

WJEC (Eduqas) Chemistry A-level

PI1 - Electrochemistry

Definitions and Concepts

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Definitions and Concepts for WJEC (Eduqas) Chemistry A-level PI1 - Electrochemistry

PI1.1 - Redox and Standard Electrode Potential

Anode: Positive electrode where oxidation takes place.

Cathode: Negative electrode where reduction takes place.

Cell potential: A measure of the potential difference between two half cells, calculated by combining two standard electrode potentials. The calculated cell potential can be used to predict the feasibility of a reaction, although this doesn't consider concentration or kinetics.

E.M.F: Electromotive force, measured in volts. The difference between the potential differences of the cathode and anode in an electrochemical cell.

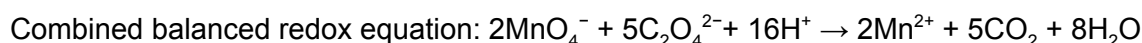
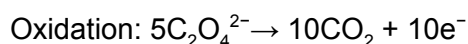
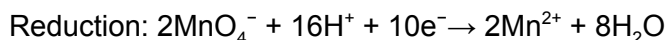
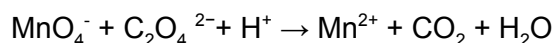
Electrochemical cell: Combination of two half cells, consists of two electron conductors (electrodes) separated by an ionic conductor (electrolyte). Cells are used to measure electrode potentials by reference to the standard hydrogen electrode.

Electrode: A conductor through which electricity enters or leaves the electrolyte in an electrochemical cell.

Electrode potential: The potential difference of a cell consisting of a specific electrode as the cathode and the standard hydrogen electrode as the anode. Reduction always takes place at the cathode, and oxidation at the anode.

Feasible reaction: For a reaction to be feasible at a given temperature it must occur spontaneously. This means no extra energy is required for the reaction to occur.

Half equation: A full redox equation can be split into two half-equations, one involving oxidation and the other involving reduction. This is useful for balancing complex redox reactions, such as:



Hydrogen fuel cell: An electrochemical cell that converts the chemical energy of the fuel (hydrogen) and the oxidising agent (oxygen) into electricity through redox reactions. They do not need to be recharged but require a constant supply of fuel to maintain the potential difference.

Oxidation state: The charge of an ion or a theoretical charge of an atom in a covalently bonded compound assuming the bond becomes ionic.

Redox reaction: A reaction in which reduction and oxidation occur simultaneously.

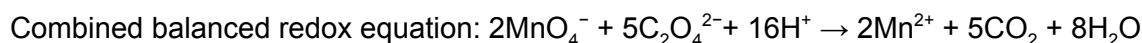
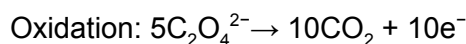
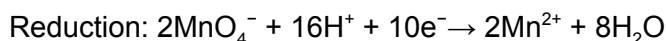
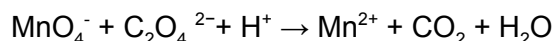
Standard conditions: Solutions of 1.0 mol dm^{-3} concentration, a temperature of 298K and 100 kPa pressure.

Standard electrode (redox) potential (E^\ominus): The EMF of a half cell compared with a standard hydrogen half cell. This is measured under standard conditions (1 mol dm^{-3} concentrations, 298K temperature and 1 atm pressure).

Standard hydrogen electrode (SHE): The measuring standard for half-cell potentials. It has a cell potential of 0.00V, measured under standard conditions.

PI1.2 - Redox Reactions

Half equation: A full redox equation can be split into two half-equations, one involving oxidation and the other involving reduction. This is useful for balancing complex redox reactions, such as:



Oxidation: Process involving the loss of electrons. Results in an increase in oxidation number.

Redox reaction: A reaction in which both reduction and oxidation are occurring simultaneously.

Reduction: Process involving the gain of electrons. Results in a decrease in oxidation number.

Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

