

Electrochemistry

1. Electrolytes and non-electrolytes.
2. Strong electrolytes and weak electrolytes
3. Ionization and dissociation
4. Mobility of ions
5. Arrhenius theory of ionization.
6. Faraday's laws of electrolysis.
7. Transport number
8. Exhibition of electrolysis process in a cell.
9. Reversible cells & irreversible cells & molar conductance.
10. Mathematical problem.

✶ Electrolyte : An electrolyte is a compound that conducts electric current when it is in aqueous solution state or in melted state.

✳ Electrolytes-

- All ionic compounds are electrolytes
- When ionic compounds dissolve, they break apart into ions which are then able to conduct current.

✳ Non-electrolyte : A non-electrolyte is a compound that doesn't conduct electric current in either aqueous solution state or in molten state.

- Almost all covalent compounds aren't electrolytes (i.e., non-electrolytes).
- When these compounds dissolve in water, they don't produce ions.

❖ Difference between electrolytes and non-electrolytes:

Electrolytes	Non-electrolytes
1. Substances When dissolved in water, allow for conduct electricity are called electrolytes.	1. Substances When dissolved in water, doesn't allow for conduct electricity are called non-electrolytes.
2. They produce ions in water.	2. They don't produce ions in water.
3. These substances are formed by ionic bond.	3. These substances are formed by covalent bond.
4. Acids, bases and salts are electrolytes.	4. Sugar, honey etc. covalent compounds are non-electrolytes.

⇒ Strong electrolyte: A strong electrolyte is a solution that completely or almost completely ionizes or dissociates in a solution.

→ Strong electrolytes are good conductors of electricity.

⇒ The strong electrolytes may be strong acids, strong bases or soluble ionic salts.

→ The strong electrolytes are:

i. Strong acids: ^{eg.} HCl , H_2SO_4 , HNO_3 , HClO_4 , HBr and HI etc.

ii. Strong bases: NaOH , KOH , Ca(OH)_2 , Mg(OH)_2 etc.

iii. Salts: Practically all salts (NaCl , KCl) are strong electrolytes.

⇒ Weak electrolyte: A weak electrolyte is a solution that isn't completely ionizes or dissociates in a solution.

→ The weak electrolytes may be organic acids, organic bases or few salts that don't soluble in water.

→ The weak electrolytes are:

- i. Organic acids [e.g., CH_3COOH (acetic acid), Oxalic acid ($\text{HOOC}-\text{COOH}$), Sulphurous acid (H_2SO_3) etc.
- ii. Organic bases [e.g., $\text{C}_2\text{H}_5\text{NH}_2$ (Alkyl amine)]
- iii. A few salts like Mercury(II) Chloride, Lead(II) acetate.

~~✗~~ Roles of electrolytes in the body:

- i. Regulate nerve and muscle function.
- ii. Balance the amount of water in the body.
- iii. Move wastes out from body.
- iv. Keep balance body's pH level.
- v. Help to rebuild damaged tissues.
- vi. Move nutrients into cells.
- vii. Keep blood pressure stable.
- viii. Keep heart rate and rhythm steady.

✚ Ionization: Ionization refers to the reaction in which the polar covalent compounds are converted into ions in water.

→ It is the process that involves the formation of ions.

→ It involves the creation of charges across the participating species.

✚ Dissociation: Dissociation refers to the separation of ions which are already present in electrovalent or ionic compounds.

→ It is the process of breaking up of a moiety (half) into its constituent atoms, molecules and ions.

→ It occurs due to a weak bond between species.

⇒ Difference between ionization and dissociation:

Ionization	Dissociation
1. It is the process which produces new charged particles.	1. It is the separation of charged particles which already exists in a compound.
2. It involves polar covalent compounds or metals.	2. It involves ionic compounds.
3. Irreversible.	3. Reversible
4. Involve covalent bond between atoms.	4. Involve ionic bond in compound.
5. Always produces charged particles.	5. It produces either charged particles or electrically neutral particles.

⇒ Conductance: Conductance is the ability of an element to conduct electric current. Conductance is expressed by G .

$$\text{So, } G = \frac{1}{R}.$$

Unit of conductance is Siemens (S).