Classification of Organic Compounds

Organic compounds are classified into following manner



Hydrocarbons

All the carbon compounds which contain only carbon and hydrogen are called *hydrocarbons*. Their main sources are petroleum (or crude oil) and natural gas.

On the basis of types of bond present (only single or double or triple bond alongwith single bonds), hydrocarbons are divided into two classes.

Saturated Hydrocarbons

The hydrocarbons in which all the carbon atoms are connected by only single bonds are called *saturated hydrocarbons* or *alkanes* or *paraffins*. The general formula of these compounds is C_nH_{2n+2} , where, n = number of carbon atoms in one molecule of a hydrocarbon.

For example, if there is only one carbon atom then its formula should be $C_1H_{2\times 1+2} = CH_4$ (methane).

Similarly, if there are two carbon atoms in the saturated hydrocarbon (alkane), its formula must be $C_2H_{2\times 2+2} = C_2H_6$ (ethane)

These compounds are chemically inert (*i.e.*, less reactive) and burn with blue flame due to their complete combustion. These compounds generally show substitution reaction (which are discussed later in this chapter).

Unsaturated Hydrocarbons

Those carbon compounds in which atleast one double or triple bond (or multiple bond) is present alongwith single bonds, are called unsaturated compounds.

These compounds generally burn with sooty flame due to their incomplete combustion. These are highly reactive and generally undergo addition reaction (which are discussed later in the chapter).

Unsaturated compounds further divided into following two classes

(i) Alkanes or Oleffins

Those carbon compounds which have atleast one double bond alongwith single bonds are called *alkanes*. (A double bond is formed by the sharing of two pairs of electrons between the two carbon atoms).

General formula of these compounds is $C_n H_{2n}$.

For example, if an alkene have two carbon atoms, its formula is $C_2H_{2\times 2} = C_2H_4$ (ethane).

(ii) Alkynes

Those unsaturated hydrocarbons which have one or more triple bonds alongwith the single bonds are called alkynes. (A triple bond is formed by the sharing of three pairs of electrons between two carbon atons

General formula of these compound is $C_n H_{2n-2}$

For example if an also revia e two carbon approxime formula is $C_2H_{2,2-2} = C_2H_2$ (ethyne). If there are o carbon atoms in the alkyne then its formula must be $C_3H_{2\times 3-2} = C_3H_4.$

 The minimum number of carbon atoms present in an unsaturated compound is 2 because formation of double or triple bonds is possible only then.

How to Draw the Structure of Saturated and Unsaturated Compounds?

- To draw the structure of carbon compound, first Step 1 connect all the carbon atoms by a single bond.
- Step 2 After that satisfy the tetravalency of carbon with available hydrogen atom.
- Step 3 If number of available H-atoms are less than that required, satisfy the remaining valency by using double or triple bond.

(i) Structure of Ethane (C_2H_6)

Here only one valency of carbon is satisfied and the three remains unsatisfied.

Each of these unsatisfied valencies are satisfied by hydrogen atoms. ப

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$$\begin{array}{ccc} & \Pi & \Pi \\ & & | \\ H - C - C - H \\ & | \\ H & H \end{array}$$
 [II step]

Now, the tetravalency of carbon in ethane is satisfied. Electron dot structure of ethane (C_2H_6)



(ii) Structure of Propane (C_3H_8)

Same rules are followed as in case of ethane.



ns are bonded to 3 hydrogen atoms and one atom is bonded to 2 hydrogen atoms.

Electron dot structure of propane



C-C

(iii) Structure of Ethene (C_2H_4)

[I step]

$$H \to C - C \to H$$
 [II step]

But in this case, even after linking the hydrogen atoms with carbon atoms, still one valency of each carbon remain unsatisfied. To satisfy it, a double bond is used between the two carbon atoms.

$$H = C = C H$$
 [III step]

Now, all the four valencies of carbon are satisfied.