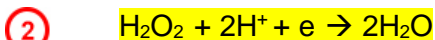


**Electrochemical Cell****Reduction at the cathode:**

The reaction remains colourless.

1 This is a reduction reaction as the oxidation number of O decreases from -1 in  $\text{H}_2\text{O}_2$  to -2 in  $\text{H}_2\text{O}$ . A decrease in oxidation number corresponds to reduction.

**Oxidation at the anode:**

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

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

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

$E^\circ$

For this reaction:

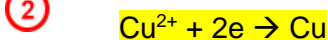
3  $E^\circ_{\text{cell}} = E^\circ_{\text{red}} - E^\circ_{\text{ox}} = +1.77 - 0.77 = +1.00$

The reaction is spontaneous.

**Electrolytic cell**

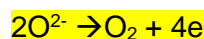
4 From observations: The electrolysis of molten copper oxide produces bubbles of a colourless gas at one electrode and an orange solid is deposited at the other electrode.

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  $\text{Cu}^{2+}$  to 0 in Cu.

Each  $\text{Cu}^{2+}$  gains 2 electrons.

**Oxidation at the anode (positive electrode)**

The bubbles of colourless gas are oxygen.

Each  $\text{O}^{2-}$  loses 2 electrons.

This process requires electrical energy to make the non-spontaneous reaction happen.