

13 - Electrochemistry

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Important terms

Electrochemistry :-

Electrochemistry is a branch of chemistry which involves the interaction between chemical reactions and electrical currents.

Oxidation :

Loss of electrons.

Reduction :

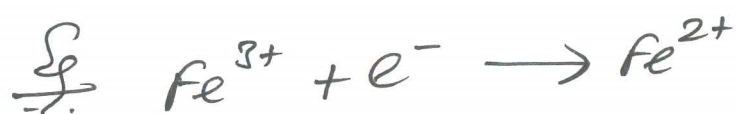
Gain of electrons.

Redox reaction :

A redox reaction involves transfer of electrons from one species to another.

Oxidizing agent: (oxidant)

Takes electrons.



Reducing agent: (Reductant).

Gives electrons.



cell:

The electrochemical or electrolytic processes are carried out in a device.

Electrolytic cell:

Electrolytic cell is the cell in which electrical energy is used to bring about chemical reaction at the electrodes.

Electrochemical cell:

Electrochemical cell is the cell in which chemical energy is used to bring about electrical energy in the form of electromotive force.

The electromotive force: (emf):

The electromotive force of the cell is the difference in potentials (voltages) of the cathode and anode in contact with the electrolytes at the electrodes.

Daniel cell (or) Galvanic cell:

Daniel cell (or) Galvanic cell is an example of electrochemical cell in which the overall reaction taking place is oxidation half reaction and reduction half reaction.

Current:

Current is the flow of electrons through a wire or any conductor.

Electrode:

A metallic bar / rod / strip which conducts electrons into and out of a solution.

Anode:

Anode is the electrode at which oxidation occurs.

~~Electrode~~:

Cathode:

Cathode is the electrode at which reduction occurs.

Electrolyte:

Electrolyte is the salt solution in a cell.

Half cell:

Each half of an electrochemical cell where the oxidation occurs at one half and reduction occurs at another half cell.

Cell voltage:

The emf or cell potential is measured in units of volts (V).

Cell diagram:

An abbreviated symbolic depiction of an electrochemical cell.

Reversible cell :-

Reversible cell is defined as that operates by reversal of cell reactions when the direction of flow of current is reversed.

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Single electrode potential:

Single electrode potential is the potential of a single electrode in a half cell.

Standard emf (E°):

Standard emf (E°) may be defined as the emf of a cell with 1M solutions of reactants and products in solution measured at 25°C.

W_{\max} :

The maximum amount of work obtainable from the cell.

$$W_{\max} = -nFE$$

Where n = number of moles of electrons

F = Faraday

E = emf of the cell.

Electrolysis:

The chemical reactions carried out at the electrodes by passing electricity.

Strong electrolytes:

The electrolytes those when dissolved in water are completely dissociated into ions of +ve and -ve charges.

Weak electrolytes:

The electrolytes those when dissolved in water are partially dissociated into ions.

Free energy (ΔG):

According to thermodynamics change

$$W_{\text{max}} = \Delta G$$

$$\therefore \boxed{\Delta G = -nFE}$$

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Cell Terminology

Current:

Current is the flow of electrons through a wire or any conductor.

Electrode:

Electrode is the material rod/bar/strip which conducts electrons into and out of a solution.

Anode:

Anode is the electrode at which oxidation occurs.

Cathode:

Cathode is the electrode at which reduction occurs.

Also ^{electrode} At which electrons are received from the outer circuit.

Electrolyte:

Electrolyte is the salt solution in a cell.

Anode Compartment:

Anode compartment is the compartment of the cell in which oxidation half reaction occurs. It contains the anode.

Cathode Compartment:

Cathode compartment is the compartment of the cell in which reduction half-reaction occurs. It contains the cathode.

Half cell:.

Each half of an electrochemical cell, where oxidation occurs and the half where reduction occurs, is called the half cell.