ST. LAWRENCE HIGH SCHOOL

A Jesuit Christian Minority Institution

FOR GOD AND COUNTRY

Study Material

Subject: Physical Science **CLASS – 10**

Topic: Organic Chemistry **Date: 20/06/2020**

Q.27. What is Catenation ?

Ans. **Catenation** : The property by virtue of which carbon forms covalent linkage chains is called catenation.

Q.28. What is Functional group ?

Ans. **Functional group** : An atom or a group of atoms which being present within the molecule of an organic compound, causes the compound to function or behave chemically in a particular way is called a functional group, e.g. alcohol (–OH), aldehyde (–CHO)

Q.29. What are Hydrocarbons ?

Ans. **Hydrocarbons** : These are organic compounds containing only carbon and hydrogen atoms in their molecules. They are divided into two classes.
(a) Saturated hydrocarbons
(b) Unsaturated hydrocarbons.

Q.30. What are saturated hydrocarbons ?

Ans. **Saturated hydrocarbons** : Saturated hydrocarbons are those in whose molecules the carbon atoms are joined to each other by single bond and the remaining valencies of the carbon atoms are satisfied by hydrogen atoms. e.g. Methane (CH_4), Ethane (C_2H_6).

Q.31. What are unsaturated hydrocarbons ?

Ans. **Unsaturated hydrocarbons :**
The compounds in which carbon atoms are connected among themselves by double bond or triple bond are called unsaturated hydrorcarbons.

Q.32. What are Alkenes ?

Ans. **Alkenes** : Those unsaturated hydrocarbons containing double bond (=) between two adjacent carbon atoms in their molecules are called as alkenes.

e.g. Ethylene $\begin{matrix} H \\ H \end{matrix}\!\!>\!C \overset{\sigma}{\underset{\pi}{=}} C\!<\!\!\begin{matrix} H \\ H \end{matrix}$

Q.33. What are Alkynes ?

Ans. **Alkynes** : Those unsaturated hydrocarbons containing triple bonds (s) between two adjacent carbon atoms in their molecules are called as alkynes.

e.g. Acetylene $\left(H-C\overset{\sigma}{\underset{\pi}{\equiv}}C-H\right)$

Q.34. What are Cyclic compounds ?

Ans. **Cyclic compounds** : Organic compounds containing closed of atoms are called cyclic compounds. Cyclic compounds are of two types. (a) Homocyclic compounds (b) Heterocyclic compounds.

Q.35. What are Homocyclic compounds ?

Ans. **Homocyclic compounds** : These are the compounds where all the atoms present in the cyclic compounds in the series are carbon atoms. These are of two types. (a) Aromatic compounds (b) Alicyclic compounds.

Q.36. What are Aromatic compounds ?

Ans. **Aromatic compounds** : Aromatic compounds are those which have a

hexagonal ring structure formed by six carbon atoms bonded each other by a single or double bonds.

e.g. Benzene () ; Naphthalene ()

Q.37. What are Alicyclic compounds ?

Ans. **Alicyclic compounds** : These compounds are the cyclic or ring compounds without having any benzene ring. e.g. cyclobutane () ; cyclohexane ()

Q.38. What are Heterocyclic compounds ?

Ans. **Heterocyclic compounds** : Sometimes N, O, S atoms are linked along with carbon atoms in series during the formation of closed ring structure. These compounds are called heterocyclic compounds.

e.g. Pyridine () ; Furan 

Q.39. What are Homologous series ?

Ans. **Homologous series** : A homologous series may be defined as a group of compounds in which various members (a) have similar chemical properties (b) can be represented by the same general formula (c) possess the same functional group the different members of homologous series are called **homologues** and the phenomenon is called **homology.**

Q.40. What is Isomerism ?

Ans. **Isomerism** : In organic chemistry when the same molecular formula represents two or more compounds which differ in their physical and chemical properties, then such compounds are called isomers and the phenomenon is called **isomerism.**

Q.41. What are Structural isomers ?

Ans. **Structural isomers** : Isomers that have same molecular formula but differ in the arrangement of atoms within the molecule are known as structural isomers.

Q.42. What are Stereoisomers ?

Ans. **Stereoisomers** : The isomers that have the same constitution but different in the spatial arrangement of their atoms are called stereoisomers.

Q.43. What are the types of structural isomers ?

Ans. **Types of structural isomers :**

(a) **Chain isomerism : e.g.**

$C_{14}H_{10}$

(i) $CH_3–CH_2–CH_2–CH_3$
(n-butane)

(ii) $CH_3–\underset{\displaystyle CH_3}{\underset{|}{CH}}–CH_3$
(Iso-butane)

(b) **Functional isomerism : e.g.**

C_2H_6O

(i) $CH_3–CH_2–OH$ (Ethyl alcohol)

(ii) $CH_3–O–CH_3$ (Dimethyl ether)

(c) **Position isomerism : e.g.**

C_3H_8O

(i) $CH_3–CH_2–CH_2–OH$ (Propan-1-ol)

(ii) $CH_3–CH(OH)–CH_3$ (Propan-2-ol)

(d) **Metamerism : e.g.**

$C_4H_{10}O$

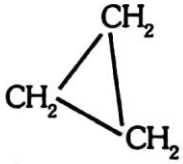
(i) $C_2H_5–O–C_2H_5$ (Diethyl ether)

(ii) $CH_3–O–C_3H_7$ (Methyl propyl ether)

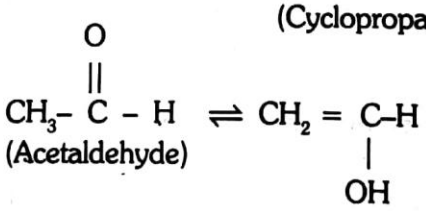
(e) **Ring chain isomerism : e.g.**

C_3H_6

(i) $CH_3–CH_3 = CH_2$ (Propene)

(ii)  (Cyclopropane)

(f) **Tautomerism : e.g.**



(Acetaldehyde) (Vinyl alcohol)

C. Short Answer Type Questions — Marks for each 3

Q.1. **State the difference between organic and inorganic compounds.**

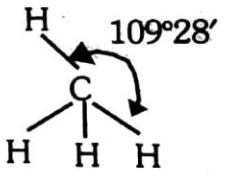
Ans. Difference between organic and inorganic compounds :

Organic Compounds	Inorganic compounds
(i) The catenation property of carbon atoms among themselves and other atoms give rise to limitless number of organic compounds.	(i) Due to absence of catenation property of its atoms the number of inorganic compounds formed by the rest of the elements is not so large.
(ii) They form covalent bonds.	(ii) Inorganic compounds may be covalent or electrovalent.
(iii) They have low melting and low boiling point.	(iii) They have high melting and boiling point.
(iv) These are not ionised at all.	(iv) Most of the inorganic compounds are electrolytes.

Organic Compounds	Inorganic compounds
(v) Reaction of organic compounds are slow in nature.	(v) They have high rate of reaction.
(vi) They show isomerism.	(vi) Very few inorganic compounds show isomerism.
(vii) They are soluble in organic solvents like alcohol, ether etc.	(vii) They are soluble in ionising solvent like water, but are insoluble in organic solvent.

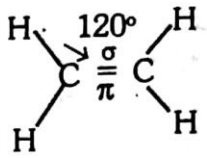
Q.2. State the following facts of Methane.
(i) Source/preparation (ii) Important reaction (iii) Uses (iv) Structure

Ans. The following facts of methane :

Source/ Preparation	Important reactions	Uses	Structure
• Laboratory preparation CH_4COONa (Sodium acetate +NaOH (CaO ↓ (Soda lime) $\boxed{CH_4}$ + Na_2CO_3 (Methane) • It is produced in nature in biological decay of plants • Al_4C_3 + $12H_2O$= ↓ 3 $\boxed{CH_4}$ + 4Al $(OH)_3$	• **Combustion** $CH_4+2O_2 \rightarrow CO_2 +2H_2O$ H° = –890·4 KJ/mol (ii) Substitution reaction : $CH_4 \xrightarrow{Cl_2} CH_3Cl$ (Methyl chloride) $CH_3Cl \xrightarrow{Cl_2} CH_2Cl$ (methylene chloride) $CH_2Cl_2 \xrightarrow{Cl_2} CHCl_3$ (Chloroform) $CHCl_3 \xrightarrow{Cl_2} CCl_4$ (Carbon tetrachlroide) (iii) Catalytic oxidation $2CH_4 + O_2 \xrightarrow[Cu\text{-}tubes,\ 457K]{120\ atm} 2CH_3OH$ **(iv) Pyrolysis** $CH_4 \xrightarrow{1273K} C+2H_2$	(i) Preparation of carbon black, printing ink (ii) Manufacture of hydrogen (iii) Manufacture of compounds like methyl chloride, chloroform, methyl alcohol, formaldehyde	

Q.3. State the following facts of Ethylene.
(i) Source/preparation (ii) Important reaction (iii) Uses (iv) Structure

Ans. The following facts of ethylene :

Source/ Preparation	Important properties and reactions	Uses	Structure
Laboratory preparation $C_2H_5OH \xrightarrow[\text{(Ethanol) } 165°-170°C]{\text{excess } H_2SO_4 \text{ conc}} H_2O + \boxed{CH_2=CH_2}$ Ethylene •Huge amount of ethylene is obtained as by product in cracking of petroleum	(i) Addition reaction (a) Addition of hydrogen $CH_2=CH_2+H_2 \xrightarrow[160°C]{Ni(cat)} CH_3-CH_3$ Ethane (b) Addition of bromine $CH_2=CH_2+Br_2 \xrightarrow{CCl_4} CH_2(Br)-CH_2(Br)$ (1, 2-dibromoethane) (ii) Combusion $C_2H_4+3O_2 \rightarrow 2CO_2+2H_2O$ $\Delta H = -1411{\cdot}0$ KJ/mol	(i) For ripening fruits. (ii) For cutting and welding metal sheets. (iii) to manufacture polythene.	

Q.4. What are Polymers and what are Monomers. Give few examples.

Ans. **Polymer** : Under suitable conditions, many molecules of alkene and alkyne combine together forming a very high molecular weight compound known as polymer. The small moleculers are known as monomers and this process is known as polymerisation.

Some common polymers :

Polymer	Monomer	Uses
(i) Polythene (Polyethylene) $(...CH_2-CH_2.....)_n$	$\xleftarrow[473-673K]{\text{hea,pressure } O_2} CH_2=CH_2$ (Ethene)	carrying bags, dishes packaging and sheathing elecric wire.
(ii) PVC (Polyvinyl chloride) $(...CH_2-CH(Cl)-...)_n$	$\xleftarrow{\text{peroxide}} n(CH_2=CH-Cl)$ (Vinyl chloride)	electric wires cables, water tanks, water taps.
(iii)Teflon $(...CF_2-CF_2....)_n$	$\xleftarrow[0{\cdot}01\%\ O_2]{\text{heat, pressure}} n(CF_2=CF_2)$ Tetra fluoro ethylene	cook ware, optical materials, biomedical materials.

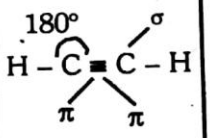
Q.5. What are Biodegradable and Non-biodegradable materials.

Ans. Biodegradable materials : Materials of vegetable and animal origin invariably decay and decompose into CO_2, H_2O, N_2 or NH_3 by the combined action of sometimes of natural agencies like air, water, subshine etc. These are called biodegradable materials.

Non-biodegradable materials : Synthetic materials like plastics, polythene, teflon, PVC etc, are not decomposed by these natural agencies even on for a long time. These are called non-biodegradable materials.

Q.6. State the following facts of acetylene.
(i) Source/preparation (ii) Important reaction (iii) Uses (iv) Structure

Ans. The following facts of acetylene :

Source/ Preparation	Important properties and reactions	Uses	Structure
● Laboratory preparation $CaC_2 + 2H_2O \rightarrow$ (Calcium carbide) $Ca(OH)_2 + H\text{–}C{\equiv}C\text{–}H$ (Acetylene) **● Industrial preparation** $2C + H_2 \xrightarrow{1200°C} H\text{–}C = C\text{–}H$ (acetylene) **● From natural gas**	**(i) Addition reaction** **(a) Addition of hydrogen** $H\text{–}C{\equiv}C\text{–}H \xrightarrow[523K]{H_2/Ni\ (cat)} CH_2{=}CH_2$ (Ethylene) $\xrightarrow[523K]{H_2 / Ni\ (cat)} CH_3\text{–}CH_3$ Ethane **(b) Addition of bromine** $H\text{–}C = C\text{–}H \xrightarrow{Br_2}$ $CH(Br){=}CH(Br)$ (1, 2-dibromo ethylene) $\xrightarrow{Br_2}$ $Br\text{–}CH(H)\text{–}CH(H)\text{–}Br$ (1, 2-tetrabromo ethane)	(i) for lighting purposes (ii) for the preparation of acetic acid, ethyl-alcohol.	

Q.7. Discuss about the hazards of using Polyethylene, Teflon and PVC.

Ans. **Explanation** : Polyethylene, teflon and PVC are non-biodegradable material. These substances do not decompose or decay naturally on long standing. These articles are usually left in soil or water. This practice causes pollution of soil, water and air.

(a) Solid wastes containing PVC when incinerated (consumed by fire) produce the highly toxic substance dioxin. Soil contains two main bios, detrivore and decomposer which analyse or detoxify many bio-degradable substances.

(b) But the polyethylene, teflon, PVC etc. are not bio-digradable substances, they rather spoil detrivore and decomposer of soil. In presence of air and water these synthetic substances excreate some poisonous chemicals in top soil spoiling the minerals necessary for plants.

Q.8. State possible alternatives to avoid the hazards due to polythene materials.

Ans. **Possible alternatives** : The possible alternative that can eliminate the hazards of using polythene is to restrict their uses to a minimum extent. In places of polythene bags for carrying purchases, bags made of cloth, paper or jute should be used. Paper or dry leaf packets should be used instead of polythene packets to carry sweets and other edible solid materials. The use of polythene glass, tea-cups etc. should be discontinued, and those made of hard paper or earthenwares should be used instead. Polythene sheets for covering should be replaced by thin terpaulin, waxed paper or tar-laminated papers, jute cloth etc.