OCR A GCSE Chemistry

Topic 3: Chemical reactions

Electrolysis

Notes

C3.4a recall that metals (or hydrogen) are formed at the cathode and non-metals are formed at the anode in electrolysis using inert electrodes

- Movement of ions in the electrolyte
    - Positive ions (cations) move to negative electrode to receive electrons and are reduced e.g. metal ions / hydrogen ions resulting in the formation of metals / hydrogen.
    - Negative ions (anions) move to positive electrode to lose electrons and are oxidised e.g. non-metal ions resulting in the formation of non-metals.

C3.4b predict the products of electrolysis of binary ionic compounds in the molten state

- if ionic compounds are molten it is much more simple to predict the products of electrolysis as there are no ions present except those in the ionic compound:
    - identify which ions there are within the ionic compound.
    - the + ions will go to the cathode.
    - the - ions will go to the anode.

C3.4c describe competing reactions in the electrolysis of aqueous solutions of ionic compounds in terms of the different species present

- When you have a ionic solution (NOT a molten ionic compound), your solution will contain: the ions that make up the ionic compound, and the ions in water (OH^- and H^+)
- at the cathode (-):
    - hydrogen (from H^+ in water) is produced UNLESS the + ions in the ionic compound are from a metal less reactive than hydrogen.
    - if the metal is less reactive, it will be produced instead.
- at the anode (+):
    - oxygen (from OH^- in water) will be produced UNLESS the ionic compound contains halide ions (Cl^-, Br^-, I^-).
    - if there are halide ions, the halogen will be produced instead (e.g. Cl_2).

electrolysis of:

- Sodium chloride solution
    - H^+ ions go to cathode, H_2 (g) is produced (Na is more reactive than hydrogen).
    - Cl^- ions go to anode, Cl_2 (g) is produced (Cl^- are halide ions).

- Copper sulfate solution
  - Cu^{2+} ions go to cathode, Cu (s) is produced (Cu is less reactive than hydrogen).
  - OH^- ions go to anode, O_2 (g) is produced (SO_4^{2-} ions are not halide ions).

C3.4d describe electrolysis in terms of the ions present and reactions at the electrodes

- Oxidation Is Loss (of electrons) and Reduction Is Gain (of electrons) - remember OIL RIG.
- ANODE – loss of electrons, oxidation (positive electrode) anions come to it.
- CATHODE – gain of electrons, reduction (negative electrode) cations come to it.

C3.4e describe the technique of electrolysis using inert and non-inert electrodes

- Inert electrodes are used if the products made are reactive- otherwise if non-inert electrodes were used, you would end up with reactions taking place between the electrodes and the solution.
- Sometimes, non-inert electrodes are used e.g. in purification of copper, a pure and impure copper electrode is used.