Chap 4. Carbon and its Components

1. What is catenation?

Carbon has the unique ability to form bonds with other carbon atoms, giving rise to large molecules. This property is called catenation.

2. What are isomers? Give example.

Compounds that have same molecular formula but different structural arrangements are called isomers.

Eg: n-butane, isobutane

3. Why does carbon form covalent bonds?

Carbon has 4 electrons in its outermost shell and needs 4 more to complete its octet. It cannot gain or lose 4 electrons easily, so it shares electrons and forms covalent bonds.

4. What is the difference between saturated and unsaturated hydrocarbons?

Saturated hydrocarbons have only single bonds between carbon atoms.

eg: Alkanes like methane (CH_4), ethane (C_2H_6), propane (C_3H_8)

Unsaturated hydrocarbons contain atleast one, double or triple bonds between carbon atoms.

eg: Alkenes like ethene (C_2H_4), propene (C_3H_6)

Alkynes like ethyne (C_2H_2),propyne (C_3H_4)

5. What are hydrocarbons?

All compounds that contain only carbon and hydrogen are called hydrocarbons.

eg: methane (CH_4), ethane (C_2H_6), propane (C_3H_8)

6. What are Homologous Series ?

A homologous series is a family of carbon compounds sharing the same functional group, general formula, and similar chemical properties. Successive member differs by a constant unit.

eg: The following alcohols (hydroxyl group - OH) form a homologous series.

Methanol - CH_3OH

Ethanol - CH_3CH_2OH

Propanol - $CH_3CH_2CH_2OH$

Butanol - $CH_3CH_2CH_2CH_2OH$

7. Define Allotropy

Allotropy is the property where an element exists in two or more different forms having the same chemical properties but different physical properties. Each form is called its allotrope.

eg: diamond and graphite are allotropes of carbon.

8. What happens when ethanoic acid reacts with sodium carbonate? Write the product formed.

Ethanoic acid reacts with sodium carbonate to produce carbon dioxide, water, and sodium ethanoate.

$2CH_3COOH + Na_2CO_3 \text{ ----> } 2CH_3COONa + H_2O + CO_2$

9. Write a note on combustion in carbon in carbon compounds.

Carbon, in all its allotropic forms, burns in oxygen to give carbon dioxide, along with the release of heat and light.

Most carbon compounds also release a large amount of heat and light on burning.

$C + O_2$ ----> CO_2 + heat and light

$CH_4 + O_2$ ----> $CO_2 + H_2O$ + heat and light

Saturated hydrocarbons will generally give a clean flame indicating complete combustion.

Unsaturated hydrocarbons give a yellow flame with lots of black smoke indicating incomplete combustion.

Fuels like coal and petroleum have some amount of nitrogen and sulphur in them. Their combustion results in the formation of oxides of sulphur and nitrogen which are major pollutants in the environment.

10. What is Addition Reaction?

Unsaturated hydrocarbons add hydrogen in the presence of catalysts like nickel to give saturated hydrocarbons.

11. What are Catalysts?

Catalysts are substances that cause a reaction to occur. In some cases, it increases or decreases the rate of reaction. Catalysts don't participate in the reaction and doesn't undergo change.

12. What is a substitution reaction?

In a substitution reaction, one type of atom or a group of atoms takes the place of another.

eg: Chlorine can replace the hydrogen atom in alkanes, in the presence of sunlight.

$CH_4 + Cl_2 \text{ ----> } CH_3Cl + HCl$

13. Why ethanol is used in medicine?

Ethanol is a great solvant. So it used in medicine like tincture iodine, cough syrups and many tonics. It is also used as disinfectant and preservative

14. How does soap help in removing dirt?

Soap removes dirt because of its special molecular structure.

A soap molecule has two ends:

• Hydrophilic head – attracted to water

• Hydrophobic tail – attracted to oil and grease.

<u>Explanation:</u>

• Dirt and grease do not dissolve in water.

• When soap is added to water, the hydrophobic tails stick to the greasy dirt.

• The hydrophilic heads remain in contact with water.

• Many soap molecules surround the dirt to form a micelle.

• The dirt is now trapped inside the micelle and gets washed away with water during rinsing.

<u>In short:</u>

Soap emulsifies oily dirt, allowing it to be removed easily with water.