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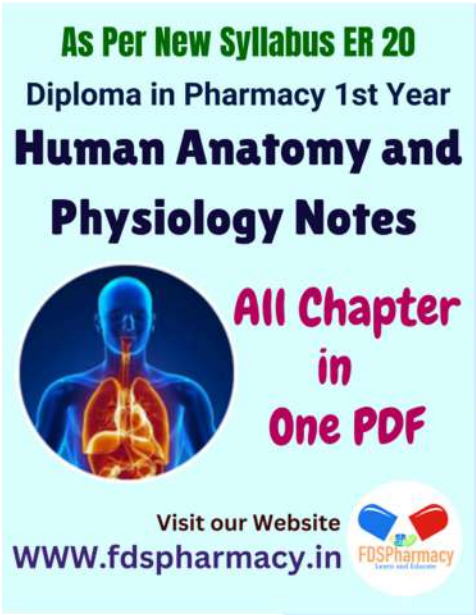
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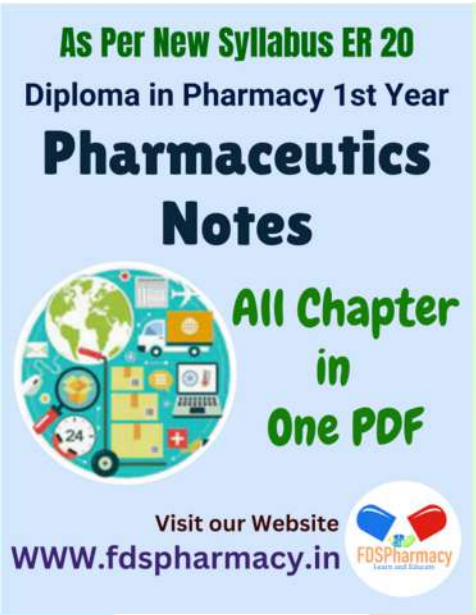
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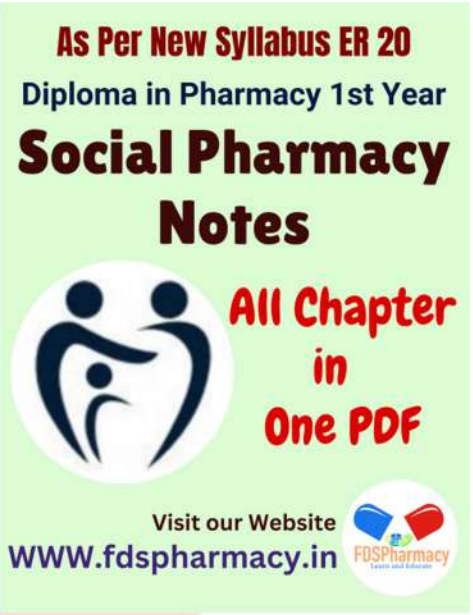
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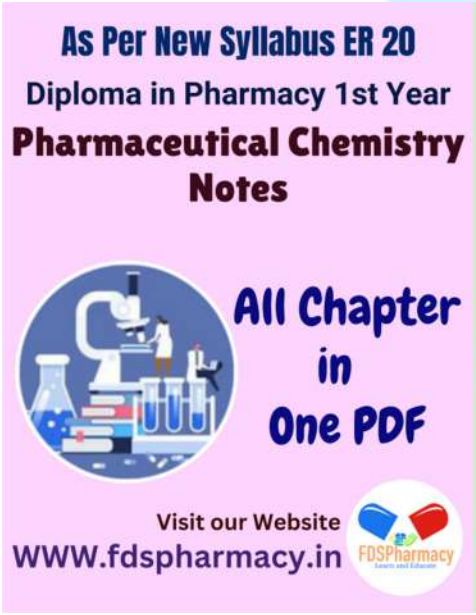
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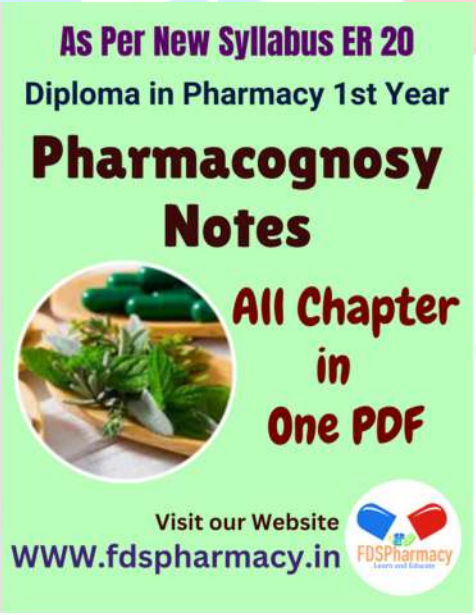
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Link in Description

Diploma in Pharmacy 1st Year
Pharmaceutical Chemistry
Chapter 4 : Organic Chemistry

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Chapter 4
Organic Chemistry

- Organic chemistry deals with the study of chemistry of carbon compounds.
- The term organic was used for branch of chemistry because at a time when most of the compounds studied in this branch of chemistry were obtained from living sources (plants or animals).
- However at the present time, organic chemistry studies the chemistry of carbon compounds irrespective of their Source. Carbon can combine with each other to form long chains and different sized rings. This process is known as catenation.
- The other few elements (apart from carbon) present in organic compounds are hydrogen, halogens, oxygen, sulphur, nitrogen, phosphorus, etc.
- Thus, organic molecules can be very large and complicated.
- The concepts of structure, homology isomerism, and functional groups are to be studied in organic chemistry.

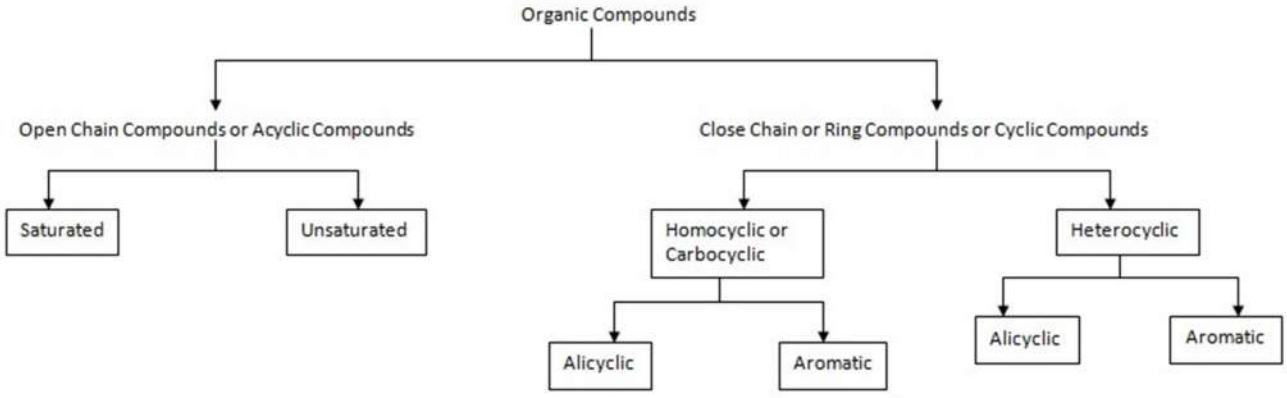
Classification of Organic Compounds

Organic compounds can be classified on the basis of following two ways:

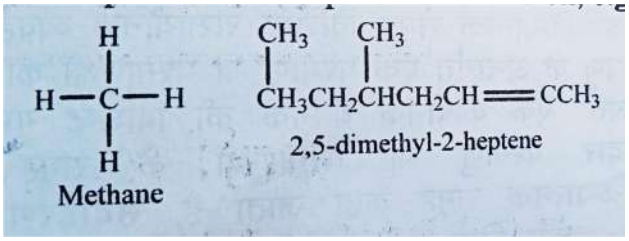
- On the basis of structure, and
- On the basis of functional group.

On the Basis of Structure

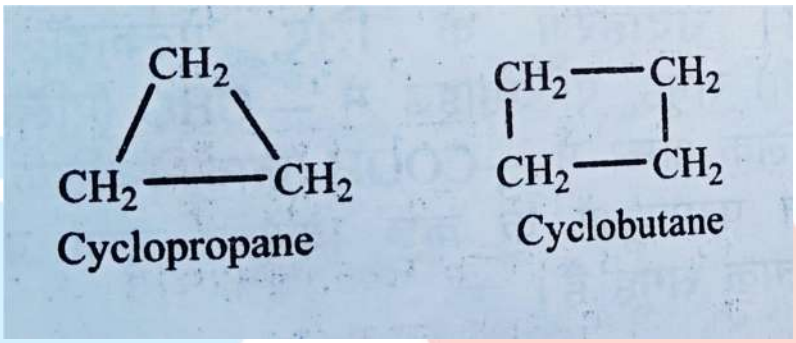
Based on structure, organic compounds are classified as shown below:



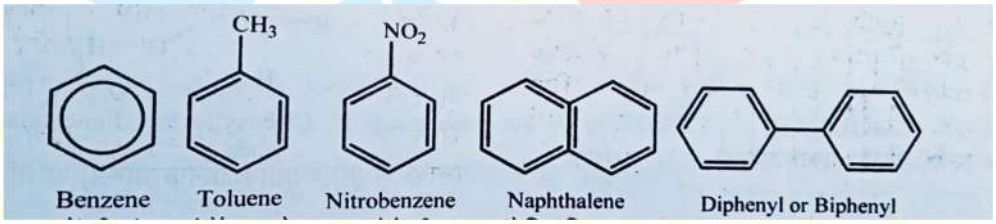
- **Acyclic or Open Chain Compounds :** These organic compound have open chain skeleton, e.g,



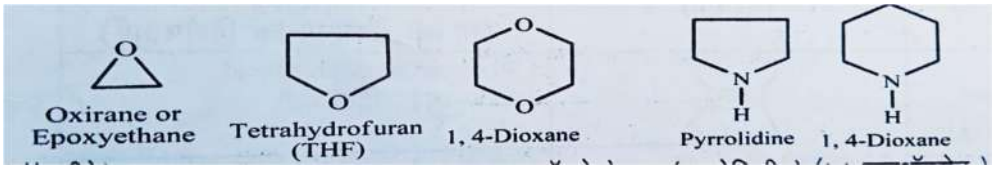
- **Cyclic or Closed Chain Compounds:** These organic compounds have closed rings and are further divided into:
  i. **Homocyclic or Carbocyclic Compounds:** In these organic compounds, the ring of compound has carbon atoms only. These compounds are further classified into:
    a) **Alicyclic Compounds:** These homocyclic compounds are similar to acyclic compounds and do not have a benzene ring, e.g.,



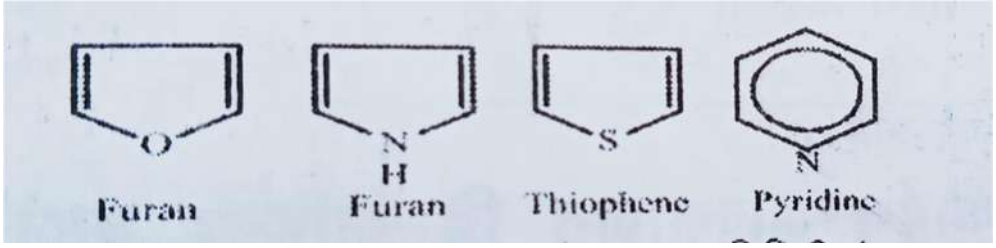
    b) **Aromatic Compounds :** These Homocylic compounds have a benzene ring eg.



  ii. **Heterocyclic Compounds:** These organic compounds have one or more heteroatoms (e.g., o, N, S, etc.) in the ring. These compounds are further classified into:
    a. **Alicycic Compounds:** These heterocyclic compounds are compounds are similar to alphatic compounds in properties, eg



    b. **Aromatic Compounts :** These heterocylic compoundsare similar to benzene and other aromatic compounds in properties eg



On the Basis of Functional Group

→ A functional group is an atom or group of atoms within a specific chemical behaviour. Thus, an atom or group of atoms responsible for the characteristic features of an organic compound is termed as a functional group eg : Carbon-carbon double bond (one of the simplest functional groups forming alkenes).

Nomenclature of organic chemical System

The two nomenclature system which are in use for naming organic compounds are :

1. Trivial or common system and
2. IUPAC System

Trivial or Common System

→ The trivial or common system of nomenclature of the organic compounds is based on various factors like the source, name of discoverer, structure etc:

- **On the basis of property :** some example of organic compounds which were named on the basis of their properties are:
  - i) Glucose (sweet in test),
  - ii) Glycol (sweet poisonous),
  - iii) Glycerol (sweet)
- **On the Basis of Discovery:** Some examples of organic compounds which were named on the basis of their discoverer are:
  - RMgx (Grignard reagent),
  - RZn (Frankland reagent).

Some of the drawbacks associated with trivial system of nomenclature are:

- ➲ This method of naming compounds was not systematic, thus naming large number of compounds was not possible.
- ➲ The naming of various organic compounds was not scientific.
- ➲ Often a compound isolated from different sources or by different discoverers or at different places was named in a different way. For example,
  - The name acetic acid originated from the Latin word acetum meaning vinegar.
  - The name methyl alcohol name originated from wood spirit (the compound was first isolated by destructive distillation of wood).
- ➲ This system of nomenclature thus caused confusion while naming compounds.

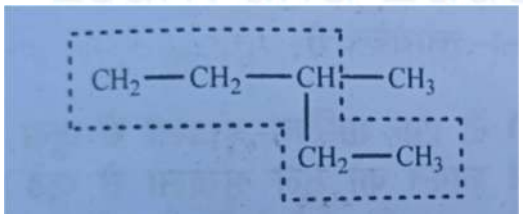
IUPAC System of Nomenclature

→ The International Union of Pure and Applied Chemistry (IUPAC) put forward a systematic method of naming organic compounds; this method is termed IUPAC nomenclature. This method eases the identification of different compounds. Each and every organic compound should be named so that their structural formula can be drawn.

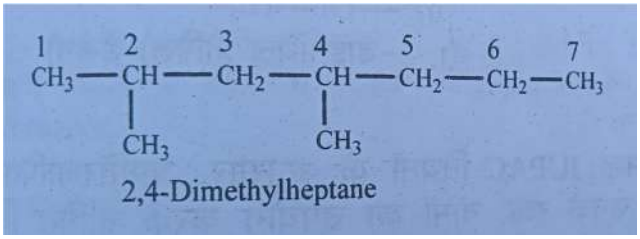
Rules Governing IUPAC Nomenclature of Branched Chain Alkanes.

Branched chain alkanes can be named by the given rules of IUPAC nomenclature system:

1. The longest continous chain of carbon atoms is identified as the parent chain and the compounds is considered its derivative.

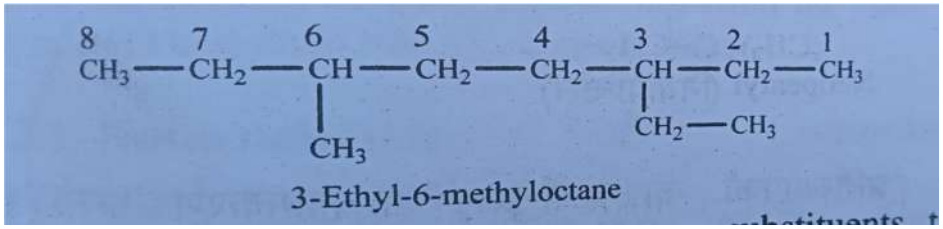


2. The carbon atom in the parent chain are numbered from one end so that the substituent carrying carbon atoms receive the lowest numbers.
3. For naming the organic compounds the position of each substituent and its name of parent alkane.

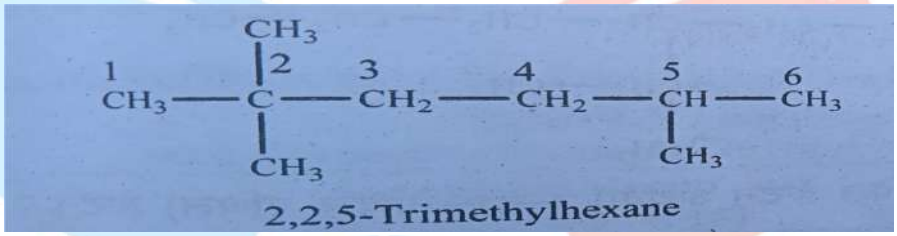


4. The names of different alkyl substituents present in the parent chain are written alphabetically

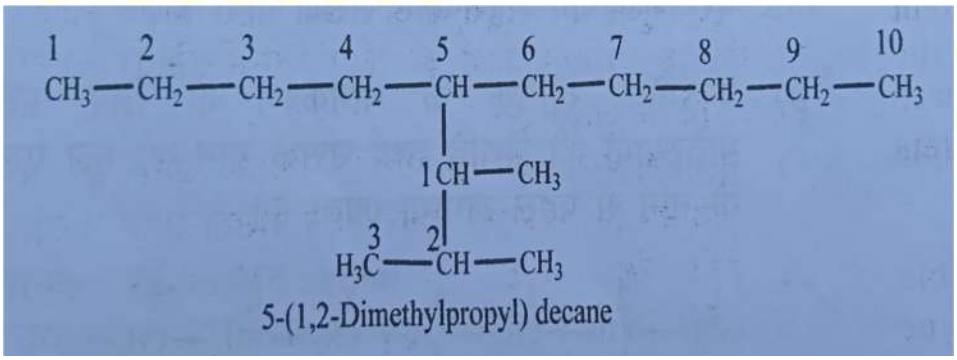
5. If the parent chain has two or more substituents at equivalent position the first substituent in the alphabetical order is given the lowest number.



6. In the presence of two or more same substituent their number position is sepersted by commas and the appropriate predix-di, tri, tetra, etc., are added to the name of each.

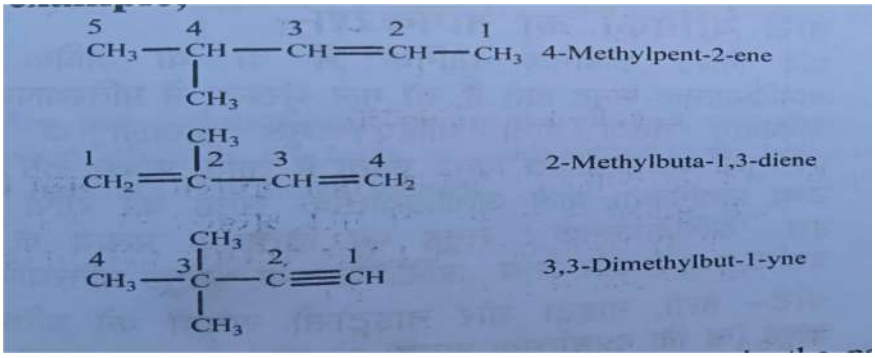


7. If the substiturnt also carries a branched chain the carbon in the chain are numbered separately beginning from the carbon attached to the parent chain. The names of such complex substituents are written within brackets.



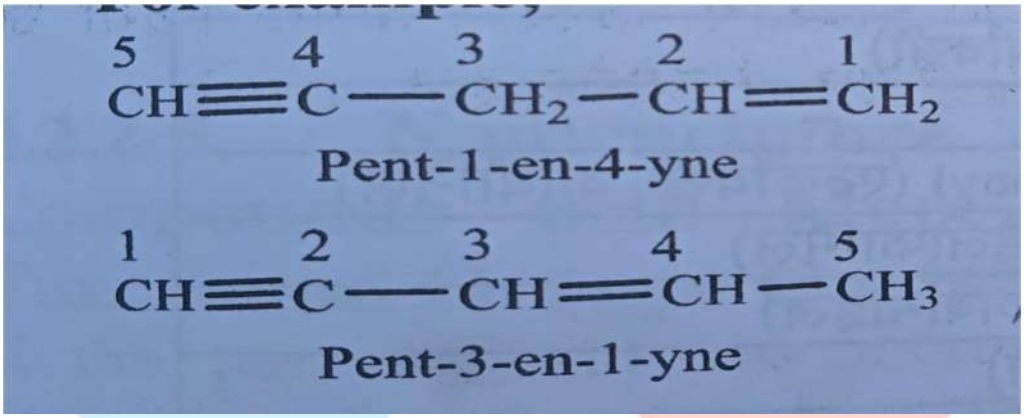
Nomenclature of Alkenes and Alkynes

Alkene and alkyne are assigned IUPAC names derived from the corresponding alkane. In the IUPAC name of alkene, the suffix -ane is replaced with ene; while in alkyne, ane is replaced with -yne.



If double as well as triple bonds are present in the parent chain, following rules are considered for naming the compound.

1) Parent chain is numbered so, that the double and triple bonds receive the lowest numbers.
2) If possible lowest number is assigned to the double bond, such a hydrocarbon is considered an alkyne derivative.



Nomenclature of compound Containing Functional Groups

→ The functional group (apart from C=C and C=C) present in a molecule is written by adding secondary suffix after the primary suffix. The 'e' terminal of the primary suffix is removed before the secondary suffix is added if its name begins with a, i, o, u, or y.

Nomenclature of Compounds with More than One Functional Group

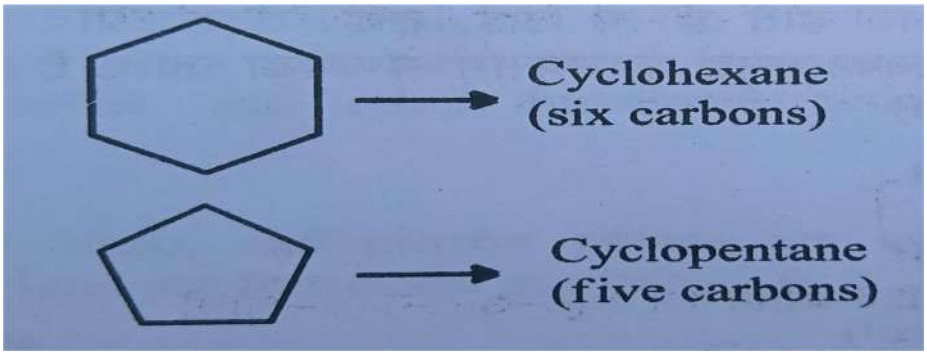
→ If an organic compound has two or more different functional groups, then the parent chain must have maximum number of Substituents. The carbon atoms of parent chain are numbered so that lowest number is assigned to the functional group of higher priority. This functional group is represented with a secondary suffix and other functional groups are the substituents.

Nomenclature of Alicyclic Compounds

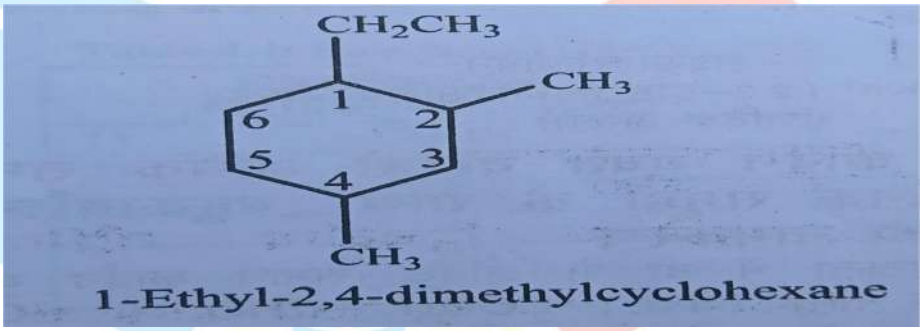
Organic Compounds having closed chain compounds and resembling with aliphatic compounds in their properties are referred as alicylic compounds Cycloalkanes , Cycloalkenes and non aromatic carbocyclic compounds are classified as alicyclic compounds

Alicylic compounds can be named based on the following rules :

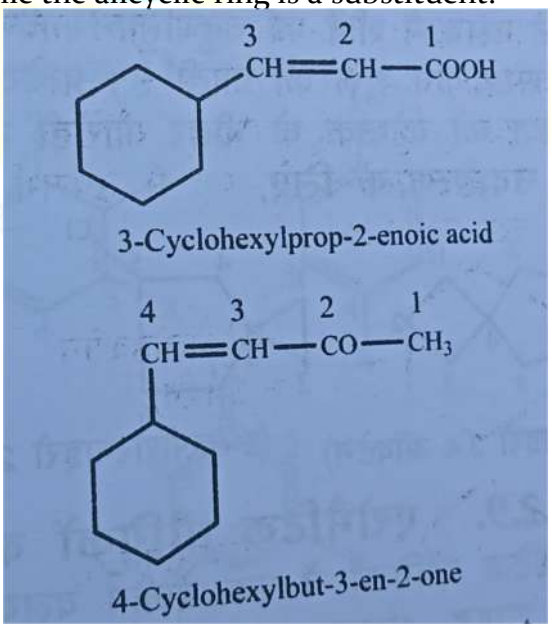
1) A saturated monocyclic compound is named prefix cyclo- to the name of the corresponding cycloalkane.



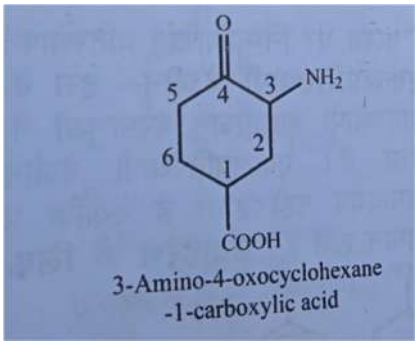
2) In the presence of two or more substituents, beginning from the one coming first in alphabetical order numbering is continued up to the last substituent so that it receives the lowest number.



3) In case, a functional group is attached to the side chain, the compound is considered as acyclic (irrespective of the ring size); while the alicyclic ring is a substituent.

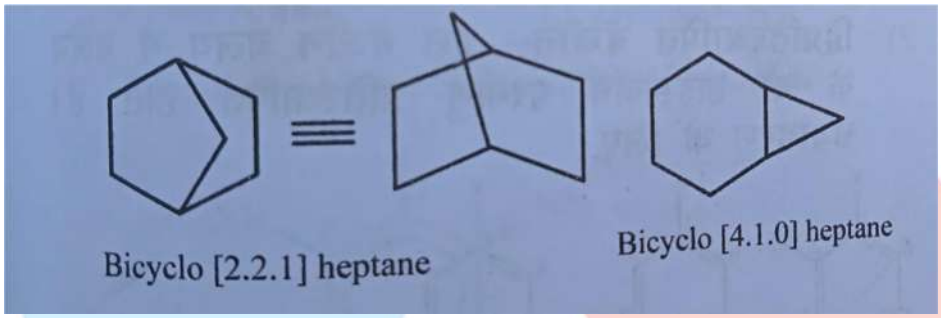


4) In case, the functional groups form a part of the ring system, the functional groups of highest priority are assigned with lowest number.



Nomenclature of Bicyclic Compounds

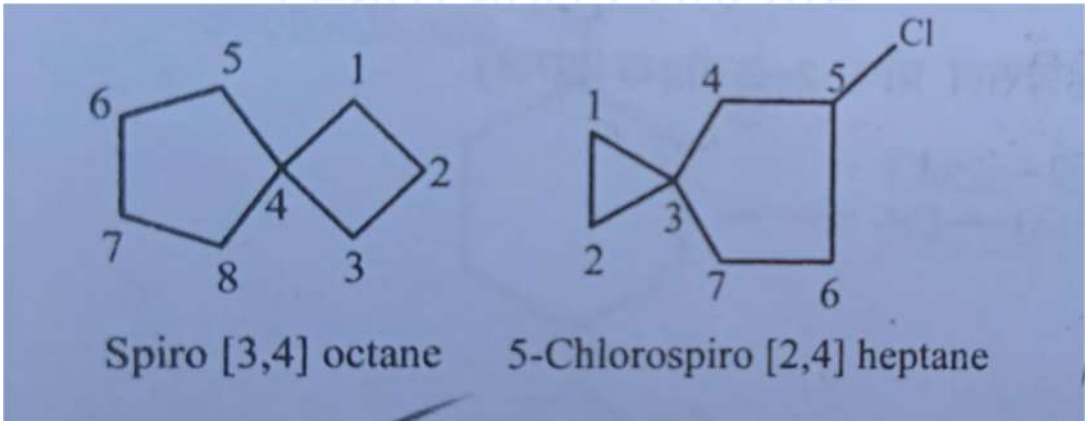
→ Bicyclic compounds have two fused rings joined by two tertiary carbon atoms. While naming these compounds, the alkane name (containing the same number of carbon as the bicyclic compound) is added after the prefix bicyclo- .The number of carbons in each of the three bridges is given within the brackets in descending order. For example,



Nomenclature of Spiro Compounds

→ Spiro compounds have two rings joined by a common quatermary carbon at the apex. While naming these compounds the name of the alkane (containin same number of carbons as part of the ring term system (s) is added: after the prefix spiro-.

→ Numbering is started from the carbon next to the quaternary carbon at the apex in the smaller ring Number of carbons in each bridge is written with in the brackets in ascending order for Example

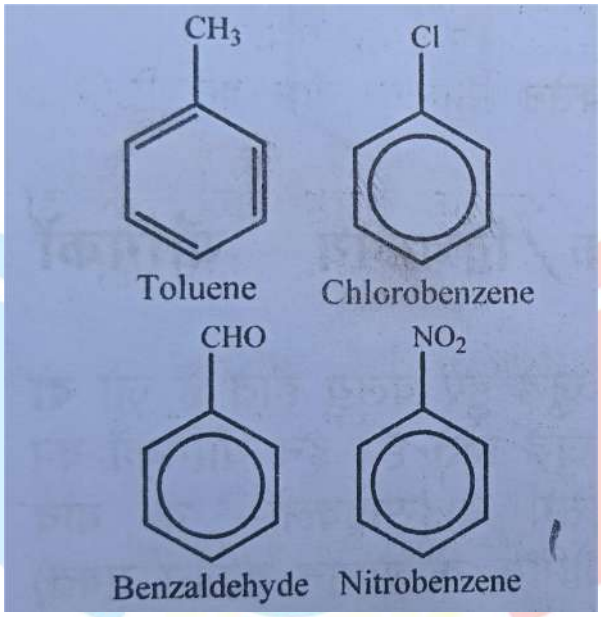


Nomenclature of Aromatic Compounds

Aromatic compounds have a benzene ring and a Side chain or substituent (the group attached to benzene ring).

Follwing substitutions are possible on benzene ring

- **Monosubstituted Benzene:** In this benzene ring, a substituent replaces one of the hydrogen atoms. Monosubstituted benzene ring has no isomer as the nuclear carbons are all similar. For example.



- **Disubstituted Benzene:** In this benzene ring, two hydrogen atoms of the ring are substituted. For example,

