

# **INTRODUCTION TO ORGANIC CHEMISTRY**

## INTRODUCTION

- Organic chemistry is the study of organic compounds.
- Organic chemistry is all around us.

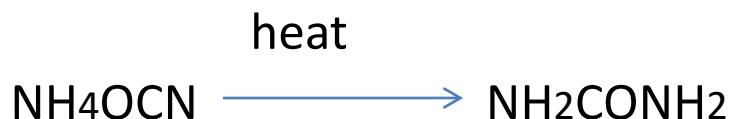
There are two main classes of chemical compounds

1.Organic compounds

2.Inorganic compounds

- In early 1800s by Jon Jacob Berzelius a Swedish chemist proposed the **“VITAL FORCE THEORY”**

- In 1828, **FREDERICH WOHLER** a German chemist first synthesized the organic compound –UREA using ammonium cyanate obtained from inorganic compound.



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- Hennel synthesized Ethyl alcohol
- Kolbe synthesized Acetic acid
- Berthelot synthesized Methane
- The vital force theory was finally disproved in 1850

## **MODERN DEFINITION OF ORGANIC CHEMISTRY**

Organic chemistry is the study of **CARBON COMPOUNDS**.

**Why organic chemistry is studied as a separate branch:**

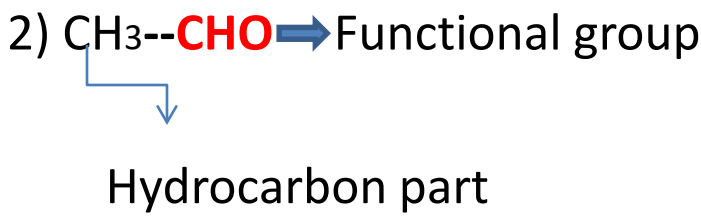
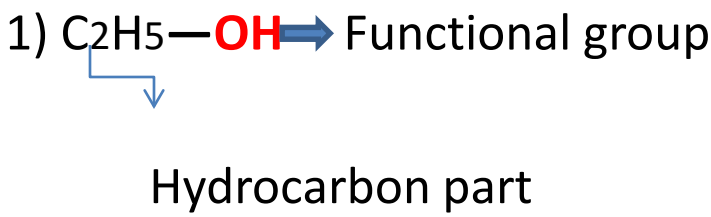
1. Large number of organic compound
2. Unique chemical and physical properties
3. Unique character of carbon ( Catenation)

# FUNCTIONAL GROUP

An atom or group of atoms that determines the property of an compound.

Organic compound can be divide into two parts

- 1. Reactive part --- Functional group (Action group)
- 2. Hydrocarbon part--- Alkyl or Aryl group (Inert group)



# CLASSIFICATION

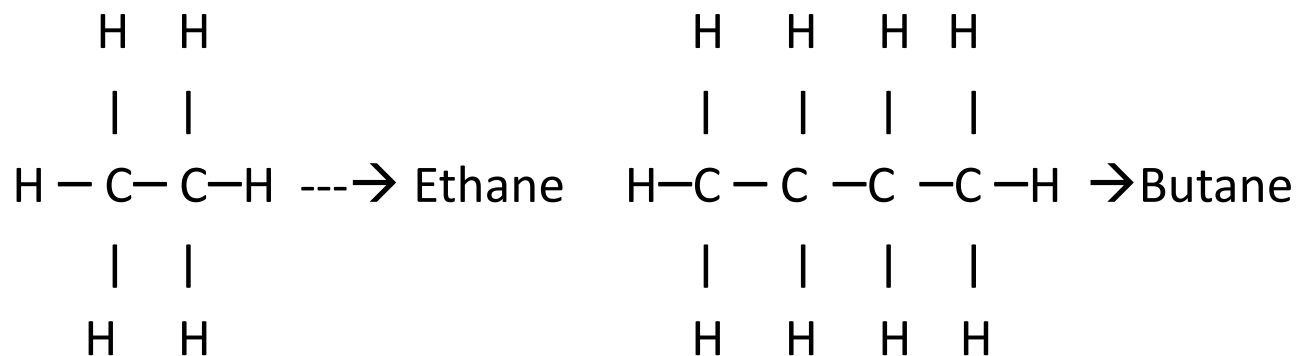
The organic compounds are classified into five main classes

1. Aliphatic compound
2. Saturated and Unsaturated compound
3. Aromatic compound
4. Alicyclic compound
5. Heterocyclic compound

## 1. Aliphatic Compounds

These are the compound which contains open chain structure of carbon atom. There is no limit for number of carbon atom.

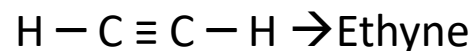
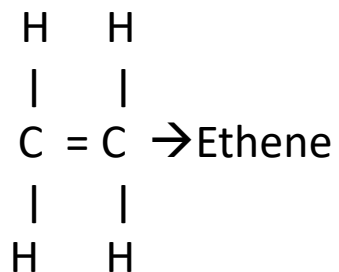
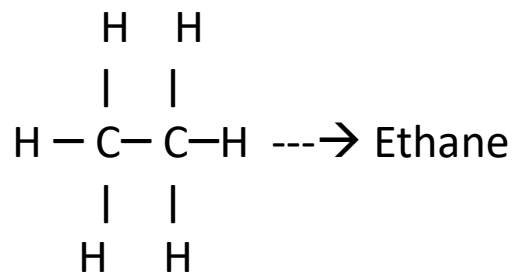
Example: Ethane, Butane and Ethyl alcohol etc



## 2. Saturated and Unsaturated Compounds

Compounds which contain only carbon and hydrogen are called Hydrocarbons. A hydrocarbon is said to be saturated if it contains only carbon carbon single bonds. A hydrocarbon is said to be unsaturated if it contains carbon carbon double or triple bonds.

Example: Ethane, Ethene and Ethyne



### 3.Aromatic Compounds

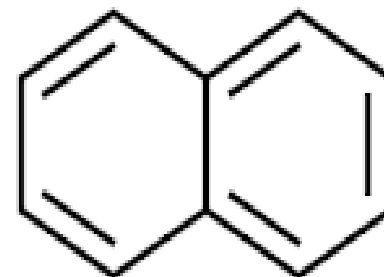
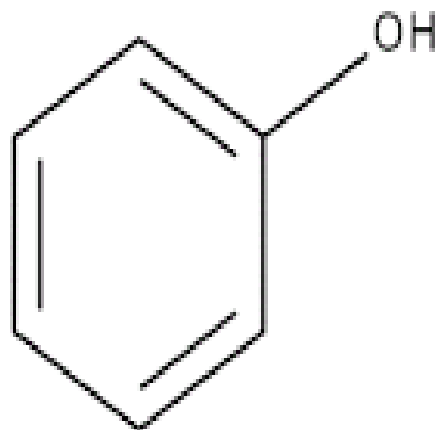
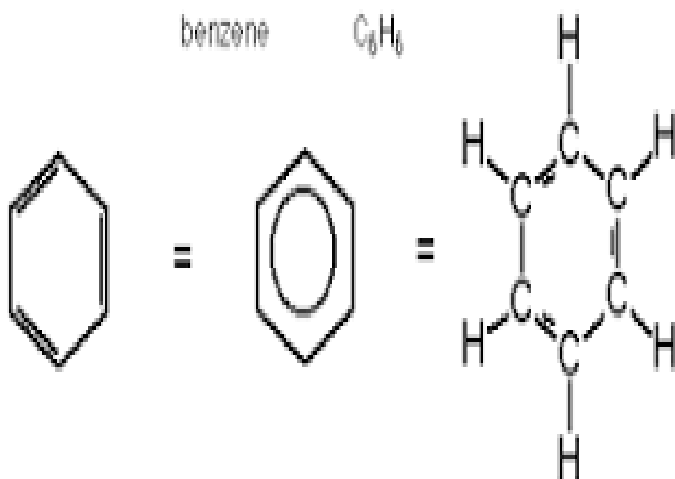
Compounds containing at least one benzene ring in it.

Example: Benzene, Phenol, Aniline and Naphthalene.

**Benzene**

**phenol**

**Naphthalene**



#### 4.Alicyclic Compounds

Cyclic compounds which consist only of carbon atoms are called alicyclic or carbocyclic compounds.

Example: Cyclopropane, cyclobutane and cyclopentane



Cyclopropane



Cyclobutane



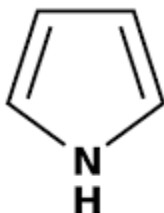
Cyclopentane

# 5. Heterocyclic Compounds

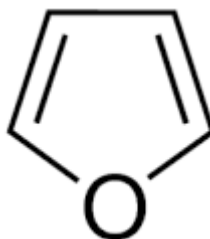
Cyclic compounds in which carbon atom of the ring is replaced by an hetero atoms like (N,S,O) etc.

Example: Pyrrole, Furan and Ethylene oxide

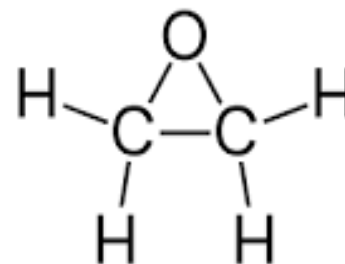
Pyrrole



Furan



Ethylene oxide



# NOMENCLATURE OF ORGANIC COMPOUND

Nomenclature means NAMING.

There are two systems of naming

1. Trivial System
2. IUPAC System

## **Trivial System**

In early days , new compound was given an individual name based on the source or some property or history. Example- Formic acid and acetic acid.

## **IUPAC System**

This system of naming is based on the structural information of the compound.

In 1892- "GENEVA SYSTEM" – International Congress of Chemists(New Geneva)

In 1930-"IUC SYSTEM"– International Union of Chemist( Belgium)

In 1958-"IUPAC SYSTEM"– International Union of Pure and Applied Chemistry.

The final form of rules for naming an organic compound was published by IUPAC in the year 1967.

The **IUPAC** name of a compound contains three parts

1. Root word
2. A Suffix
3. A prefix

## **1.ROOT WORD**

This is the basic unit of the IUPAC system. It indicates the number of carbon atoms in the longest chain/ ring of carbon atoms. Depending upon the number of carbon atoms, the root words are given. The first four members of the series are known by their common names; Methane, Ethane, Propane and Butane. Higher alkanes have their names derived from Greek prefix based on carbon atoms in the molecule.

Number of carbon atoms	Prefix
1	Meth
2	Eth
3	Prop
4	But
5	Pent
6	Hex
7	Hept
8	Oct
9	Non
10	Dec

## **2. A Suffix**

To the root word a suffix is added to indicate the functional group present in the compound.

Class of organic compound	Functional group	Suffix
Alkane	$\text{C} - \text{C}$	-ane
Alkene	$>\text{C}=\text{C}<$	-ene
Alkyne	$-\text{C}\equiv\text{C}-$	-yne
Alcohol	$-\text{OH}$	-ol
Aldehyde	$-\text{CHO}$	-al
Ketone	$>\text{C}=\text{O}$	-one
Carboxylic acids	$-\text{COOH}$	-oic acid
Amines	$-\text{NH}_2$	-amine

### **3. A Prefix**

Is added before the root word. A prefix is a substituent group, other than hydrogen, that completes the molecular structure.

Substituent group	Formula	Prefix
Alkyl/Aryl	-R/Ar	Alkyl/aryl
Halides	-X	Halo
Chlorine	-Cl	Chloro
Bromine	-Br	Bromo
Iodine	-I	Iodo
Hydroxy	-OH	Hydroxy
Nitro	-NO <sub>2</sub>	Nitro
Amine	-NH <sub>2</sub>	amino

PREFIX+ROOT WORD+SUFFIX= IUPAC NAME