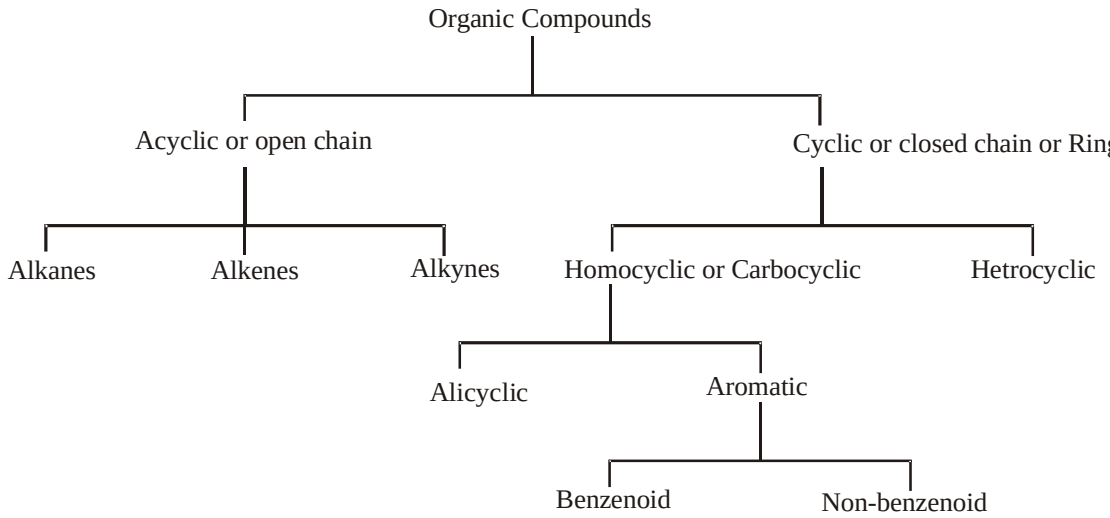
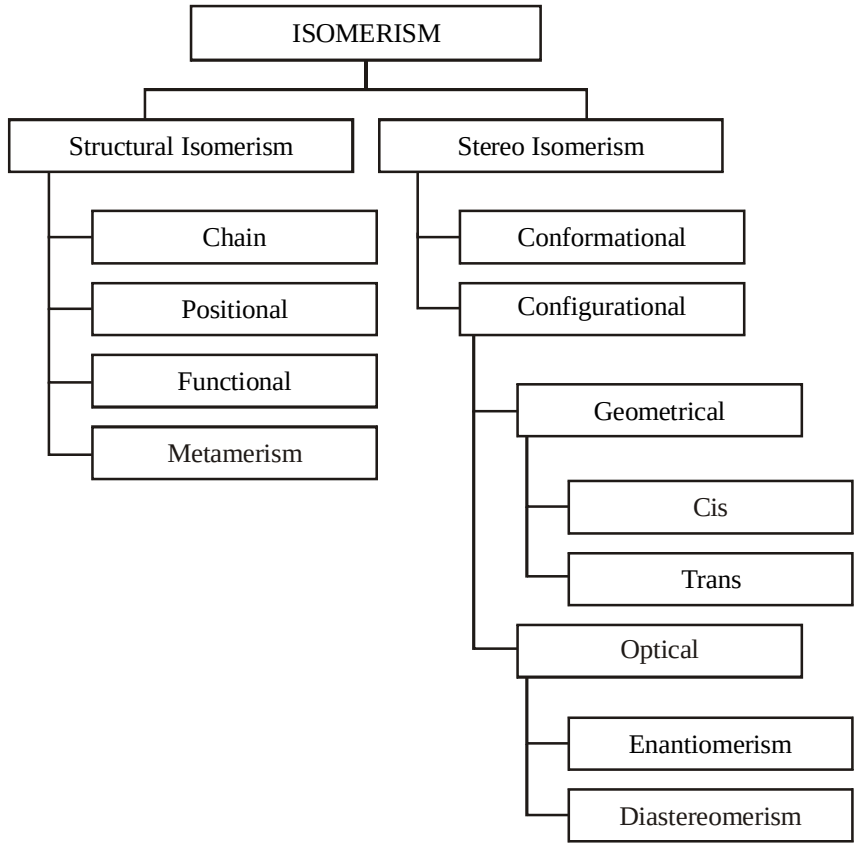
CHAPTER

9 General Organic Chemistry

1. **Wohler** prepared the first organic compound urea while preparing ammonium cyanate.
2. **Classification of organic compounds:**



3. **Isomerism**. The existence of two or more chemical compounds with the same molecular formula but having different properties owing to different arrangement of atoms within the molecule is termed as isomerism.

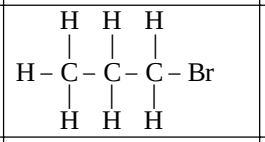
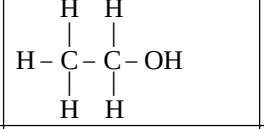


4. **Hydrocarbons :** All those compounds which contain just carbon and hydrogen are called hydrocarbons.
5. **Functional group :** The atom or group of atoms which determine the properties of a compound is known as functional group. e.g. –OH (alcohol), –CHO (aldehyde), > C = C < (alkene), – C ≡ C – (alkyne), etc.
6. **Homologous Series :** A series of compounds in which the same functional group substitutes hydrogen in a carbon chain is called a homologous series. e.g. CH_3Cl and C_2H_5Cl differ by a $–CH_2$ unit.
7. **Nomenclature :** Chemists developed a set of rules, for naming organic compounds based on their structures which is known as IUPAC rules.

   The IUPAC name of an organic compounds consists of three parts.

   Prefix – word root – Suffix

   Word root : A word root indicates the nature of basic carbon skeleton.
   - In case a functional group is present, it is indicated in the name of the compound with either as a prefix or as a suffix.
   - While adding the suffix to the word root the terminal 'e' of carbon chain is removed
   - If the carbon chain is unsaturated then the final 'ane' in the name of the carbon chain is substituted by 'ene' or 'yne' respectively for double and triple bonds.

Functional group	Prefix/Suffix	Functional group	Example	IUPAC Name
1. Halogen	Chloro, bromo, Iodo	–Cl, – Br, – I		– Bromopropane
2.Alcohol	–ol	–OH		– Ethanol
3. Aldehyde	–al	–CHO	$CH_3CH_2CH_2CHO$	– Butanal
4. Ketone	–one	–CO	CH_3COCH_3	– Propanone
5. Carboxylic acid	–oic acid	–COOH	CH_3CH_2COOH	– Propanoicacid
6. Amine	Amino	$–NH_2$	$CH_3CH_2NH_2$	– Amino ethane
7. Ester	oate –	–COOR	CH_3COOCH_3	– Methyl ethanoate
8. Double bond	ene		$CH_3 – CH = CH_2$	– Propene
9. Triple bond	yne		$CH_3 – CH_2 – C \equiv CH$	– Butyne

8. **Chemical Properties of Carbon Compounds**

   (i) Combustion : Carbon compound undergo combustion reaction to produce CO_2 and H_2O with the evolution of heat and light.

   $$CH_4 + O_2 \longrightarrow CO_2 + H_2O + \text{heat and light}$$

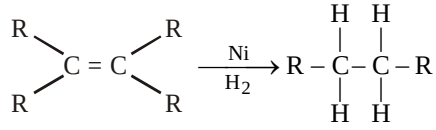
   (ii) Oxidation :

   $$\underset{\text{ethanol}}{CH_3CH_2OH} \xrightarrow{\text{alk. } KMnO_4 / \Delta} \underset{\text{ethanoic acid}}{CH_3COOH}$$

   The substance which are used for oxidation are known as oxidising agent. e.g alkaline $KMnO_4$, acidified $K_2Cr_2O_7$.

   (iii) Addition reaction :

   Unsaturated hydrocarbons (alkenes and alkynes undergo addition reaction in presence of catalysts e.g.

   (iv) Substitution reaction : Saturated hydrocarbons give substitution reaction e.g. methane in presence of sunlight undergo chlorination.

EXERCISE

1. Two adjacent members of a homologous series have :
   (a) a difference of $-CH_2$ in their structure
   (b) a difference of 14 a.m.u. in molecular mass
   (c) same general methods of preparation
   (d) all of the above
2. Alkenes are characterized by
   (a) C – C bonds (b) C = C bonds
   (c) C ≡ C bonds (d) cyclic structure
3. Which of the following contains carbonyl group?
   (a) Ketones (b) Aldehydes
   (c) Esters (d) All of these
4. The functional group present in $CH_3COOC_2H_5$ is
   (a) ketonic (b) aldehydic
   (c) ester (d) carboxylic
5. Butanone is a four-carbon compound with the functional group
   (a) carboxylic acid (b) aldehyde
   (c) ketone (d) alcohol
6. Which of the following is incorrectly matched?
   (a) Vinegar → carboxylic acid
   (b) C_2H_6 → alkane
   (c) Ethanol → alcohol
   (d) Methanol → ketone
7. If a hydrocarbon has any double bond, it is
   (a) alkyne (b) alkane
   (c) alkene (d) All the above
8. Alkynes are characterized by –
   (a) C – C bonds (b) C = C bonds
   (c) C ≡ C bonds (d) cyclic structure
9. How many different isomers are possible for a hydrocarbon with the molecular formula C_4H_{10}?
   (a) 1 (b) 2
   (c) 3 (d) 5
10. The general formula $C_nH_{2n}O_2$ could be for open chain
    (a) diketones (b) carboxylic acids
    (c) diols (d) dialdehydes
11. The IUPAC name of CH_3CH_2COCl is
    (a) propanoyl chloride (b) ethanoyl chloride
    (c) acetyl chloride (d) chloroethane
12. General formula of alkenes and alkyl radicals are respectively:
    (a) C_nH_{2n} and C_nH_{2n+1} (b) C_nH_{2n} and C_nH_{2n+2}
    (c) C_nH_{2n-1} and C_nH_{2n} (d) C_nH_{2n+1} and C_nH_{2n+2}
13. The IUPAC name of $CH_3COOC_2H_5$ will be –
    (a) ethyl acetate (b) ethyl ethanoate
    (c) methyl propanoate (d) none of these
14. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that
    (a) the food is not cooked completely.
    (b) the fuel is not burning completely.
    (c) the fuel is wet.
    (d) the fuel is burning completely.
16. Which is a general formula of alkenes?
    (a) C_nH_{2n+2} (b) C_nH_{2n}
    (c) C_nH_{2n-2} (a) None of these
17. Organic compounds will always contain
    (a) carbon (b) hydrogen
    (c) nitrogen (d) sulphur
18. Methane, ethane and propane are said to form a homologous series because all are
    (a) hydrocarbons
    (b) saturated compounds
    (c) aliphatic compounds
    (d) differ from each other by a CH_2 group
19. General formula of alkyne is
    (a) C_nH_{2n+2} (b) C_nH_{2n}
    (c) C_nH_{2n-2} (d) C_nH_n
20. Which among the following are unsaturated hydrocarbons?

    (i) $H_3C-CH_2-CH_2-CH_3$

    (ii) $H_3C-C\equiv C-CH_3$

    (iii) $H_3C-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$

    (iv) $H_3C-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH_2$

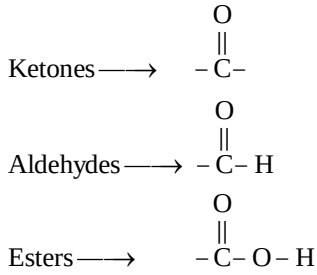
    (a) (i) and (iii) (b) (ii) and (iii)
    (c) (ii) and (iv) (d) (iii) and (iv)
21. Pentane has the molecular formula C_5H_{12}. It has
    (a) 5 covalent bonds (b) 12 covalent bonds
    (c) 16 covalent bonds (d) 17 covalent bonds
22. The heteroatoms present in
    $CH_3-CH_2-O-CH_2-CH_2Cl$ are
    (i) oxygen (ii) carbon
    (iii) hydrogen (iv) chlorine
    (a) (i) and (ii) (b) (ii) and (iii)
    (c) (iii) and (iv) (d) (i) and (iv)
23. Isomers of a substance must have the same
    (a) structural formula
    (b) physical properties
    (c) chemical properties
    (d) molecular formula

ANSWER KEY							
1	(d)	**7**	(c)	**13**	(b)	**19**	(c)
2	(b)	**8**	(c)	**14**	(b)	**20**	(c)
3	(d)	**9**	(b)	**15**	(b)	**21**	(c)
4	(c)	**10**	(b)	**16**	(a)	**22**	(d)
5	(c)	**11**	(a)	**17**	(a)	**23**	(d)
6	(d)	**12**	(a)	**18**	(d)		

HINTS AND SOLUTIONS

2. (b) Alkanes are saturated compounds in which all the four electrons of carbon are covalently bonded with other carbon atoms through single bond

3. (d) All contains carbonyl $(>C=O)$ compounds.



4. (c) $CH_3-\underbrace{C(=O)-O-H}_{\text{ester group}}$

5. (c) $CH_3-CH_2-C(=O)-CH_3$
Butanone or methyl ethyl ketone

6. (d) Methanol is an alcohol.

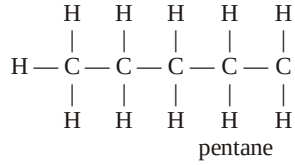
7. (c) Alkenes have double bond.

9. (b) $\underset{\text{normal butane}}{CH_3-CH_2-CH_2-CH_3}$ $\underset{\text{iso butane (chain isomers)}}{CH_3-CH(CH_3)-CH_3}$

10. (b) General formula

18. (d) They belong to homologus series as they succesively have a difference of a $-CH_2$ group.

20. (c) Unsaturated hydrocarbons have double or triple bond.

21. (c) 
pentane
i.e., 16 covalent bonds.

23. (d) Organic compounds having same molecular formula but differ from each other in physical properties or chemical properties or both are known as isomers.