



STEPPING STONE
SCHOOL (HIGH)

CLASS :X

Subject:CHEMISTRY

Date:19/05/2020

Topic: ELECTROLYSIS

Time Limit:40 MINUTES

Worksheet No. :6

[Copy the questions and solve them on a sheet of paper date wise. Keep the worksheets ready in a file to be submitted on the opening day.]

THEORY OF ELECTROLYTIC DISSOCIATION

Arrhenius gave the ionic theory

- a)An electrolyte on dissolving in water dissociates into free mobile ions i.e cation and anions.
- b)All ions carry an electric charge.
- c)The conductivity of electrolyte depends on the concentration of ions.
- d)The number of positive charges equals the number of negative charges in the solution and thus the solution is in electrolytic equilibrium.

DIFFERENCE BETWEEN ARRHENIUS AND MODERN CONCEPT:

Arrhenius considered that water ionises electrolytes but modern concept considers that electrolytes are ionic even in solid state and their ions are held together by strong electrostatic forces .

CHARACTERISTICS OF ELECTROLYSIS

- a) The passage of electricity through an electrolyte causes the positive ions (cations) to migrate towards the cathode and negative ions (anions) to migrate towards anode.
- b) The number of electrons gained by the anode is equal to the number of electrons given by the cathode.
- c) Only hydrogen gas and metals are liberated at cathode hence ELECTRO-POSITIVE elements and non -metals are liberated at anode and are called ELECTRO-NEGATIVE elements.

FARADAY'S LAW OF ELECTROLYSIS

The mass of a substance produced at an electrode during electrolysis is proportional to the quantity of electricity passing through the electrolyte.

The process of electrolysis is a redox reaction

At Cathode: $\text{Na}^+ + \text{e}^- = \text{Na}$ (reduction)

At Anode: $\text{Cl}^- - \text{e}^- = \text{Cl}$ (oxidation)



Overall reaction: $2\text{NaCl} = 2\text{Na} + \text{Cl}_2$

Why is direct current used in electrolysis?

The alternating current does not cause any chemical change when passed through an electrolyte and therefore electrolysis do not occur hence electrolysis is caused by **direct current**.

ELECTROLYTIC DISSOCIATION:

The process due to which an ionic compound dissociates into ions in the fused state or in aqueous solution is called **electrolytic dissociation**.

DISSOCIATION OF SODIUM CHLORIDE:

- a) Solid sodium chloride in solid state the ions are not free but are held together by an electrostatic force of attraction hence it does not conduct electricity due to absence of free ions.
- b) When sodium chloride is dissolved in water ,in aqueous state the slightly negative charged oxygen atoms of the polar water molecule exerts a pull on the positively charged sodium ions,a similar pull is exerted by the slightly positive charge hydrogen atoms of the water on the negatively charged chloride ions,thereby making the ions free to conduct electricity.
- c) When sodium chloride is in molten state , the high temperature required to melt the bond weakens the bond between the particles and set the ions free.

IONISATION:

The process by which polar covalent compounds are converted into ions, in water solution, is called ionisation.

e.g.

In gaseous state or in pure liquid state, HCl is unionised and does not conduct an electric current.

When HCl is dissolved in water the slightly negative charged oxygen atoms of the water exerts an electrostatic pull on the slightly positively charged hydrogen ions present in the molecule of HCl to form hydronium ions.

ELECTROCHEMICAL SERIES OF METALS

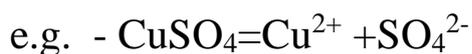
Reactivity Series of Metals			
These metals are more reactive than hydrogen	Potassium	K	(Most reactive metal)
	Sodium	Na	
	Calcium	Ca	
	Magnesium	Mg	
	Aluminium	Al	
	Zinc	Zn	
	Iron	Fe	
	Tin	Sn	
	Lead	Pb	
	[Hydrogen]	[H]	
These metals are less reactive than hydrogen	Copper	Cu	
	Mercury	Hg	
	Silver	Ag	
	Gold	Au	(Least reactive metal)

PREFERENTIAL OR SELECTIVE DISCHARGE OF IONS AT ELECTRODES:

It depends on three factors:

- The relative position of ions in the electrochemical series.
- The relative concentration of ions.
- The nature of electrodes

- Any ion lower in the electrochemical series gets discharged at the respective electrode



Cations: $\text{Cu}^{2+} / \text{H}^+$

Anions: $\text{SO}_4^{2-} / \text{OH}^-$

Cu^{2+} being lower in the electrochemical series will be discharged at cathode and OH^- will be discharged at anode.

- If an electrolyte has higher concentration of a particular ion, then the ion will be discharged at the relevant electrode in preference to those ions which are lower in the series.

Electrodes are 2 types:

INERT ELECTRODES: Graphite, Platinum

ACTIVE ELECTRODES: Copper, Nickel, Silver

So children that is the end of today's discussion next day we are going to discuss about the various examples of electrolysis..... Go through the part and make a note in your copies with proper headings.....

Go through the link...

<https://youtu.be/WaEztcY1-f8>