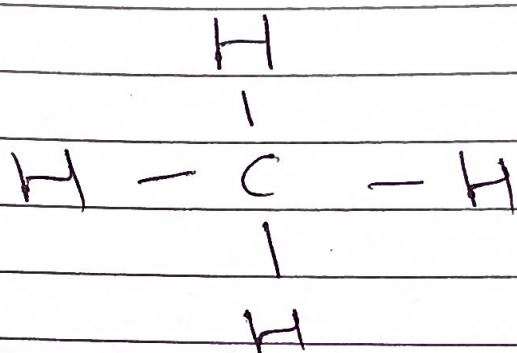


ORGANIC CHEMISTRY

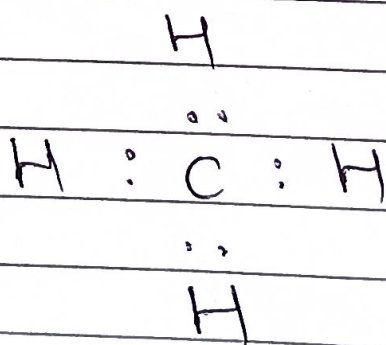
— Some Basic principles and Techniques

Structural Representation of organic molecules

Covalent bond dash structure
 CH_4



electron dot structure



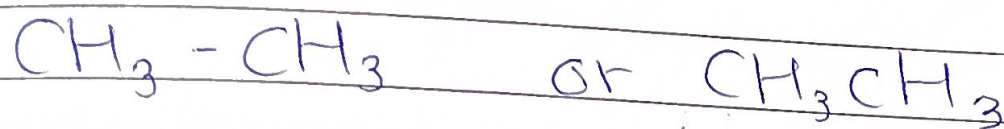
Electron dot structure also called Lewis structure and dash formula represents simplified Lewis formula

Condensed formula

The complete structural formula can be further simplified with hiding of some or all the covalent bonds and indicating the number of identical groups attached to an atom by a subscript. The resulting formula of a compound is known as condensed formula.

ex.

ethane



Bond line formula or zig-zag formula

In this representation of a molecule symbols of carbon and hydrogen atom are not written. The line representing C-C bond are drawn in a zig-zag manner and the

the terminals of the zig-zag line represent methyl groups

ex.

propane



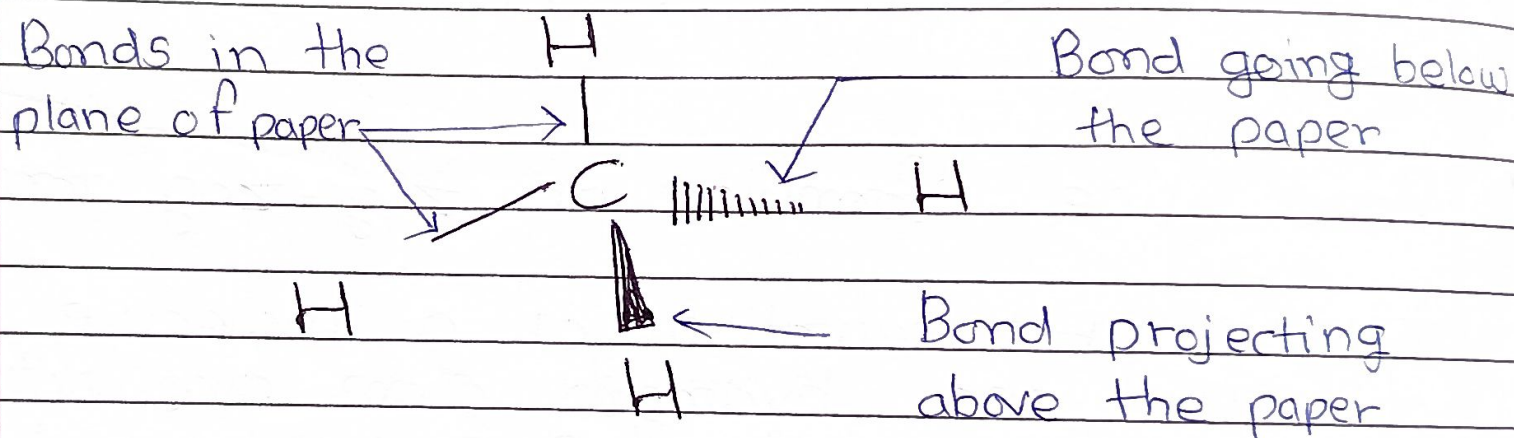
The bond formula of $\text{C}_2\text{H}_5\text{OH}$



Drawing the molecules in three dimensions

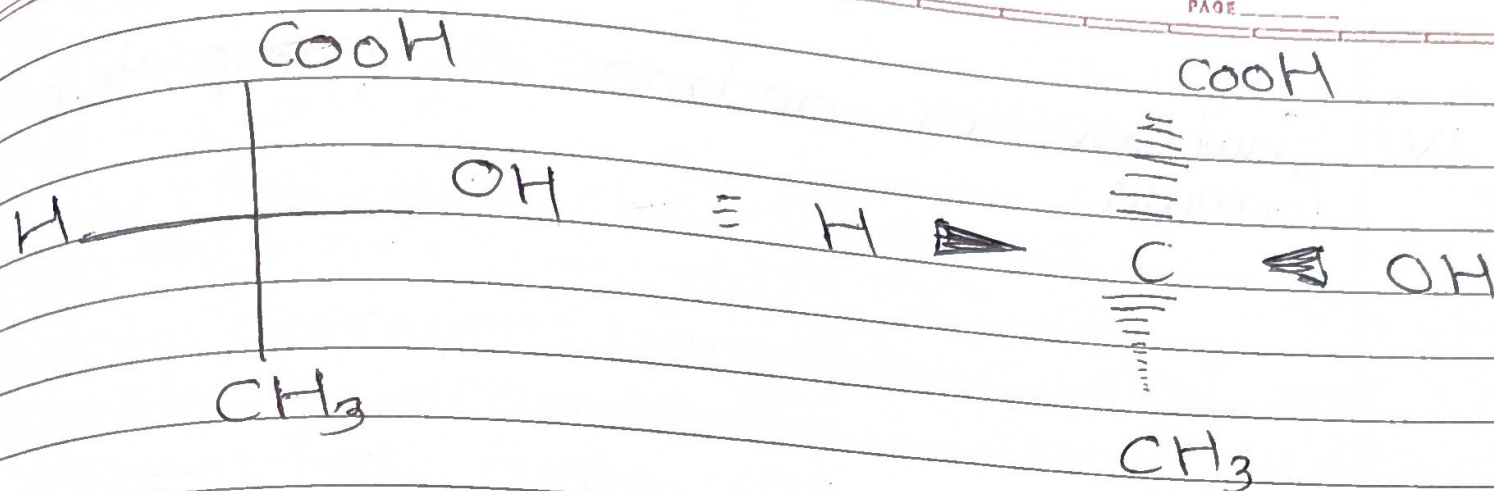
I) Wedge formula

The three dimensional (3-D) view of a molecule can be represented on plane paper by representing the single bonds using solid wedge () , dashed wedges () and normal line ()



II) Fischer projection formula or cross formula

In this representation a three dimensional molecule is projected on plane of paper. A Fischer formula can be drawn by visualizing the molecule with its main carbon chain. Each Carbon on the vertical chain is represented by a cross.



Fischer Projection

wedge formula

Fischer projection formula is more commonly used in carbohydrate chemistry.

iii) Newman projection formula:

iv) Sawhorse or andiron or perspective formula

* Classification of organic compounds

Organic compounds are broadly classified in two ways, on the basis of

i) Carbon skeleton

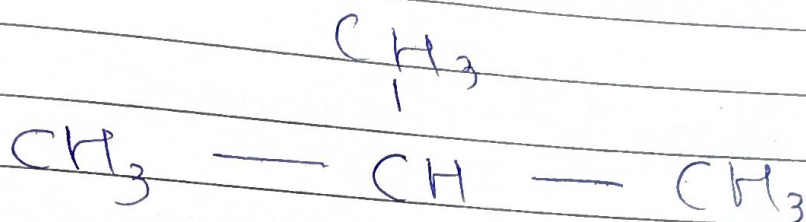
ii) functional group.

classification based on carbon skeleton

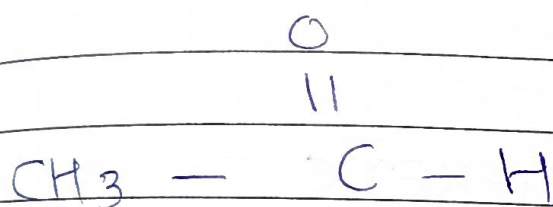
Acyclic or open chain compound:

These compounds are also called as aliphatic compounds and consist of straight or branched chain compounds for ex.

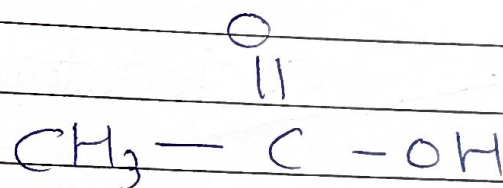
ethane
 CH_3CH_3



Isobutane



Acetaldehyde



Acetic acid

Cyclic compounds:

These are compounds in which molecules are formed by joining atoms to form ring like structures.

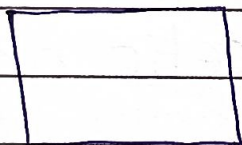
The compounds in which the ring is made of only carbon atoms are known as homocyclic or carbocyclic compounds.

- All the other atoms that are found in organic molecules are called heteroatoms.
- The cyclic compounds in which the ring includes one or more heteroatoms (Oxygen, nitrogen, sulphuretc.) are known as heterocyclic compounds

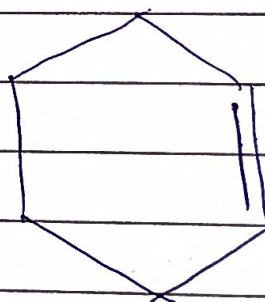
Alicyclic compounds

These are cyclic compounds exhibiting properties similar to those of aliphatic compounds

ex cyclobutane, cyclohexene



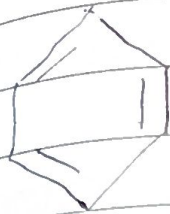
cyclobutane



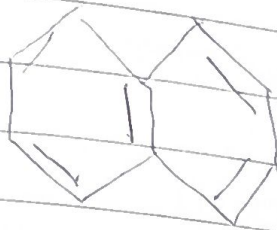
cyclohexene

Aromatic compounds

Aromatic compounds have special stability. Aromatic compounds containing benzene ring are known as benzenoid aromatics while those not containing benzene ring are called non-benzenoid aromatic.



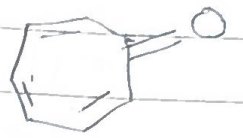
Benzene



Naphthalene



phenol



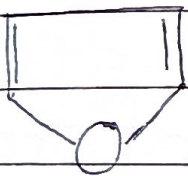
Tropone

b) Benzenoid Aromatic compounds

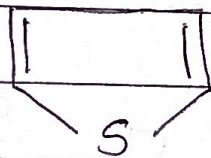
c) Non benzenoid Aromatic compounds

Some heterocyclic compounds

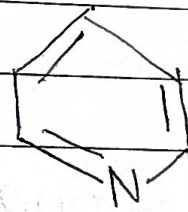
Heterocyclic aromatic compounds



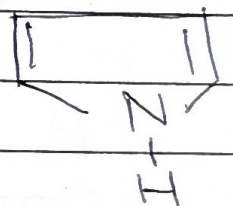
Furan



Thiophene

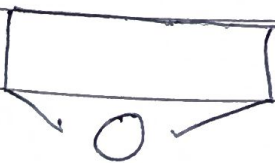


Pyridine

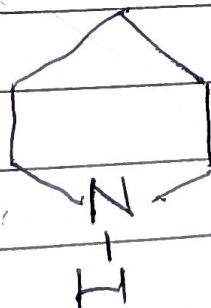


Pyrrole

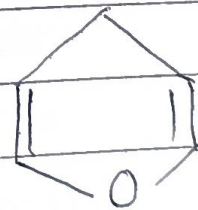
Heterocyclic Non-aromatic compounds



Tetrahydrofuran



Piperidine



4H-Pyran

Functional Group

The functional group is an atom or a group of atoms joined to the carbon chain which is responsible for the characteristic chemical properties of the organic compounds

ex hydroxyl group ($-OH$)

aldehyde group ($-CHO$)

Carboxylic acid group ($-COOH$)

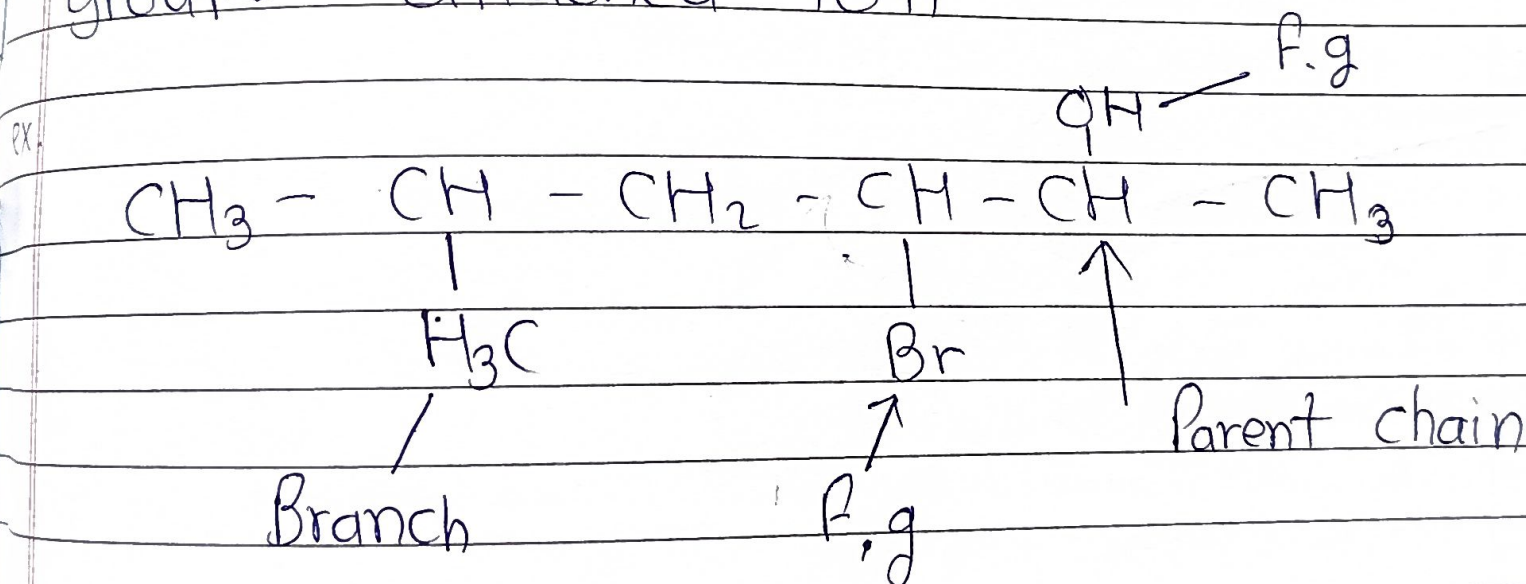
Homologous Series

A series of organic compounds each containing a characteristic functional group forms a homologous series and the members of the series are called homologues

Nomenclature of organic compounds

IUPAC Nomenclature

A systematic name of an organic compound is generally derived by identifying the parent hydrocarbon and the functional groups attached to it.



The IUPAC name for a homologous series of such compounds is alkane

IUPAC Nomenclature of Alkanes

Straight chain hydrocarbons

IUPAC names of branched Saturated hydrocarbon

The branches or the side chains in saturated hydrocarbon are alkyl substituents.

Alkyl group: