° value will be the reduction reaction as these are reduction potentials.

The most positive E° value indicates the strongest oxidant so H_2O_2 is a stronger oxidant than Fe^{3+} . Therefore, H_2O_2 will be reduced.

Overall equation:

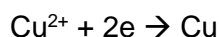


Electrolytic cell

From observations: The electrolysis of molten copper oxide produces bubbles of a colourless gas at one electrode and an orange solid is deposited at the other electrode.

Colourless gas is oxygen at the positive anode. Orange solid is copper and it is deposited at the negative cathode.

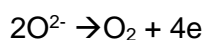
Reduction at the cathode (negative electrode)



The oxidation number of Cu decreases from +2 in Cu^{2+} to 0 in Cu.

Each Cu^{2+} gains 2 electrons.

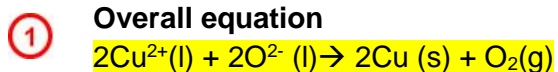
Oxidation at the anode (positive electrode)



The bubbles of colourless gas are oxygen.

The oxidation number of O increases from -2 in O^{2-} to 0 in O_2 .

Each O^{2-} loses 2 electrons.



③ **Energy requirements**
The battery provides push for electrons to move in the reverse direction to their natural tendency. The non-spontaneous reaction is forced to occur and electrical energy is consumed in order to produce a chemical reaction.

④ Electrochemical cell Reactions are spontaneous producing electrical energy.	Electrolytic cell The battery provides push for electrons to move in the reverse direction to their natural tendency. The non-spontaneous reaction is forced to occur and electrical energy is consumed in order to produce a chemical reaction.
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