Al-Zahraa University for women
College of health and medical technologies
Radiology department
The first stage

Electrolytes and Aromatic hydrocarbons

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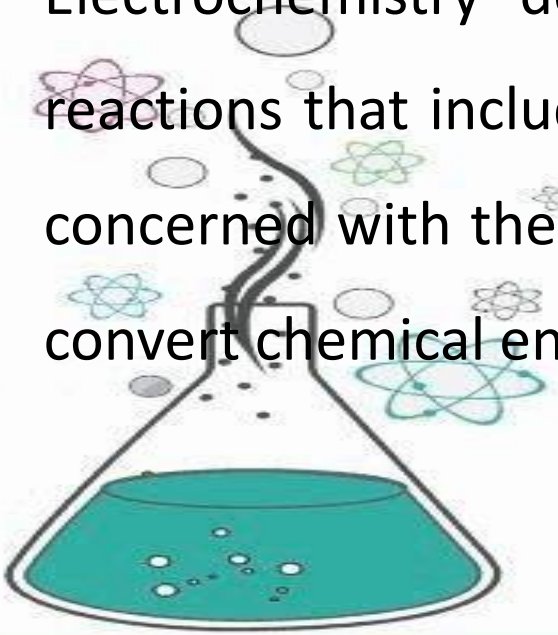
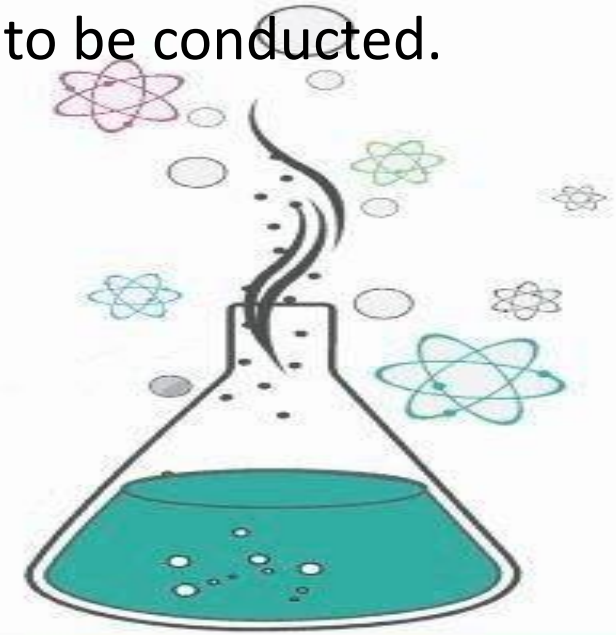
Electrolytes

Electrolytes are chemicals that have the ability to dissociate into ions when dissolved in a solution, making them capable of conducting electricity. Electrochemistry deals with the study of chemical reactions that include the transfer of electrons, and is concerned with the study of electrochemical cells that convert chemical energy into electrical energy.

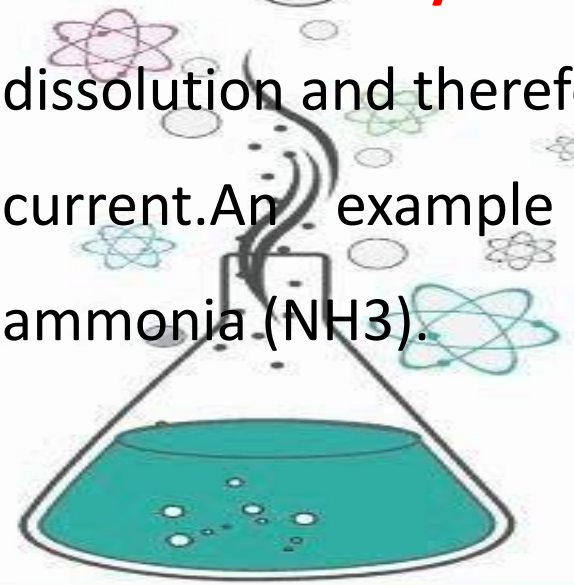


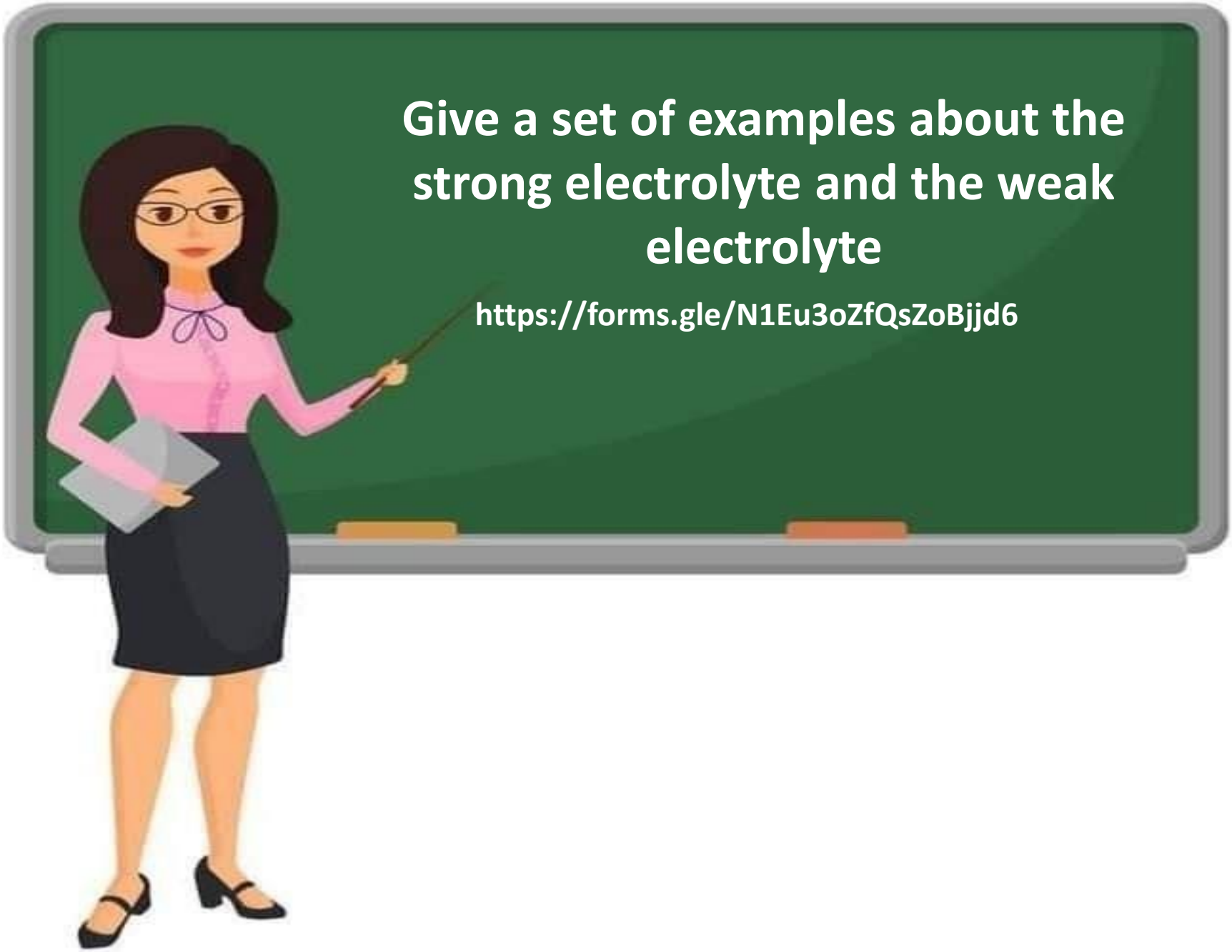
Electrolytes are formed when a substance such as salt (such as sodium chloride) is dissolved in water. The salt decomposes into sodium ions (Na^+) and chloride ions (Cl^-) which are distributed in the solution, allowing electricity to be conducted.



Types of electrolytes

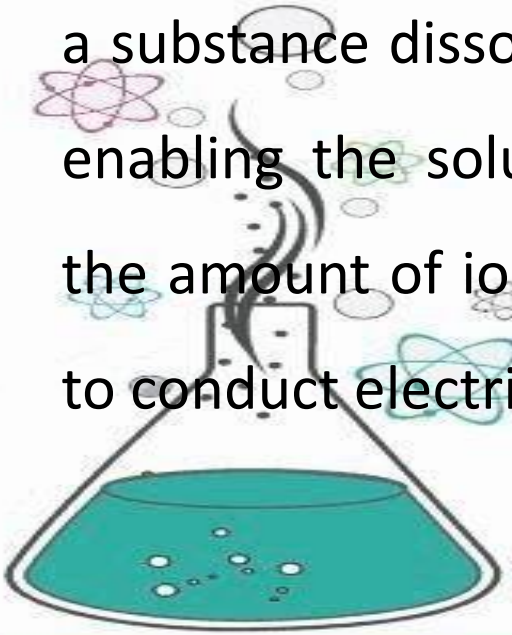
- **Strong electrolytes** :are substances that completely dissociate into ions when dissolved in water, resulting in instantaneous conduction of electricity. An example is hydrochloric acid (HCl) and sodium sulfate (Na_2SO_4).
- **Weak electrolytes**:only partially disintegrate upon dissolution and therefore do not provide a strong electrical current.An example is acetic acid (CH_3COOH) and ammonia (NH_3).




Give a set of examples about the strong electrolyte and the weak electrolyte
https://forms.gle/N1Eu3oZfQsZoBjjd6

Properties of electrolytes

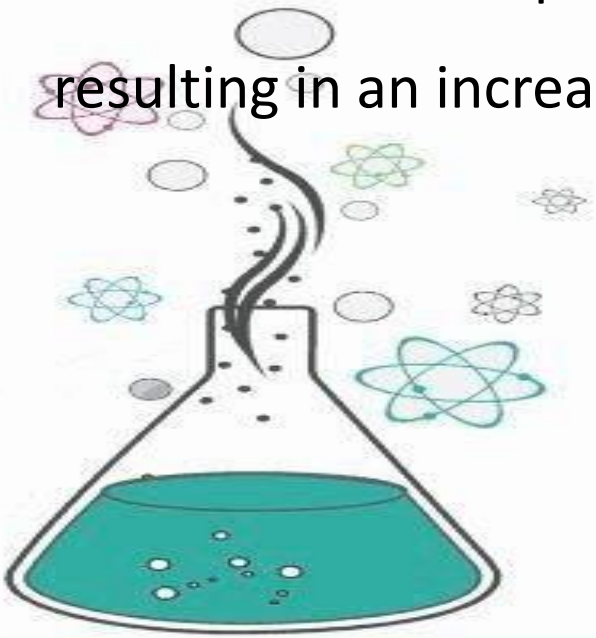
- **Ability to conduct electricity:** Electrolytes are responsible for conducting electricity in solutions, as the ions in the solution are able to transfer electrical charges.
- **Ionization in solutions:** The ionization process occurs when a substance dissolves in water, breaking it down into ions, enabling the solution to conduct electricity. The greater the amount of ions, the greater the ability of the solution to conduct electricity.



Oxidation and Reduction

- **Oxidation**: The process of losing electrons, usually resulting in an increase in the positive charge of the atom.

- **Reduction**: The process of gaining electrons, usually resulting in an increase in the negative charge of the atom.



Oxidation and Reduction

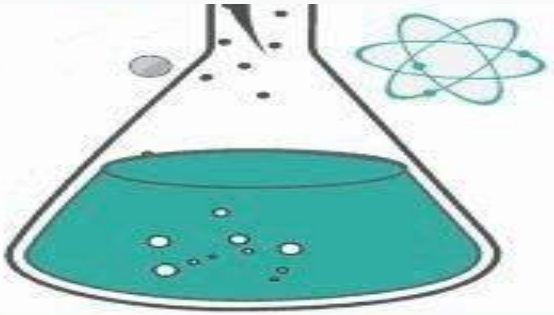
Redox reactions are the core of electrochemical processes, forming the basis of the operation of galvanic and electrolytic cells By understanding these interactions, more efficient batteries can be designed, electrolysis processes improved, and new technologies in various fields developed.

galvanic cell

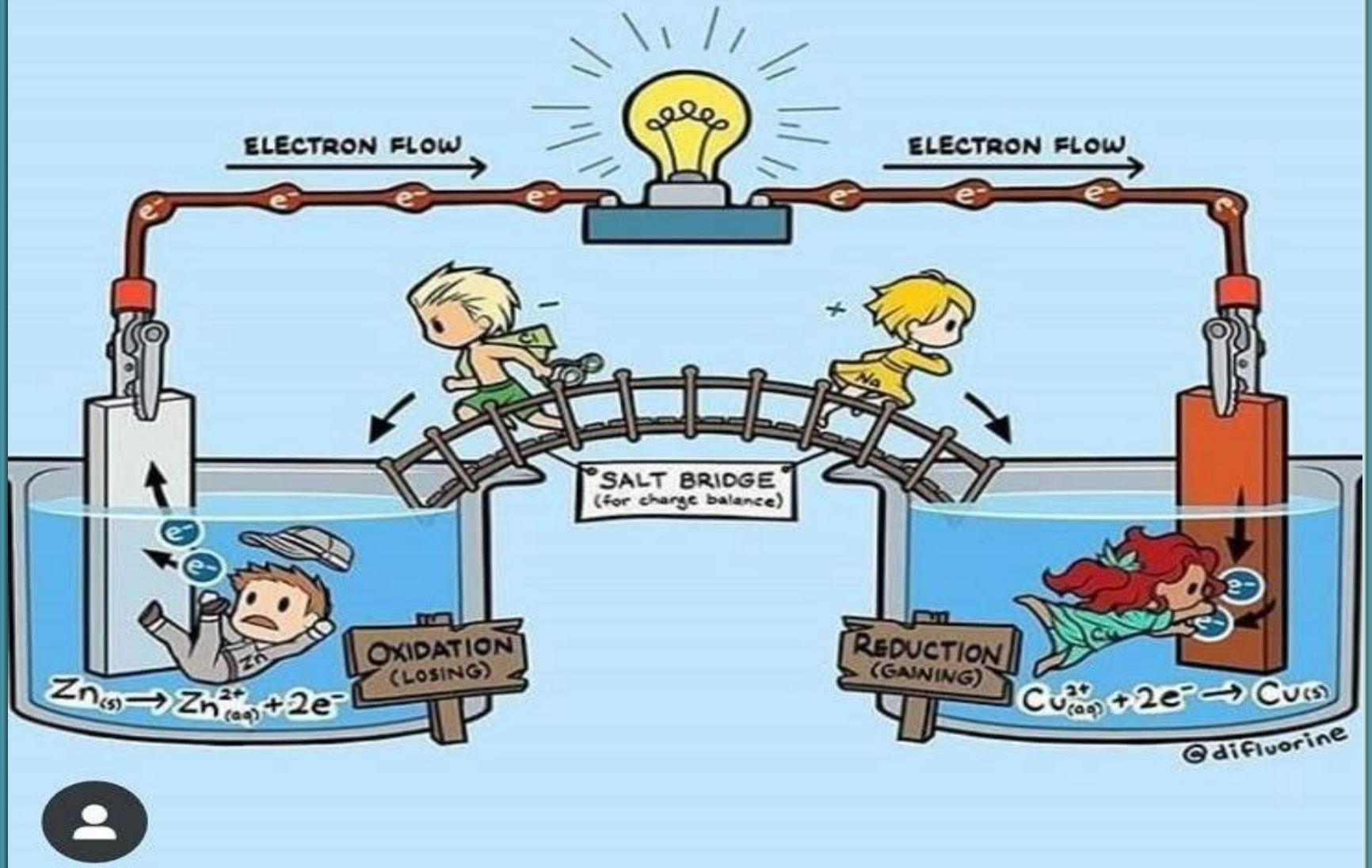
A **galvanic cell** is a device that converts chemical energy resulting from a redox reaction into electrical energy.

How it works:

- The anodic half cell (in which oxidation occurs).
- The cathodic half cell (in which reduction occurs).
- Salt bridge to balance charges.
- External wires for the passage of electrons..



Explain what happens in the galvanic cell and what you understand from the picture؟



Electrochemistry applications

1. Batteries and coupons:

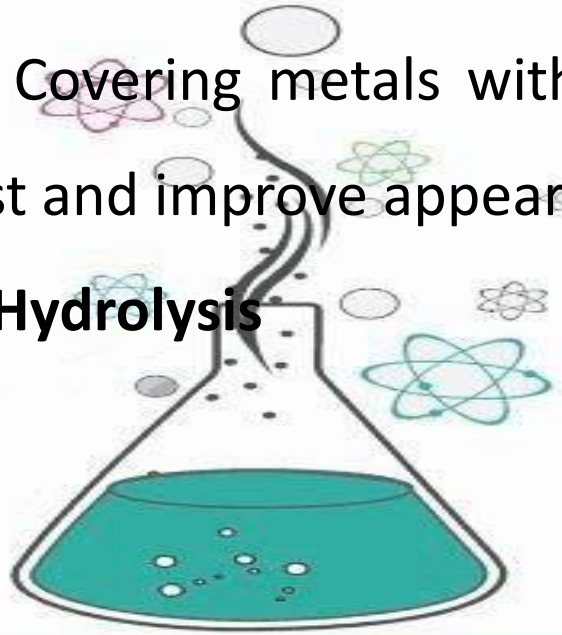
- Lithium-ion batteries.

- Rechargeable batteries.

2. Electroplating:

- Covering metals with a layer of another metal to prevent rust and improve appearance.

3. Hydrolysis



Industrial applications

- Production of chlorine and caustic soda.
- Extraction and purification of metals (such as copper and aluminum).
- Hydrogen production.
- Fertilizer industry.
- Possibility of reducing carbon emissions using fuel cells.
- Chemical waste treatment.
- Using electrodes to purify water from heavy metals.

Aromatic hydrocarbons

Aromatic hydrocarbons: are a class of organic compounds that contain one or more benzene rings in their structure. The benzene ring is a hexagonal ring made up of six carbon atoms to its cab with single and double bonds.

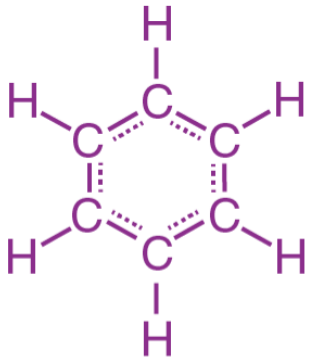
Characteristics of aromatic hydrocarbons

Aromatic hydrocarbons have distinctive properties such as: * High stability * Aromaticity * Their ability to undergo substitution reactions

Classification of aromatic hydrocarbons

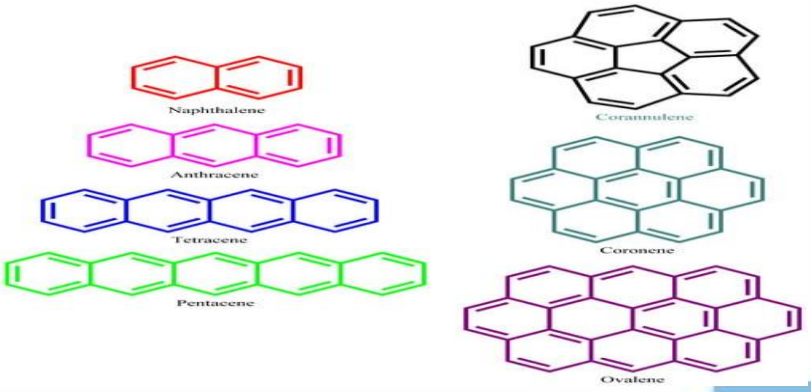
❖ **Benzene**

Benzene is the simplest aromatic hydrocarbon. It represents only one benzene ring



❖ Polycyclic

Polycyclic aromatic hydrocarbons consist of two or more benzene rings linked together. * Such as naphthalene, anthracene, and phenanthrene



❖ Cyclic aromatic hydrocarbons

Cyclic aromatic hydrocarbons consist of one or more benzene rings linked together via other carbon atoms. * Such as toluene, xylene, and ethylbenzene

Aromatic hydrocarbon reactions

1. substitution

Substitution reactions are known as reactions in which a hydrogen atom in the benzene ring is replaced by another atom or functional group. * Such as: nitration, halogenation, sulfonation, and alkylation

- **Nitration**: Benzene is converted into nitrobenzene by reacting with nitric acid.

- **Halogenation**: Benzene is converted into halobenzene by reacting with halogens.

- **Sulfonation**: Benzene is converted into benzenesulfonic acid by reacting with sulfuric acid.
- **Alkyla**: Benzene is converted into alkyl benzene by reacting with alkyl.

The importance of aromatic hydrocarbons

- Aromatic hydrocarbons are a major component of fuels such as gasoline and diesel, which are converted into energy when burned.
- Aromatic hydrocarbons play an important role in the production of plastics such as polystyrene, polyethylene terephthalate (PET), and nylon.

- Aromatic hydrocarbons are used in the manufacture of many medicines, such as aspirin, paracetamol, and vitamins.

- Aromatic hydrocarbons are used in the manufacture of various chemicals, such as pesticides, solvents, and dyes.