4.3 ELECTROLYSIS

Extracting metals

- Anode continually replaced
  - Anode made of carbon which reacts with oxygen to produce carbon dioxide
- Requires lots of energy
- Aluminium oxide and cryolite
  - Cryolite lowers melting temperature
- Used if...
  - The metal is more reactive than carbon
    - Use the reactivity series to determine type of extraction
  - The metal reacts with carbon

Ionic compounds

- Must be molten or aqueous so the ions are free to move
  - Aqueous solutions
    - At the cathode, hydrogen is produced if the metal is more reactive than hydrogen
    - At the anode, oxygen is produced unless the solution contains halide ions - then the halogen is produced
  - Molten compounds
    - The metal is produced at the cathode
    - Non metal produced at the anode
    - Lead bromide example
      - Lead produced at cathode, bromine produced at anode

The process

- Splitting up with electricity
  - Electric current passes through the electrolyte, ions move towards the electrodes where they react
- Electrolyte
  - Molten or aqueous ionic compound
  - Conducts electricity
- Electrodes
  - Solid placed in the electrolyte
  - Anode
    - Negative ions move towards the anode
    - Positive electrode
  - Cathode
    - Positive ions move towards the cathode
    - Negative electrode
  - To remember electrode charge: Positive Anode Negative Is Cathode

Half equations

Write half equations for the process at each electrode

- E.g. $2Br^- \rightarrow Br_2 + 2e$ $Pb^{2+} + 2e^- \rightarrow Pb$
- Show reduction reactions at the cathode, oxidation reactions at the anode
- Balance the electrons to combine half equations

KEY
'Higher only' written in blue.

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