CLASS – X
SUBJECT – CHEMISTRY

Gist of the lesson

CARBON AND ITS COMPOUNDS – UNIT 1

How does carbon attain noble gas configuration?

(i) Carbon is tetravalent, it does not form ionic bond by either losing four electrons (C^{4+}) or by gaining four electrons (C^{4-}). It is difficult to hold four extra electron and would require large amount of energy to remove four electrons. So, carbon can form bond by sharing of its electrons with the electrons of other carbon atom or with other element and attain noble gas configuration.

(ii) The atoms of other elements like hydrogen, oxygen and nitrogen, chlorine also form bonds by sharing of electrons.

(iii) **The bond formed by sharing of electrons between same or different atoms is covalent bond.**

Physical Properties of Covalent Compounds

(a) Covalent compounds have low melting and boiling points as they have weak intermolecular force.

(b) They are generally poor conductor of electricity as electrons are shared between atoms and no charged particles are formed.

Versatile Nature of Carbon

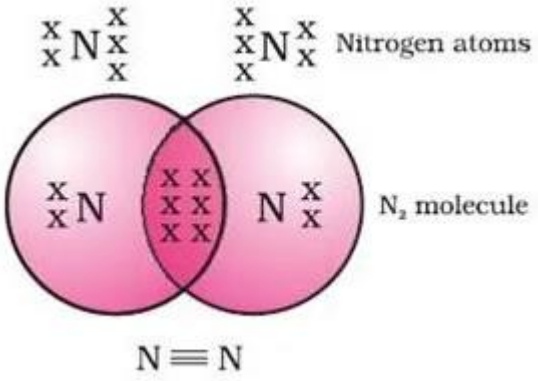
The two characteristic properties of carbon element which lead to the formation of large number of compounds:

(i) Catenation: Carbon can link with carbon atoms by means of covalent bonds to form long chains, branched chains and closed ring.

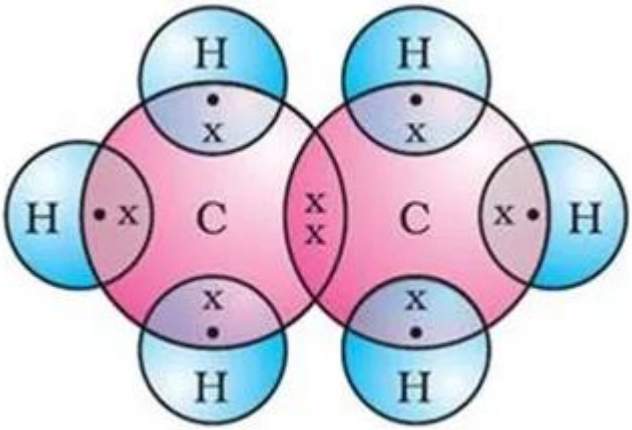
(ii) Tetravalency: Carbon has 4 valence electrons. Carbon can bond with four carbon atoms, monovalent atoms, oxygen, nitrogen and sulphur.

Electron-dot structure

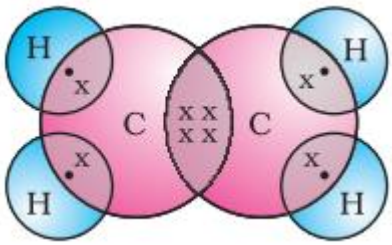
1) Nitrogen



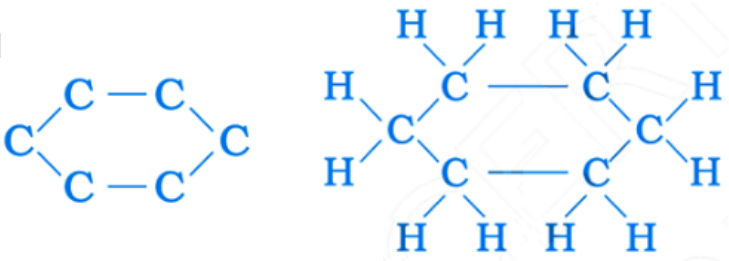
2. Electron-dot structure of ethane (A saturated carbon compound)



3. Electron dot structure of ethene (An unsaturated carbon compound)

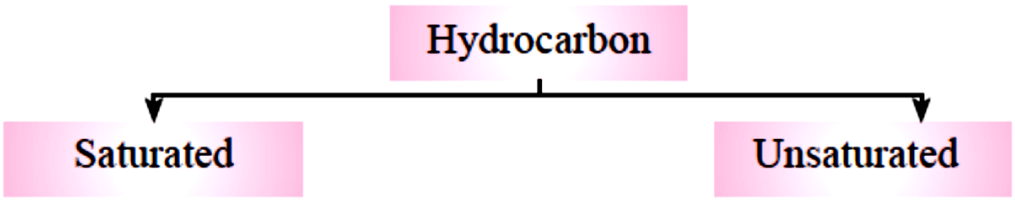


Cyclic carbon compound – an example



Carbon skeleton

Complete molecule



Saturated	Unsaturated	
• Single bond between carbon atoms.	• Double or triple bond between carbon atoms.	
• – C – C –	• – C = C –	– C ≡ C –
• Alkanes **General formulae** C_nH_{2n+2}	• Alkenes C_nH_{2n}	Alkynes C_nH_{2n-2}

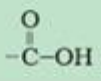
Important: Table 4.2 Formulae and structures of saturated compounds of carbon and hydrogen

Heteroatom: In a hydrocarbon chain, one or more hydrogens can be replaced by elements like O, Cl, N, S, such that the valency of carbon remains satisfied. In such compounds, the element replacing hydrogen is referred to as a heteroatom.

Functional Groups

- heteroatom or group of atoms which replace one or more hydrogen atoms in a hydrocarbon chain which make carbon compound reactive and decides its properties are called functional groups.

Some functional groups in carbon compounds:

Hetero atom	*Functional group*	*Formula of functional group*
Cl/Br	Halo- (Chloro/bromo)	—Cl, —Br (substitutes for hydrogen atom)
Oxygen	1. Alcohol	—OH
	2. Aldehyde	
	3. Ketone	
	4. Carboxylic acid	

Homologous Series

It is series of compounds in which same functional group substitutes for the hydrogen in Carbon chain.

e.g., Alcohols – CH_3OH, C_2H_5OH, C_3H_7OH, C_4H_9OH

• Have same general formula.

• Any two homologues differ by – CH_2 group and difference in molecular mass is 14u.

• Have same chemical properties but show gradual change in physical properties.

Structural Isomers:

Compounds with identical molecular formula but different structural formula are called structural isomers.

IUPAC nomenclature: Important rules are stated in article 4.2.5

IUPAC Nomenclature of some organic compounds Ref. Table 4.4

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