

Solutions

2.1 In the solid, the ions are fixed in the lattice and cannot move; when molten the ions are free to move to the electrodes and carry charge.

2.2 Lead at the cathode; bromine at the anode.

2.3 Chlorine.

3.1 The mixture has a much lower melting point than pure aluminium oxide; so less energy is needed to keep it molten – cheaper and probed. At the anode, oxygen is produced; the hot carbon anode reacts/burns with the oxygen to form carbon dioxide, so it is used up and must be replaced.

3.2 At the cathode, copper deposits – copper is less reactive than hydrogen, so Cu^{2+} is discharged in preference to H^+ : $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$. At the anode, oxygen forms from the hydroxide ions of the water – no halide present: $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$.

3.3 Cathode (negative): $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$. Anode (positive): $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$.