

STD 10 CHEMISTRY– CHAPTER 3 VIDEO LINKED NOTES

(EM)

FIRST BELL CLASS- 18

Electrolytic Cells

Cells in which electrical energy is converted to chemical energy by means of redox reactions are known as Electrolytic cells.

An electrolytic cell require:

- Electrolyte
- Anode
- Cathode
- Battery (DC current)
- Voltmeter



To view First bell Class 18 Click the image

Electrolyte

Substances which conduct electricity in molten states or in aqueous solutions are called electrolytes. Eg: Acids, Alkalies and salts.

Electrolysis

The process of chemical change taking place in an electrolyte by passing electricity is known as electrolysis.

Anode

The electrode which is connected to positive terminal of the battery is the Anode. Oxidation takes place at anode

Cathode

The electrode which is connected to negative terminal of the battery is the Cathode. Reduction takes place at cathode.

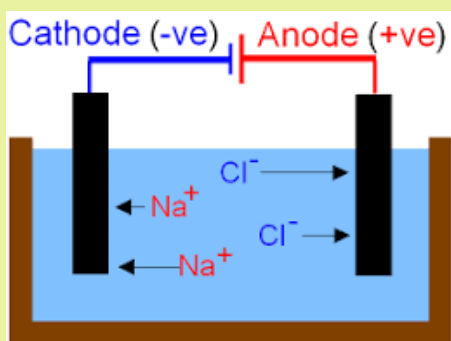
Cations

The positive ions which are attracted towards the the negative electrode (cathode) are called cations.

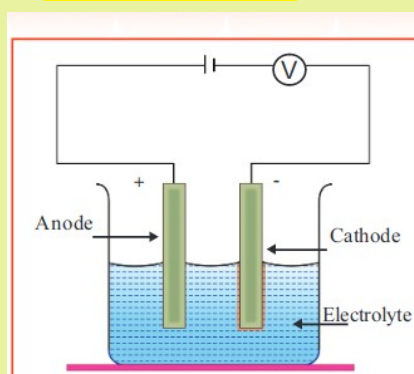
Anions

The negative ions which attracted toward the positive electrode (anode) are called anions.

Electrolysis of molten sodium chloride

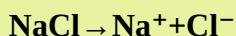


ELECTROLYSIS



When NaCl melts, the positively charged sodium ions (Na^+) and the negatively charged chloride ions (Cl^-) are free to move.

Molten NaCl ionises as follows:



Worksheet

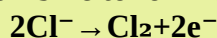
1. When electricity passed through molten NaCl, which ion is attracted to the +ve electrode (anode)?

Chloride ion (Cl^-)

2. Which is the chemical reaction taking place there?

Oxidation

Each Cl^- ion loses one electron (oxidation) forming chlorine atom and two chlorine atoms combine to form chlorine molecule at anode.



3. Which is the gas liberated at the anode?

Chlorine

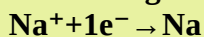
4. Which is the ion attracted to the -ve electrode (cathode)?

Sodium ion (Na^+)

5. Which is the chemical reaction taking place there?

Reduction

Each Na^+ ion gain one electron forming Na atom and deposited at the cathode.



6. Which is the metal deposited at cathode?

Na

*Products at Anode – Chlorine
Products at Cathode – Sodium*

Electrolysis of sodium chloride solution

Ions like Na^+ , Cl^- , H_3O^+ , OH^- and H_2O are present in a solution of sodium chloride.

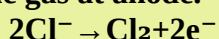
Worksheet

1. Which are the ions attracted to the positive electrode (anode)?

Cl^- and OH^-

2. Which is the chemical reaction taking place at anode ?

The tendency to get oxidised is greater for Cl^- ions and undergo oxidation forming chlorine gas at anode.

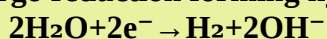


3. Which are the ions attracted to the negative electrode (cathode)?

Na^+ ions and H_3O^+ ions (Hydronium ions)

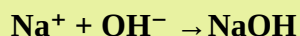
4. Which is the chemical reaction taking place at cathode ?

Compared to Na^+ ions and H_3O^+ ions, H_2O has a greater tendency to get reduced and H_2O undergo reduction forming hydrogen at cathode.



5. Which compound is formed in the resultant solution?

Na⁺ ions and OH⁻ ions in the electrolyte combine to form sodium hydroxide solution as a byproduct.



Product at anode – Chlorine
Product at cathode – Hydrogen
Product in solution - NaOH

<i>Electrolysis</i>	<i>Electrodes</i>	<i>Chemical change</i>	<i>Products</i>
Electrolysis of molten NaCl	Anode	$2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$	Cl_2
	Cathode	$\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$	Na
Electrolysis of NaCl solution	Anode	$2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$	Cl_2
	Cathode	$2\text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{OH}^-$	H_2

Applications of Electrolysis

1. Production of metals.
eg: K, Na, Ca, Al
2. Production of non-metals
eg: H₂, O₂, Cl₂ etc
3. Production of compounds.
eg: NaOH, KOH etc
4. Refining of metals
eg: Cu, Au etc
5. Electroplating

Electroplating

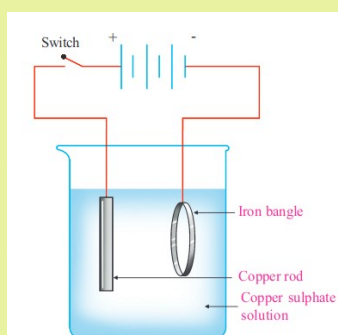
The process of obtaining a coating of one metal over another metal using electrolysis is known as electroplating.

Anode - The metal to be plated

Cathode – The object to be coated

Electrolyte – A salt solution of the metal to be coated.

Copper plating on Iron bangle



Anode – Cu rod
Cathode – Iron bangle
Electrolyte – Coppers sulphate solution

Worksheet

[To view copper plating video click here](#)

1. Which is the anode?

Cu rod

2. Which is the cathode?

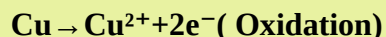
Iron bangle

3. Which is the electrolyte?

Copper sulphate solution

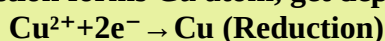
4. What happens to the Cu rod (anode) ?

Each Cu atom in the Cu rod undergo oxidation forming Cu^{2+} ions and goes to the solution.



5. What happens to the iron bangle (cathode) ?

Cu^{2+} ions of the copper sulphate solution are attracted to the cathode and undergo reduction forms Cu atom, get deposited on Iron bangle.



<i>Electrolytes used in electroplating</i>	
<i>Metal to be covered</i>	<i>Electrolyte</i>
<i>Silver</i>	Silver nitrate solution/Sodium cyanide+silver cyanide solution
<i>Gold</i>	Sodium cyanide+ gold cyanide solution
<i>Copper</i>	Copper sulphate solution

Prepared by – USHAKUMARY. S
HST Physical Science
Govt HSS Karunagappally
Kollam (Dist)