CHAPTER – 4

CARBON AND ITS COMPOUND

CARBON: INTRODUCTION

Carbon is the fourth most abundant element in the universe by mass. It is also the second most abundant element in the human body after oxygen. It is the 15th most common element in the Earth's crust. Carbon was discovered in prehistory and it was known to the ancients. They used to manufacture charcoal by burning organic material.

Carbon is a non-metal. It belongs to the fourteenth group or IV A group in the modern periodical table. The elements of this group have four electrons in the valence shell.

Atomic Number: 6
Electronic configuration: 2, 4
Valence electrons: 4
Property: Non-metal

Compounds having carbon atoms among the components are known as carbon compounds. Previously, carbon compounds could only be obtained from a living source; hence they are also known as organic compounds.

BONDING IN CARBON: COVALENT BOND

Bond formed by sharing of electrons is called covalent bond. Two of more atoms share electrons to make their configuration stable. In this type of bond, all the atoms have similar rights over shared electrons. Compounds which are formed because of covalent bond are called COVALENT COMPOUNDS.

FORMATION OF COVALENT BONDS

1. **Covalent band** is the chemical bond formed through the **sharing of electrons between two non-metal atoms**.
2. Compounds which have covalent bonds are called **covalent compounds**.
3. Examples of covalent compounds or molecules are chlorine, Cl_2, carbon dioxide, CO_2, ammonia, NH3, water, H2O, and tetrachloromethane (carbon tetrachloride), CCl_4.
4. During the formation of covalent molecules, **each non-metal covalent atom** provides one, two or three electrons to be **shared** with other atoms. The bond formed is called a covalent bond.
5. Through this process, each non-metal atom in covalent molecules will achieve **stable electron arrangement**.
6. The type of covalent bond formed in a covalent compound depends on the number of electron pairs shared between non-metal atoms.

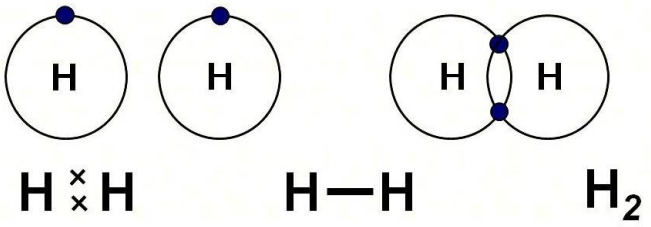
Covalent bonds are of three types: Single, double and triple covalent bond.

SINGLE COVALENT BOND

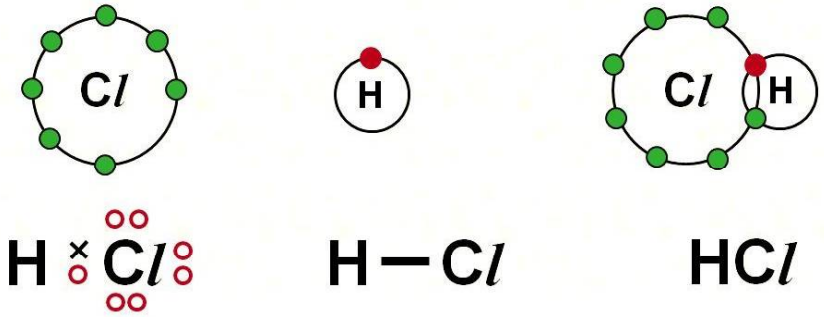
1. A single covalent bond is the covalent bond formed through the **sharing of a pair of electrons between two non-metal atoms**.

2. Each non-metal atom contributes one electron for sharing to achieve a **stable electron arrangement**.
3. Example of single covalent compound are chlorine gas, Cl_2, hydrogen chloride, HCl, water, H_2O, methane, CH_4, ammonia, NH_3, and tetrachloromethane, CCl_4.
4. Single covalent bonds can also be formed between different non-metal atoms.

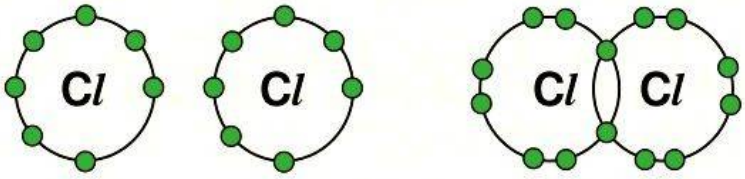
Formation of hydrogen molecule (H_2)
Atomic Number of H = 1
Electronic configuration of H = 1
Valence electron of H = 1
Hydrogen forms a duet, to obtain stable configuration. This configuration is similar to helium (a noble gas).
Since, hydrogen has one electron in its valence shell, so it requires one more electron to form a duet. So, in the formation of hydrogen molecule; one electron from each of the hydrogen atoms is shared.



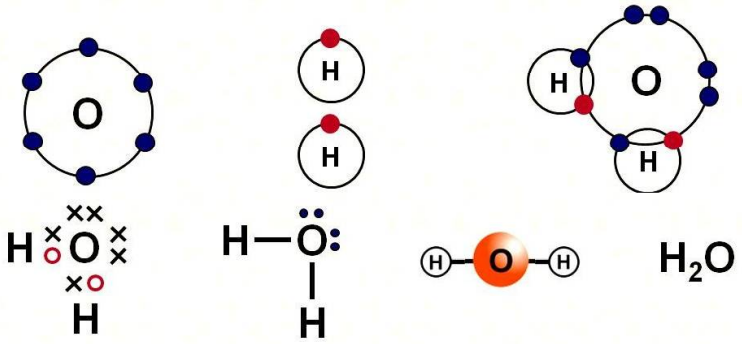
Formation of hydrogen chloride (HCl):
Valence electron of hydrogen = 1
Atomic number of chlorine = 17
Electronic configuration of chlorine: 2, 8, 7
Electrons in outermost orbit = 7
Valence electron = 7



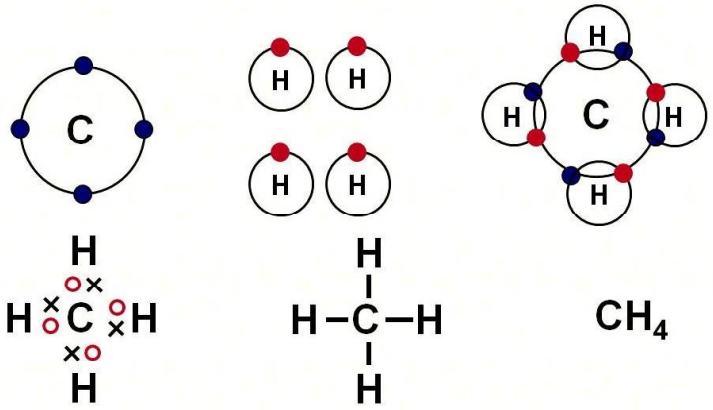
Formation of chlorine molecule (Cl_2):
Valence electron of chlorine = 7



Formation of water (H_2O)
Valence electron of hydrogen = 1
Atomic number of oxygen = 8
Electronic configuration of oxygen = 2, 6
Valence electron = 6



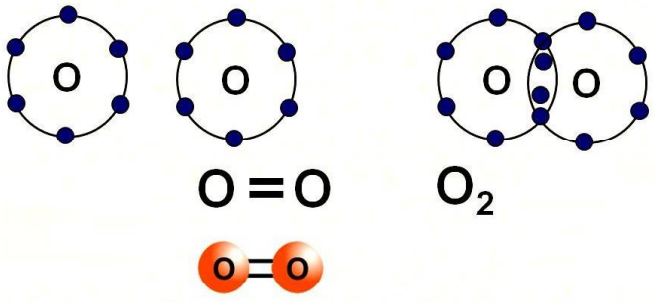
Formation of Methane (CH_4)
Valence electron of carbon = 4
Valence electron of hydrogen = 1



DOUBLE COVALENT BOND

1. Double covalent bond is the type of covalent bond formed through the **sharing of two pairs of electrons between two non-metal atoms**.
2. Examples of molecules which have double covalent bonds are oxygen, O2, and carbon dioxide, CO2.
3. During the formation of double bond, each **non-metal atom contributes two pairsof electrons to be shared** to achieve a **stable electron arrangement**.

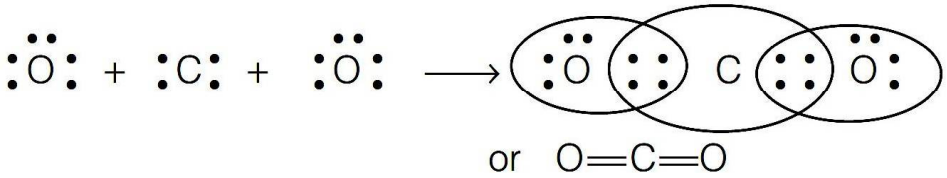
Formation of oxygen molecule (O_2):
Valence electron of oxygen = 2



- In the formation of oxygen molecule, two electrons are shared by each of the two oxygen atoms to complete their stable configuration.

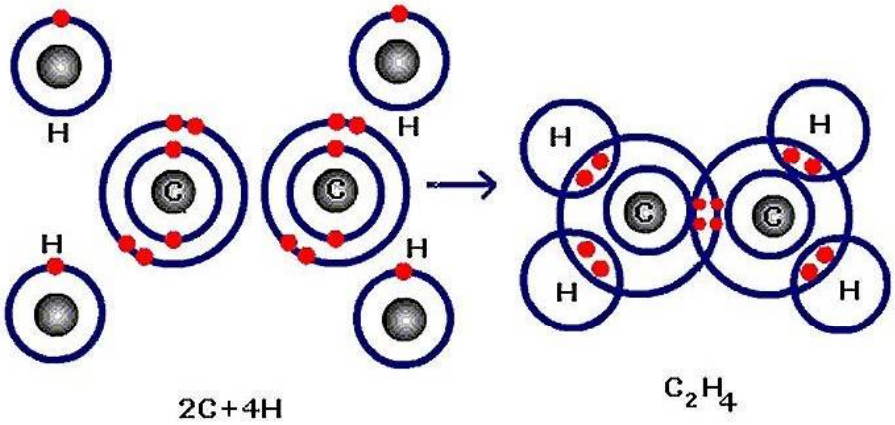
- In oxygen, the total number of shared electrons is four, two from each of the oxygen atoms. So a double covalent bond is formed.

Formation of Carbon dioxide (CO_2):
Valence electron of carbon = 4
Valence electron of oxygen = 6



In carbon dioxide two double covalent bonds are formed.

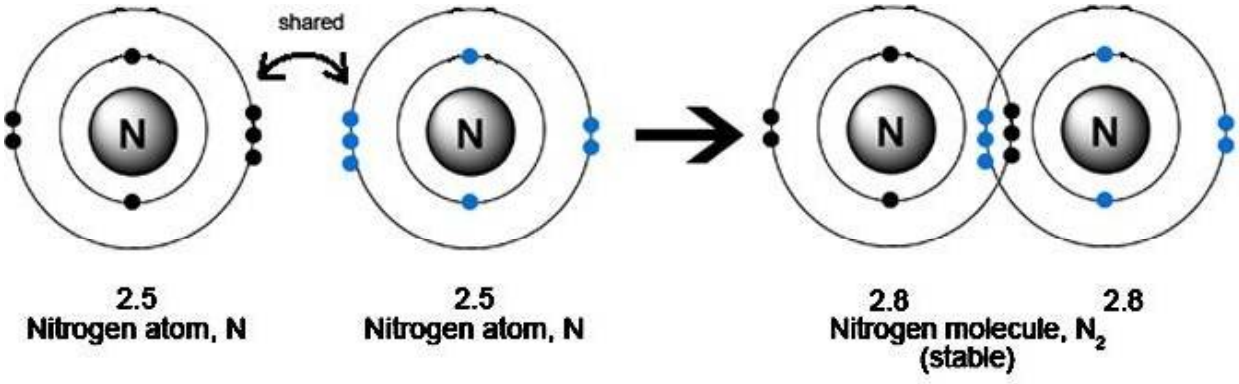
Formation of Ethylene (C_2H_4):
Valence electron of carbon = 4
Valence electron of hydrogen = 1



TRIPLE COVALENT BOND

1. The triple covalent bond is the type of covalent bond formed through the **sharing of three pairs of electrons between two non-metal atoms**.
2. Example of molecule which has triple covalent bonds is the nitrogen molecule, N2.

Formation of Nitrogen (N_2):
Atomic number of nitrogen = 7
Electronic configuration of nitrogen = 2, 5
Valence electron = 5



In the formation of nitrogen, three electrons are shared by each of the nitrogen atoms. Thus one triple bond is formed because of the sharing of total six electrons.

Properties of Covalent Bond:

- Intermolecular force is smaller.
- Covalent bonds are weaker than ionic bond. As a result, covalent compounds have low melting and boiling points.
- Covalent compounds are poor conductor of electricity as no charged particles are formed in covalent bond.
- Since, carbon compounds are formed by the formation of covalent bond, so carbon compounds generally have low melting and boiling points and are poor conductor of electricity.

ALLOTROPY

Allotropy is defined as the property by which an element can exist in more than one form that are physically different but chemically similar.

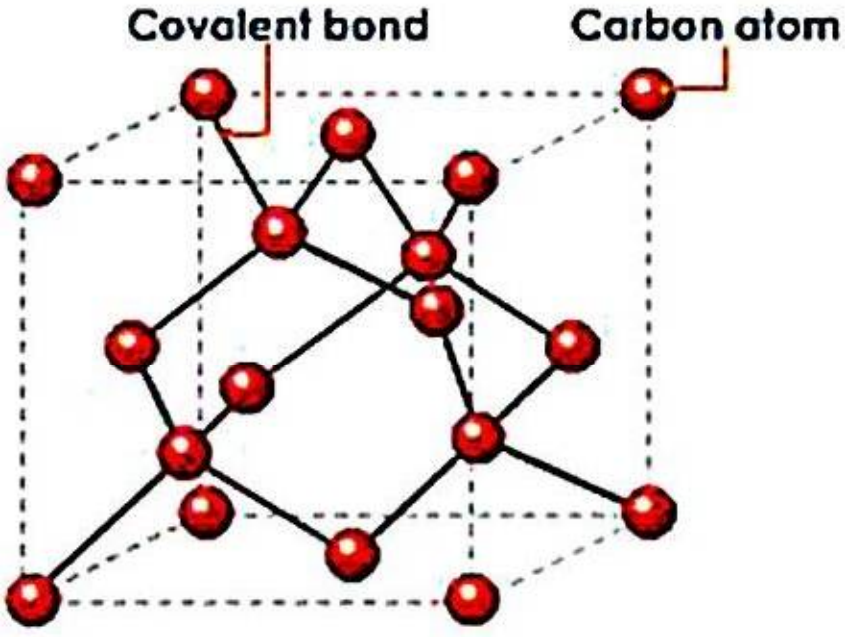
Allotropes of carbon

Carbon exists in three allotropic forms. They are crystalline form (diamond and graphite), amorphous form (coke,charcoal) and fullerene.

In diamond each carbon atom is bonded to four other carbon atoms forming a rigid three dimensional structure , accounting for it's hardness and rigidity.

General properties of diamond are

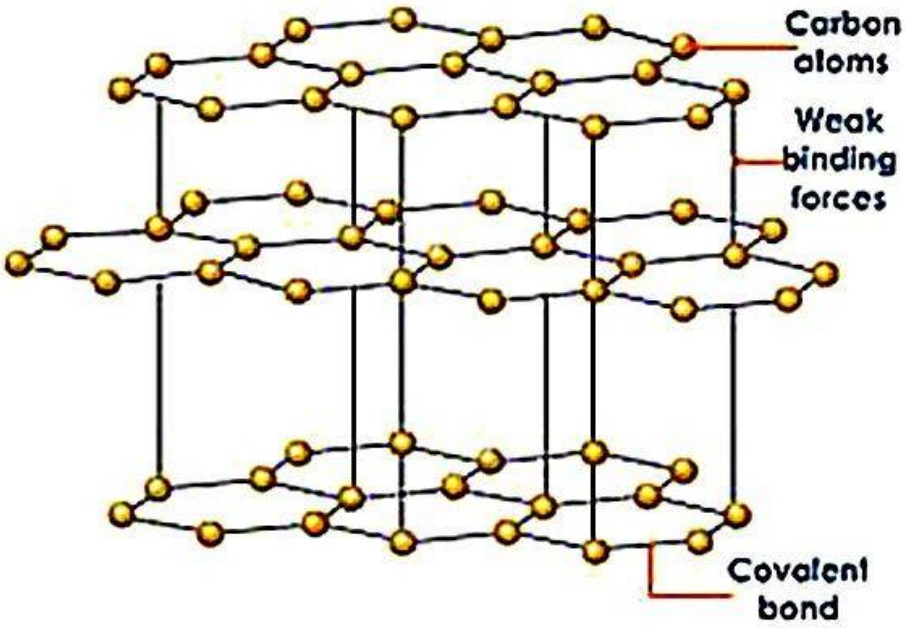
- It is a colourless transparent substance with extraordinary brilliance due to its high refractive index.
- It is quite heavy.
- It is extremely hard (hardest natural substance known).
- It does not conduct electricity (because of the absence of free electrons).
- It has high thermal conductivity and high melting point.
- It burns on strong heating to form carbon dioxide.



In graphite each carbon atom is bonded to three other carbon atoms in the same plane giving hexagonal layers held together by weak **vander Waals forces** accounting for softness.

General properties of graphite are

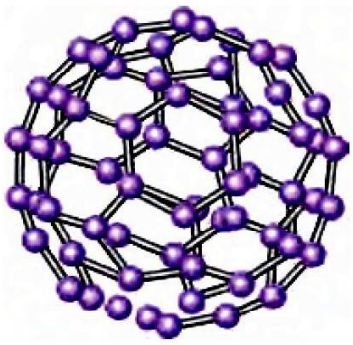
- It is a greyish black opaque substance.
- It is lighter than diamond, feels soft and slippery to touch.
- It is a good conductor of electricity (due to the presence of free electrons) but bad conductor of heat.
- It burns on strong heating to form carbon dioxide.



Fullerenes form another type of carbon allotropes. The first one was identified to contain 60 carbon atoms
in the shape of a football. (C-60). Since this looks like the geodesic dome designed by the US architect
Buck Minster Fuller, it is named as Buck Minster Fullerene.

General Properties of fullerenes are

- These are dark solids at room temperature.
- These are neither too hard nor too soft.
- These are the purest allotrophic forms of carbon because of the absence of free valencies or surface bonds.
- On burning, these produce only carbon dioxide gas.



Fullerene

Foot ball

VERSATILE NATURE OF CARBON

Initially, compounds of carbon could only be obtained from living sources and there was no way of synthesizing them. Hence, carbon compounds are also known as organic compounds. Carbon forms a large number of compounds. So far, formulae of about 3 million carbon compounds are known.

Cause of formation of such a large number of compounds by carbon:

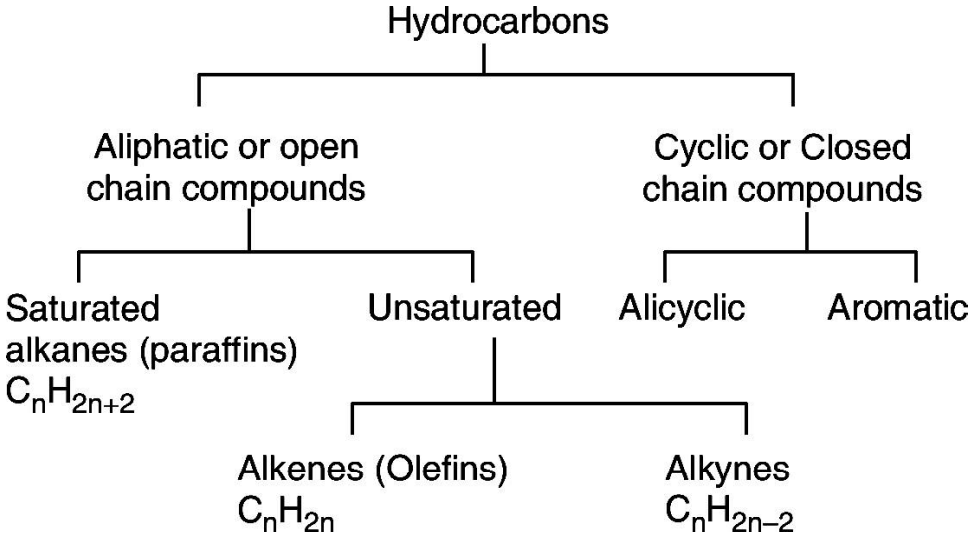
- Carbon can form bonds with other carbon atoms. This property of carbon is known as CATENATION. Because of catenation, carbon can form a long chain; while making bond with other carbon atoms. Carbon can make single, double and triple bonds by catenation.
- Carbon can form branched chain; along with straight chain; while combining with carbon atoms, i.e. because of the property of catenation.
- Due to the valency of four, carbon is capable of bonding or pairing with four other carbon atoms or with the atoms of some other monovalent elements. It also forms compounds with oxygen, nitrogen, sulphur, hydrogen and many other elements. This gives rise to compounds with specific properties which depend on the element other than carbon present in the molecule.
- Bonds which carbon forms with other elements are very strong thus, making these compounds very stable. The main reason for such strong bond formation is the small size of carbon. As a result, the shared pair of electrons are tightly held by the nucleus.

ORGANIC COMPOUNDS

The compounds of carbon except its oxides, carbonates and hydrogen carbonate salts, are known as ***organic compounds.*** These compounds were initially extracted from natural substances and was believed that some vital force was necessary for the synthesis of these compounds (vital force theory).

HYDROCARBONS

(Hydrogen + Carbon = Hydrocarbon) Compounds formed because of the combination of hydrogen and carbon are known as hydrocarbons. These are regarded as the **parent organic compounds** and all other compounds are considered to be derived from them by the replacement of one or more hydrogen atoms by other atoms or groups of atoms.
Hydrocarbons can be divided into various classes as shown in below:



ALIPHATIC HYDROCARBONS

The word aliphatic is derived from the Greek word aleiphar meaning fat. Aliphatic hydrocarbons were named so because they were derived from fats and oils. Hydrocarbons can be *acyclic* compounds, which are straight chain compounds, or cyclic compounds, which have rings of carbon atoms.

AROMATIC HYDROCARBONS

The word aromatic is derived from the word *aroma* meaning fragrance. The aromatic compounds have a characteristic smell. Structurally, they include benzene and its derivative.
The *aliphatic hydrocarbons* can be divided into two categories: **saturated hydrocarbons** and **unsaturated hydrocarbons.** In *saturated hydrocarbons*, carbon atoms are linked to each other by single bonds whereas in *unsaturated hydrocarbons*, multiple bond (double and triple bonds) are present between
carbon atoms.

SATURATED HYDROCARBONS

Alkanes
General formula = C_nH_{2n+2} Suffix : ane
These are the organic compounds which contain carbon – carbon single bond. These were earlier named as **paraffins**(Latin : meaning little affinity) due to their least chemical reactivity. According to IUPAC system, these are named as ***alkanes*** (ane is suffix with root word).

UNSATURATED HYDROCARBONS

These are hydrocarbons which contain carbon to carbon double bonds or carbon to carbon triple bonds in
their molecules.These are further classified into two types: ***alkenes and alkynes.***

i)***Alkenes***: ***General formula:*** **C_nH_{2n}** ***Suffix :*** **ene**
The hydrocarbons containing atleast one carbon to carbon double bond are called ***alkenes.***They have the general formula C_nH_{2n} .These were previously called ***olefins*** (Greek : olefiant – oil forming) because the lower gaseous members of the family form oily products when treated with chlorine.

In IUPAC system, the name of alkene is derived by replacing suffix "**ane"** of the correspding alkane by "**ene"**. For example,

$CH_3 - CH_3$	$H_2C = CH_2$
ethane	ethene

In higher alkenes, the position of the double bond, can be indicated by assigning numbers 1, 2, 3, 4, …… to the carbon atoms present in the molecule.

Alkene	Common name	IUPAC name
$CH_2 = CH_2$	Ethylene	Ethene
$CH_3CH = CH_2$	Propylene	Propene
$CH_3CH_2–CH=CH_2$	α-Butylene	But–1–ene
$CH_3CH = CHCH_3$	β-Butylene	But–2–ene

ii) ***Alkynes*****:** ***General formula:*** C_nH_{2n-2} ***Suffix :*** **yne**

The hydrocarbons containing carbon to carbon triple bond are called ***alkynes***. Alkynes are named in the same way as alkenes i.e., by replacing suffix **ane** of alkane by **yne.** In higher members, the position of triple bond is indicated by giving numbers 1, 2, 3, 4, ….to the carbon atom in the molecule.

Alkyne	Common name	IUPAC name
HC ≡ CH	Acetylene	Ethyne
H_3C – C ≡CH	Methyl acetylene	Propyne
H_3C – C ≡C – CH_3	Dimethyl acetylene	But–2-yne
H_3C - CH_2 –C ≡ CH	Ethyl acetylene	But–1–yne

HOMOLOGOUS SERIES

A homologous series is a group or a class of organic compounds having similar structure and similar chemical properties in which the successive compounds differ by a CH_2 group.

Characteristics of homologous series

- Each member of the series differs from the preceeding or succeeding member by a common difference of CH_2 and by a molecular mass of 14 amu (amu = atomic mass unit).
- All members of homologous series contain same elements and the same functional groups.
- All members of homologous series have same general molecular formula.

  e.g **Alkane = C_nH_{2n+2}**
  Alkene = C_nH_{2n}
  Alkyne = C_nH_{2n-2}
- The members in homologous series show a regular gradation in their physical properties with respect to increase in molecular mass.
- The chemical properties of the members of the homologous series are similar.
- All members of homologous series can be prepared by using same general method.

IMPORTANCE OF HOMOLOGOUS SERIES

- It helps to predict the properties of the members of the series that are yet to be prepared.
- Knowledge of homologous series gives a systematic study of the members.
- The nature of any member of the family can be ascertained if the properties of the first member are known.

FUNCTIONAL GROUP

Functional group may be defined as an atom or group of atoms or reactive part which is responsible for the characteristic properties of the compounds.

The chemical properties of organic compounds are determined by the functional groups while their physical properties are determined by the remaining part of the molecule.

CLASSIFICATION OF ORGANIC COMPOUNDS BASED ON FUNCTIONAL GROUP

1. ALCOHOLS

Alcohols are carbon compounds containing **–OH** group attached to alkyl group. The general formula of alcohol is **R-OH** where '**R**' is an **alkyl group** and **–OH** is the **functional group**.
The IUPAC name of alcohol is derived by replacing **–e**, in the word **alkane,** by the suffix **–ol**.
Hence we get the name **alkanol**.

Molecular formula	Common name	IUPAC name
CH_3OH	Methyl alcohol	Methanol
CH_3-CH_2-OH	Ethyl alcohol	Ethanol
CH_3- CH_2-CH_2-OH	n-Propyl alcohol	1-Propanol
CH_3-CH-CH_3 OH	Isopropyl alcohol or secondary propyl alcohol	2-Propanol
CH_3- CH_2-CH_2-CH_2-OH	n-Butyl alcohol	1-Butanol
CH_3-CH-CH_2-OH CH_3	Isobutyl alcohol	2-Methyl-1-propanol

2. ALDEHYDES
Aldehydes are carbon compounds containing **-CHO** group attached to alkyl group or hydrogen atom. The general formula of aldehydes is **R – CHO** where **'R'** is an **alkyl group** or **hydrogen atom** and **– CHO** is the **functional group**.
The IUPAC name of aldehyde is derived by replacing **–e**, in the word alkane, by the suffix **–al**.
Hence we get the name **"alkanal"**.

Molecular formula	Common name	IUPAC name
HCHO	Formaldehyde	Methanal
CH_3- CHO	Acetaldehyde	Ethanal
CH_3- CH_2- CHO	Propionaldehyde	Propanal
CH_3- CH_2-CH_2- CHO	Butyraldehyde	Butanal

3. KETONES
Ketones are carbon compounds containing carbonyl **– CO –** group attached to two alkyl groups. The general formula of ketone is **R-CO-R'** where **R** and **R'** are **alkyl groups** and **– CO –** is the **functional group**.
The IUPAC name of ketone is derived by replacing **–e**, in the word alkane, by the suffix **-one**.
Hence we get the name **"alkanone"**.

Molecular formula	Common name	IUPAC name
CH_3COCH_3	Dimethyl ketone (Acetone)	Propanone
$CH_3COCH_2CH_3$	Ethyl methyl ketone	Butanone
$CH_3CH_2COCH_2CH_3$	Diethyl ketone	3-Pentanone

4. CARBOXYLIC ACIDS

Carboxylic acids are carbon compounds containing **–COOH** group attached to a hydrogen atom or alkyl group. The general formula of acid is **R-COOH** where **'R'** is a **hydrogen atom** or **alkyl group** and **–COOH** is the **functional group**.

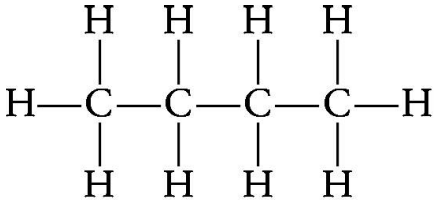
The IUPAC name of acid is derived by replacing – e, in the word alkane, by the suffix –oic acid. Hence we get the name **"alkanoic acid"**.

Molecular formula	Common name	IUPAC name
HCOOH	Formic acid	Methanoic acid
CH_3-COOH	Acetic acid	Ethanoic acid
CH_3- CH_2-COOH	Propionic acid	Propanoic acid
CH_3- CH_2-CH_2-COOH	n-Butyric acid	Butanoic acid

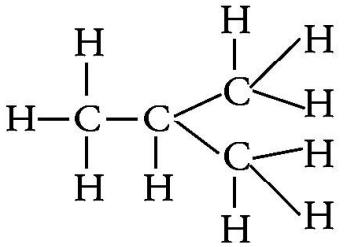
ISOMERISM

Carbon compounds or organic compounds with same molecular formula can show different structures and hence, different properties. This phenomenon is called **isomerism** and compounds are called ***isomers***.

For example, following two arrangements are possible for butane, an alkane with four C atoms (C_4H_{10})



Straight chain structure



Branched chain structure

Such pair of isomers is called ***chain isomers*** and the isomerism is called ***chain isomerism.*** Thus, ***chain isomers*** are the compounds that have same molecular formula but differ in the arrangement of carbon chains.

NOMENCLATURE OF CARBON COMPOUNDS

In general, the names of organic compounds are based on the name of basic carbon chain modified by a prefix (phrase before) or suffix (phrase after) showing the name of the functional group.

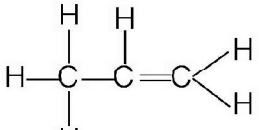
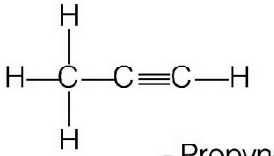
Following steps are used to write the name of an organic compound

***Step* 1** Count the number of carbon atoms in the given compound and write the root word for it (Root word upto 10 carbon atoms are tabulated below.)

Root Words for Carbon Atoms

No. of C atoms		Root word	No. of C atoms		Root word
1	(C_1)	Meth	6	(C_6	Hex
2	(C_2)	Eth	7	(C_7)	Hept
3	(C_3)	Prop	8	(C_8)	Oct
4	(C_4)	But	9	(C_9)	Non
5	(C_5)	Pent	10	(C_{10})	Dec

Prefix and Suffix of Different Functional Groups

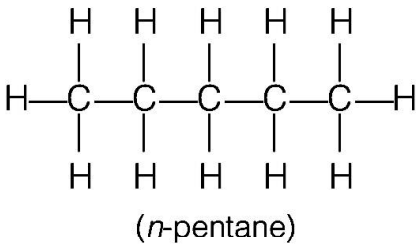
Functional Group	Prefix/Suffix	Example
Alcohol	Suffix -ol	C_3H_7OH – Proane–e+ol Propanol
Aldehyde	Suffix -al	CH_3CHO – Ethane–e+al= Ethanal
Ketone	Suffix -one	CH_3COCH_3 - Propane–e+one Propanone
Carboxylic acid	Suffix -oic acid	CH_3COOH - Acetic acid/ Ethanoic acid
Halogen	Prefix -chloro, bromo, etc.	CH_3Cl - Chloromethane C_2H_5Br - Bromoethane
Double bond (alkenes)	Suffix -ene	 - Propene
Triple bond (alkynes)	Suffix -yne	 - Propyne

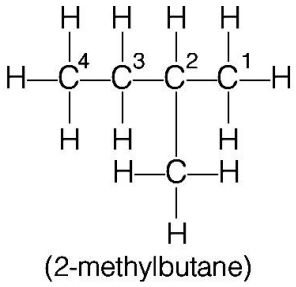
***Step* 2** If the compound is saturated, add suffix 'ane' to the root word, but if is unsaturated, add suffix 'ene' and 'yne' for double and triple bonds respectively.
For example, $CH_3CH_2CH_3$ contains three C atoms so root word is 'prop' and it contains only single
bonds, so suffix used is 'ane'. Hence, the name of this compound is propane.
Similarly, the compound $CH_3CH == CH_2$ is named as propene as here suffix 'ene' is used for double bond.
***Step* 3** If functional group is present in the compound, it is indicated by adding its suffix (which are given in the table above).

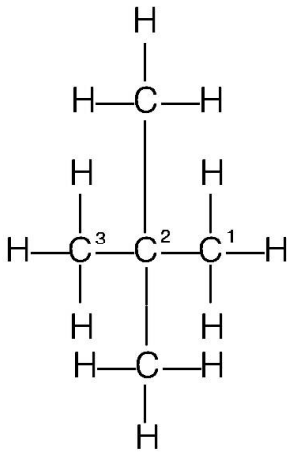
- *Prefix 'iso' and 'neo' represent the presence of one or two carbon atoms respectively as side chain.*
- *If the functional group is named as a suffix, the final 'e' of alkane (or alkene or alkyne) is substituted by appropriate suffix.*
- *If the functional group and subtituents are not present at first carbon, then their location is indicated by digits* 1,2,3... .

INTEXT QUESTIONS PAGE NO. 68

Q1. How many structural isomers can you draw for pentane?
Ans:
Pentane (C_5H_{12}) has a skeleton of five carbon atoms. It can exist as straight chain as well as two branched chains. The possible structural isomers have been shown below.


(*n*-pentane)

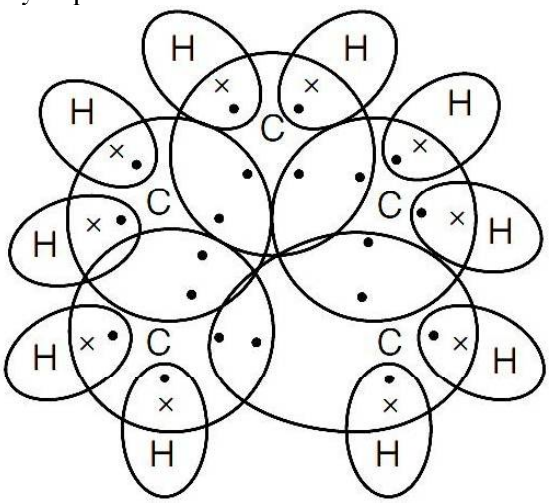

(2-methylbutane)


(2, 2-dimethyl propane)

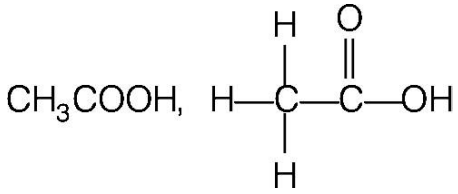
Q2. What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?
Ans:
The two features of carbon that give rise to a large number of compounds are as follows:
(i) Catenation − It is the ability to form bonds with other atoms of carbon.
(ii) Tetravalency − With the valency of four, carbon is capable of bonding with four other atoms.

Q3. What will be the formula and electron dot structure of cyclopentane?
Ans:
General formula of cycloalkane = C_nH_{2n}
In cyclopentane $n = 5$,
$\therefore$ Formula of cyclopentane, $C_5H_{5\times2} = C_5H_{10}$

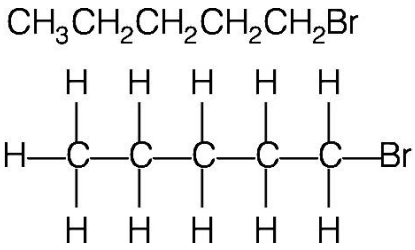
Electron dot structure of cyclopentane



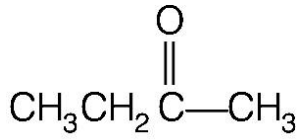
Q4. Draw the structures for the following compounds.
(i) Ethanoic acid (ii) Bromopentane*
(iii) Butanone (iv) Hexanal.
Are structural isomers possible for bromopentane?
Ans:
(i) Ethanoic acid

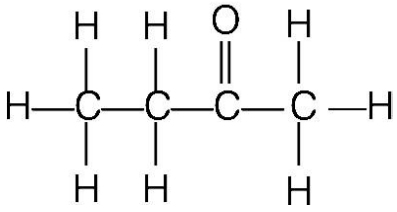


(ii) Bromopentane



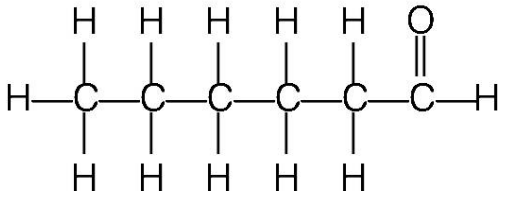
(iii) Butanone





(iv) Hexanal.

$CH_3CH_2CH_2CH_2CH_2CHO$



Yes, isomers of bromopentane are

(i) $CH_3CH_2CH_2CH_2CH_2Br$

1-bromopentane

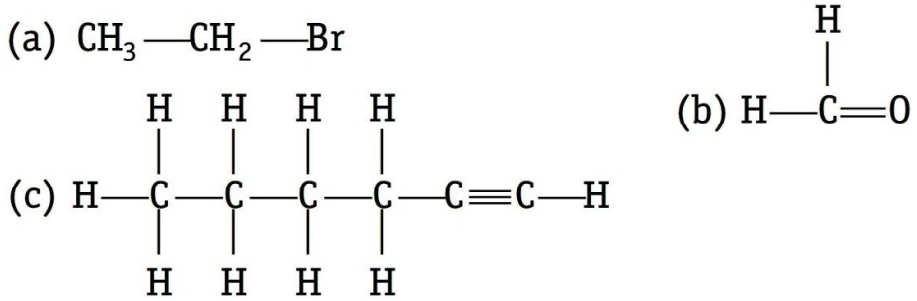
(ii) $CH_3CH_2CH_2CHCH_3$ (Br)

2-bromopentane

(iii) $CH_3CH_2CHCH_2CH_3$ (Br)

3-bromopentane

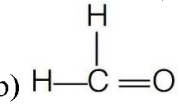
Q5. How would you name the following compounds?



Ans:

(a) $CH_3 - CH_2 - Br$

Bromoethane (because for two carbons, root word is 'eth')



Formaldehyde or methanal (because for single carbon, root word is 'meth')

(c) $CH_3CH_2CH_2CH_2CHC{\equiv\equiv}C$,

1-hexyne (because for 6 carbons, root word is 'hex' and for triple bond suffix is 'yne'.)

CHEMICAL PROPERTIES OF CARBON COMPOUNDS

COMBUSTION

All the carbon compounds burn in oxygen and yield carbon dioxide and water vapour. Heat and light are also released during this process. This reaction is called **combustion**.

(i) $C + O_2 \rightarrow CO_2$ + heat and light

(ii) $CH_4 + O_2 \rightarrow CO_2 + H_2O$ + heat and light

(iii) $CH_3CH_2OH + O_2 \rightarrow CO_2 + H_2O$ + heat and light

Further, once carbon and its compounds ignite, they keep on burning without the requirement of additional energy. That's why these compounds are used as fuels.

Saturated hydrocarbons give a clean flame due to their complete combustion whereas, unsaturated hydrocarbons give a yellow flame with lots of black smoke as they do not undergo complete combustion.

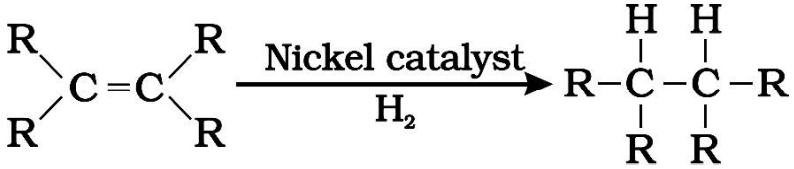
OXIDATION

Oxidation is a process of intake of oxygen and removal of hydrogen. Those substances which are capable of providing oxygen to other substances are called oxidising agents. *e.g.,* alk. $KMnO_4$ and acidified $K_2Cr_2O_7$ can both behave as oxidising agents.

$$CH_3CH_2OH \xrightarrow[\text{alk. } KMnO_4 + \Delta]{\text{Acidic } K_2Cr_2O_7 + \Delta} CH_3COOH + H_2O$$

ADDITION REACTION

The reaction in which a reagent adds completely on a substance without the removal of small molecules are called ***addition reactions***. ***For example***, addition of hydrogen (in the presence of catalysts like **Palladium or Nickel)** to unsaturated hydrocarbons, yields saturated hydrocarbons **(Hydrogenation)**.



Hydrogenation (addition of hydrogen) of vegetable oil (which are unsaturated compounds) in the presence of nickel catalyst gives ghee (saturated compounds). This process is called ***hardening of oils***.

$$\text{Vegetables oils} \xrightarrow[H_2\ 200°C]{\text{Ni catalyst}} \text{Ghee}$$

SUBSTITUTION REACTION

The reactions in which a reagent substitutes (replaces) an atom or a group of atoms from the reactant (substrate) are called ***substitution reactions.*** These are generally shown by saturated compounds and benzene.

Most of the saturated hydrocarbons are fairly inert and unreactive in the presence of most reagents. So, presence of sunlight is necessary for their substitution reactions.

When chlorine is added to hydrocarbons at a rapid rate, in the presence of sunlight, Cl replaces H atom one by one.

FUELS AND FLAMES

FUELS

Those carbon compounds which have stored energy in them and burn with heat and light are called ***fuels***. The released energy (heat or light) is utilised for various purposes like for cooking food, running machines in factories, etc. In fuels, the carbon can be in free state as present in coal, coke and charcoal or in combined state as present in petrol, LPG, kerosene, petroleum, natural gas, etc. Those fuels which were formed by the decomposition of the remains of the pre-historic plants and animals (fossils) burried under the earth long ago, are called ***fossils fuels***.

For example, coal, petroleum and natural gas.

COAL

It is a complex mixture of compounds of carbon, hydrogen and oxygen and some free carbon alongwith traces of nitrogen and sulphur.

It was formed by the decomposition of plants and trees buried under the earth millions of years ago.

PETROLEUM

It is a dark viscous foul smelling oil and is also known as **rock oil** or **black gold.** It was formed by the decomposition of the remains of extremely small plants and animals buried under the sea millions of years ago.

FLAME

A flame is the region where combustion (or burning) of gaseous substances takes place. *Depending upon the amount of oxygen available and burning of fuels, flames are of following two types*

(i) Blue or Non-luminous Flame

When the oxygen supply is sufficient, the fuels burn completely producing a blue flame. Since, light is not produced during this type of combustion, so the flame is called ***non-luminous*** (non-light giving flame), *e.g.,* burning of LPG in gas stove.

(ii) Yellow or Luminous Flame

In the insufficient supply of air, the fuels burn incompletely and produce yellow flame. The colour of the flame is yellow because of the presence of unburnt carbon particles. This flame produces light so also known as ***luminous flame.*** *e.g.,* burning of wax vapours.

INTEXT QUESTIONS PAGE NO. 71

Q1. Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

Ans:

Since the conversion of ethanol to ethanoic acid involves the addition of oxygen to ethanol, it is an oxidation reaction.

$$CH_3CH_2OH + O_2 \longrightarrow CH_3\overset{\overset{O}{\|}}{C}—OH + H_2O$$

Q2. A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

Ans:

When ethyne is burnt in air, it gives a sooty flame. This is due to incomplete combustion caused by limited supply of air. However, if ethyne is burnt with oxygen, it gives a clean flame with temperature 3000°C because of complete combustion. This oxy-acetylene flame is used for welding. It is not possible to attain such a high temperature without mixing oxygen. This is the reason why a mixture of ethyne and air is not used.

$$2CH \equiv CH + 5O_2 \longrightarrow 4CO_2 + 2H_2O + \text{heat} + \text{light}$$

SOME IMPORTANT CARBON COMPOUNDS – ETHANOL AND ETHANOIC ACID

Almost all the compounds are useful to us in a number of ways. Most of the fuels, medicines, paints, explosives, synthetic polymers, perfumes and detergents are basically organic compounds. In fact, organic chemistry has made our life colourful and also comfortable.
Two commercially important compounds are ethanol and ethanoic acid

ETHANOL (C_2H_5OH)

Ethanol or ethyl alcohol or simply alcohol is one of the most important members of the family of alcohols.

(1) Manufacture of ethanol from molasses

Molasses is a dark coloured syrupy liquid left after the crystallization of sugar from the concentrated sugar cane juice. Molasses still contain about 30% of sucrose which can not be separated by crystallization. It is converted into ethanol by the following steps:

(i) Dilution

Molasses is first diluted with water to bring down the concentration of sugar to about 8 to 10 percent.

(ii) Addition of ammonium salts

Molasses usually contains enough nitrogenous matter to act as food for yeast during fermentation. If the nitrogen content of the molasses is poor, it may be fortified by the addition of ammonium sulphate or ammonium phosphate.

(iii) Addition of yeast

The solution from step (ii) is collected in large ' fermentation tanks' and yeast is added to it. The mixture is kept at about 303K for a few days.During this period, the enzymes invertase and zymase present in yeast, bring about the conversion of sucrose into ethanol.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{\text{invertase}} C_6H_{12}O_6 + C_6H_{12}O_6$$

Sucrose — Glucose Fructose

$$C_6H_{12}O_6 \xrightarrow{\text{zymase}} 2C_2H_5OH + 2CO_2\uparrow$$

Glucose or Fructose — Ethanol

The fermented liquid is technically called wash.

- **FERMENTATION is t**he slow chemical change taking place in an organic compound by the action of enzymes leading to the formation of smaller molecules.

(iv) Distillation of wash

The fermented liquid containing 15 to 18 percent alcohol and the rest of the water, is now subjected to fractional distillation. The main fraction drawn, is an aqueous solution of ethanol which contains 95.5% of ethanol and 4.5% of water. This is called rectified spirit. This mixture is then heated under reflux over quicklime for about 5 to 6 hours and then allowed to stand for 12 hours. On distillation of this mixture, pure alcohol (100%) is obtained. This is called absolute alcohol.

PROPERTIES OF ETHANOL

PHYSICAL PROPERTIES

(i) Ethanol is a clear liquid with burning taste.
(ii) Its boiling point is 351K which is higher than corresponding alkane.
(iii) It is completely miscible with water in all proportions.

CHEMICAL PROPERTIES

(i) DEHYDRATION

(a) Intra molecular dehydration : Ethanol, when heated with excess conc. H_2SO_4 at 443 K undergoes intra molecular dehydration (i.e. removal of water within a molecule of ethanol).

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[443K]{Conc.H_2SO_4} \underset{\text{Ethene}}{CH_2=CH_2}+H_2O$$

(b) Inter molecular dehydration : When excess of alcohol is heated with conc. H_2SO_4 at 413K two molecules condense by losing a molecule of water to form ether (i.e. removal of water from two molecules of ethanol).

$$C_2H_5\text{- }OH + HO\text{- }C_2H_5 \xrightarrow[413K]{Conc.H_2SO_4} \underset{\text{Diethyl ether}}{C_2H_5\text{-O-}C_2H_5}+H_2O$$

(ii) Reaction with sodium : Ethanol reacts with sodium metal to form sodium ethoxide and hydrogen gas.

$$2C_2H_5OH + 2Na \longrightarrow \underset{\text{sodium ethoxide}}{2C_2H_5ONa} + H_2\uparrow$$

(iii) Oxidation : Ethanol is oxidized to ethanoic acid with alkaline $KMnO_4$ or acidified $K_2Cr_2O_7$

$$CH_3CH_2OH \xrightarrow{Oxidation} \underset{\text{Ethanoic acid}}{CH_3COOH} +H_2O$$

During this reaction, orange colour of $K_2Cr_2O_7$ changes to green. Therefore, this reaction can be used for the **identification of alcohols**.

(iv) Esterificaiton : Ethanol reacts with ethanoic acid in the presence of conc.H_2SO_4 (catalyst) to form ethyl ethanoate and water. The compound formed by the reaction of an alcohol with carboxylic acid is known as ester (fruity smelling compound) and the reaction is called esterification.

$$\underset{\text{Ethanol}}{C_2H_5OH} + \underset{\text{Ethanoic acid}}{CH_3COOH} \xrightarrow{conc.H_2SO_4} \underset{\text{Ethyl ethanoate}}{CH_3COOC_2H_5} + H_2O$$

(v) Dehydrogenation : When the vapour of ethanol is passed over reduced copper catalyst at 573 K, it is dehydrogenated to acetaldehyde.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[573\ K]{Cu} \underset{\text{Acetadehyde}}{CH_3CHO}+H_2$$

USES OF ETHANOL

- As an anti-freeze in automobile radiators.
- As a preservative for biological specimen.
- As an antiseptic to sterilize wounds in hospitals.
- As a solvent for drugs, oils, fats, perfumes, dyes, etc.
- In the preparation of methylated spirit (mixture of 95% of ethanol and 5% of methanol), rectified spirit (mixture of 95.5% of ethanol and 4.5% of water), power alcohol (mixture of petrol and ethanol) and denatured sprit (ethanol mixed with pyridine).
- In cough and digestive syrups.

EVIL EFFECTS OF CONSUMING ALCOHOL

- If ethanol is consumed, it tends to slow down metabolism of our body and depresses the central nervous system.
- It causes mental depression and emotional disorder.
- It affects our health by causing ulcer, high blood pressure, cancer, brain and liver damage.
- Nearly 40% accidents are due to drunken drive.
- Unlike ethanol, intake of methanol in very small quantities can cause death.
- Methanol is oxidized to methanal (formaldehyde) in the liver and methanal reacts rapidly with the components of cells.
- Methanal causes the protoplasm to get coagulated, in the same way an egg is coagulated by cooking. Methanol also affects the optic nerve, causing blindness.

ETHANOIC ACID (CH_3COOH)

Ethanoic acid is most commonly known as acetic acid and belongs to a group of acids called carboxylic acids. Acetic acid is present in many fruits and sour taste of fruits is because of this acid.

PREPARATION OF ETHANOIC ACID

Ethanol on oxidation in the presence of alkaline potassium permanganate or acidified potassium dichromate gives ethanoic acid.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow{\text{Oxidation}} \underset{\text{Ethanoic acid}}{CH_3COOH} + H_2O$$

PROPERTIES OF ETHANOIC ACID

PHYSICAL PROPERTIES

(i) Ethanoic acid is a colourless liquid and has a sour taste.
(ii) It is miscible with water in all proportions.
(iii) Boiling point (391 K) is higher than corresponding alcohols, aldehydes and ketones.
(iv) On cooling, pure ethanoic acid is frozen to form ice like flakes. They look like glaciers, so it is called glacial acetic acid.

CHEMICAL PROPERTIES

(i) Ethanoic acid is a weak acid but it turns blue litmus to red.

(ii) Reaction with metal

Ethanoic acid reacts with metals like Na, K, Zn, etc to form metal ethanoate and hydrogen gas.

$$2CH_3COOH + Zn \longrightarrow (CH_3COO)_2Zn + H_2\uparrow$$

$$2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2\uparrow$$

(iii) **Reaction with carbonates and bicarbonates.**

Ethanoic acid reacts with carbonates and bicarbonates and produces brisk effervescence due to the evolution of carbon dioxide.

$$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + CO_2\uparrow + H_2O$$

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + CO_2\uparrow + H_2O$$

(iv) Reaction with base

Ethanoic acid reacts with sodium hydroxide to form sodium ethanoate and water.

$$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$$

(v) Decarboxylation (Removal of CO_2)

When sodium salt of ethanoic acid is heated with soda lime (Solid mixure of 3 parts of NaOH and 1 part of CaO) methane gas is formed.

$$CH_3COONa \xrightarrow{NaOH\ /\ CaO} CH_4 \uparrow + Na_2CO_3$$

USES OF ETHANOIC ACID

- For making vinegar which is used as a preservative in food and fruit juices.
- As a laboratory reagent.
- For coagulating rubber from latex.
- In the preparation of dyes, perfumes and medicine.

INTEXT QUESTIONS PAGE NO. 74

Q1. How would you distinguish experimentally between an alcohol and a carboxylic acid?

Ans:

Sodium bicarbonate test ($NaHCO_3$ test)

Alcohol + $NaHCO_3$ → No effervescence

Acid + $NaHCO_3$ → Brisk effervescence

The sample which produces brisk effervescence when treated with $NaHCO_3$ due to release of CO_2 is a carboxylic acid.

Q2. What are oxidising agents?

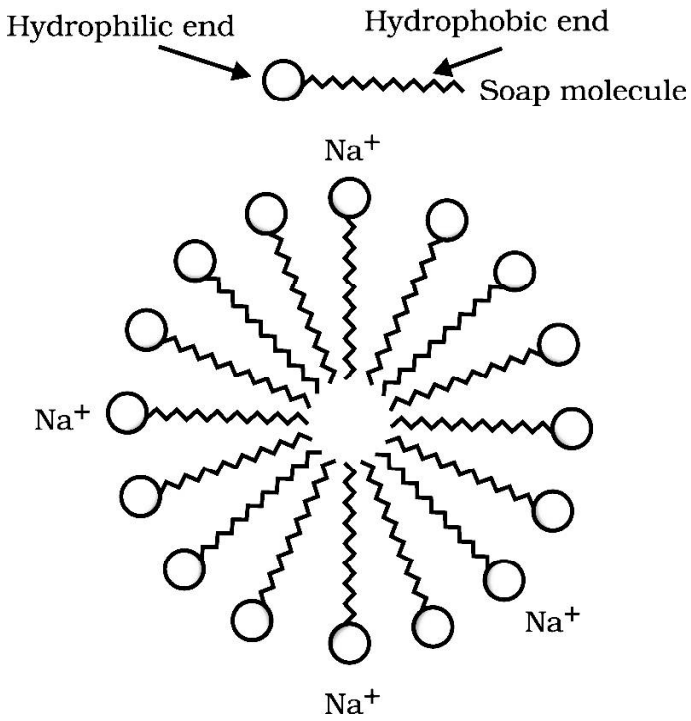
Ans:

Those substances which are capable of providing oxygen to other substances are called oxidising agents. *e.g.*, alk. $KMnO_4$ and acidified $K_2Cr_2O_7$ can both behave as oxidising agents.

$$CH_3CH_2OH \xrightarrow[\text{alk. } KMnO_4 + \Delta]{\text{Acidic } K_2Cr_2O_7 + \Delta} CH_3COOH + H_2O$$

SOAPS AND DETERGENTS

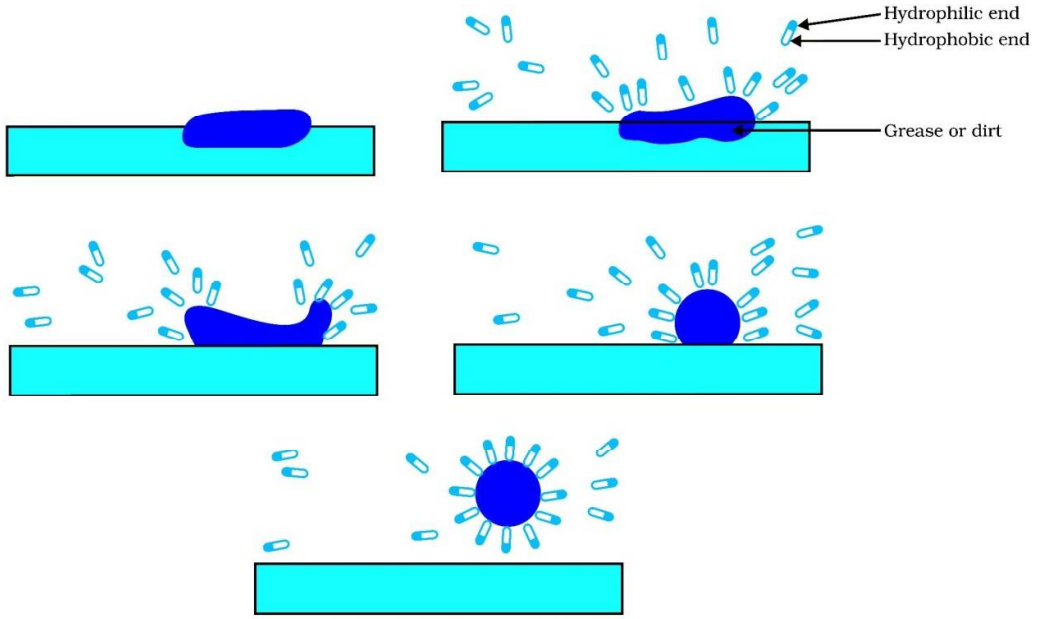
Most dirt is oily in nature and as you know, oil does not dissolve in water. The molecules of soap are sodium or potassium salts of long-chain carboxylic acids. The ionic-end of soap dissolves in water while the carbon chain dissolves in oil. The soap molecules, thus form structures called micelles (see the below figure) where one end of the molecules is towards the oil droplet while the ionic-end faces outside. This forms an emulsion in water. The soap micelle thus helps in dissolving the dirt in water and we can wash our clothes clean.



MICELLES

Soaps are molecules in which the two ends have differing properties, one is hydrophilic, that is, it dissolves in water, while the other end is hydrophobic, that is, it dissolves in hydrocarbons. When soap is at the surface of water, the hydrophobic

'tail' of soap will not be soluble in water and the soap will align along the surface of water with the ionic end in water and the hydrocarbon 'tail' protruding out of water. Inside water, these molecules have a unique orientation that keeps the hydrocarbon portion out of the water. This is achieved by forming clusters of molecules in which the hydrophobic tails are in the interior of the cluster and the ionic ends are on the surface of the cluster. This formation is called a micelle.



Soap in the form of a micelle is able to clean, since the oily dirt will be collected in the centre of the micelle. The micelles stay in solution as a colloid and will not come together to precipitate because of ion-ion repulsion. Thus, the dirt suspended in the micelles is also easily rinsed away. The soap micelles are large enough to scatter light. Hence a soap solution appears cloudy.

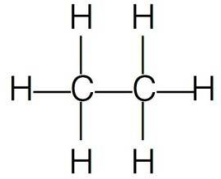
INTEXT QUESTIONS PAGE NO. 76

Q1. Would you be able to check if water is hard by using a detergent?
Ans:
Detergents are ammonium or sulphonate salts of long chain carboxylic acids. Unlike soap, they do not react with calcium and magnesium ions present in hard water to form scum. They give a good amount of lather irrespective of whether the water is hard or soft. This means that detergents can be used in both soft and hard water. Therefore, it cannot be used to check whether the water is hard or not.

Q2. People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes?
Ans:
A soap molecule has two parts namely hydrophobic and hydrophilic. With the help of these, it attaches to the grease or dirt particle and forms a cluster called micelle. These micelles remain suspended as a colloid. To remove these micelles (entrapping the dirt), it is necessary to agitate clothes.

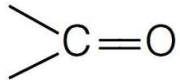
EXERCISE QUESTIONS PAGE NO. 77 and 78

Q1. Ethane, with the molecular formula C_2H_6 has
(a) 6 covalent bonds.
(b) 7 covalent bonds.
(c) 8 covalent bonds.
(d) 9 covalent bonds.
Ans:
(b) Structure of C_2H_6 is



It is clear that it has 7 covalent bonds.

Q2. Butanone is a four-carbon compound with the functional group
(a) carboxylic acid.
(b) aldehyde.
(c) ketone.
(d) alcohol.
Ans: (c) In butanone, the function group is ketone (one)

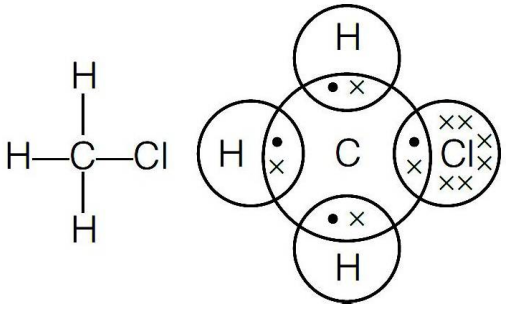


Q3. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that
(a) the food is not cooked completely.
(b) the fuel is not burning completely.
(c) the fuel is wet.
(d) the fuel is burning completely.
Ans: (b) The unburnt particles of the fuel present in smoke blacken the vessel from outside.

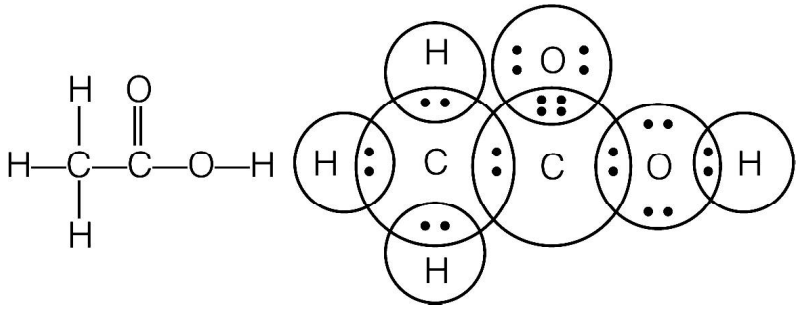
Q4. Explain the nature of the covalent bond using the bond formation in CH_3Cl.
Ans:
Atomic number of
C = 6; H = 1; Cl = 17
Electronic configuration

	K	*L*			*K*	*L*	*M*		*K*
C	2	4		Cl	2	8	7	H	1

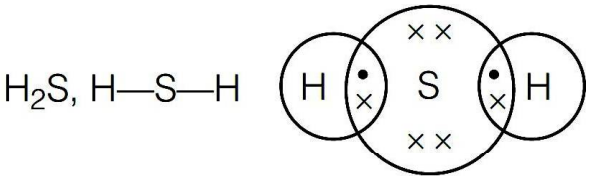
C needs 4 electrons to complete its octet, H needs 1 and Cl needs 1 electron.
∴ C shares its 4 electrons with each of the 3 H-atoms and 1 with chlorine atom. It thus forms 4 covalent bonds as shown.



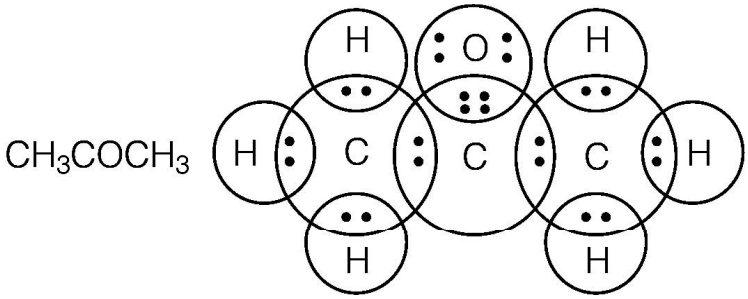
Q5. Draw the electron dot structures for
(a) ethanoic acid.
(b) H_2S.
(c) propanone.
(d) F_2 .
Ans:
(a) ethanoic acid.



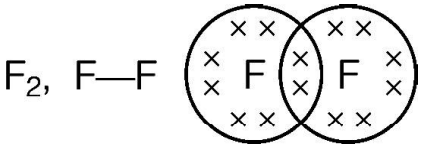
(b) H_2S.



(c) propanone.



(d) F_2 .



Q6. What is an homologous series? Explain with an example.
Ans:
A homologous series is a series of carbon compounds that have different numbers of carbon atoms but contain the same functional group.
Example of homologous series

Alkane series C_nH_{2n+2}
CH_4 Methane, C_2H_6 Ethane
C_3H_8 Propane, C_4H_{10} Butane C_5H_{12} Pentane

It can be noticed that there is a difference of $-CH_2$ unit between each successive compound.

Q7. How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?
Ans:

I. Distinction based on physical properties

1. **Smell** Ethanoic acid has a pungent smell. Ethanol has a pleasant smell.
2. **Melting point** Ethanol has lower melting point (150 K) than ethanoic acid (290 K).
3. **Physical state** Ethanoic acid is solid (glacial acetic acid) in winters but ethanol is always a liquid.

II. Distriction based on chemical properties

(i) **Action with sodium hydrogen carbonate** On adding a small amount of sodiumhydrogen carbonate to ethanoic acid, carbon dioxide gas is evolved with brisk effervescence. However, no such reaction noticed in case of ethanol.

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + CO_2 \uparrow + H_2O$$

(ii) **Action with caustic alkalies** Ethanoic acids reacts with both sodium hydroxide (NaOH) and potassium hydroxide (KOH) to form corresponding salt and water. Ethanol fails to react with either of these.

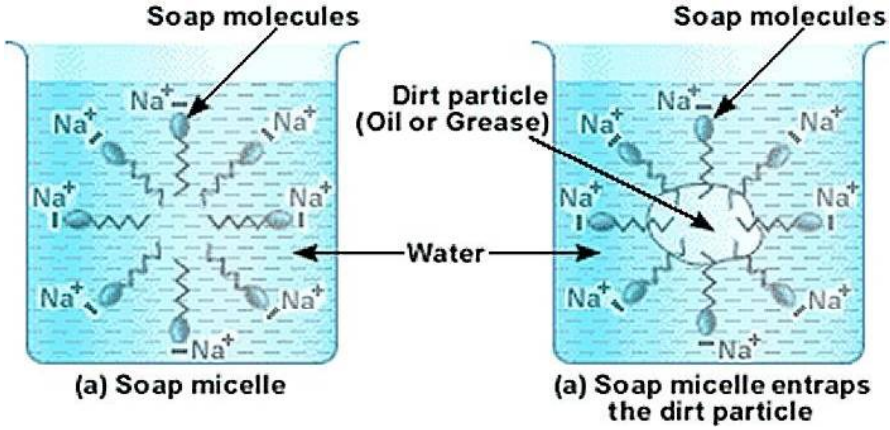
$$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$$

$$CH_3COOH + KOH \longrightarrow CH_3COOK + H_2O$$

Q8. Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?

Ans:

A soap is a sodium or potassium salt of long chain fatty acids. It has one polar end and one non-polar end. The polar end is hydrophilic in nature i.e., this end is attracted towards water. The non-polar end is hydrophobic but lipophilic, i.e., it is attracted towards hydrocarbons. When soap is added to water, soap molecules arrange themselves in a cluster to keep the non- polar portion out of water such that the non-polar ends are in the interior of the cluster and the polar ends are on the surface of the cluster. Since the dirt present on clothes is organic in nature and insoluble in water, the hydrophobic ends of the clusters attach themselves to the dirt. This cluster formation in which the dirt is entrapped is the micelle. Micelle formation does not occur in alcohol because the alkyl chain of soap becomes soluble in alcohol.



Q9. Why are carbon and its compounds used as fuels for mostapplications?

Ans:

Carbon burns in oxygen (air) to form carbon dioxide and water.

During this reaction a large amount of heat and light are released. Further, once ignited carbon and its compounds keep on burning without the requirement of additional energy. Hence, they are used as fuels.

$$C + O_2 \longrightarrow CO_2 + \text{heat} + \text{light}$$

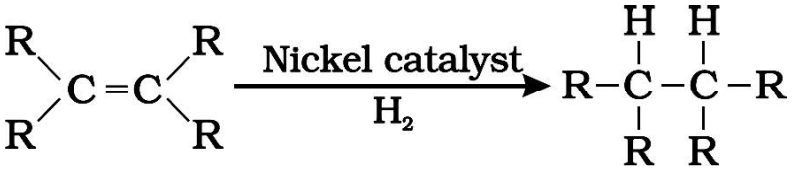
Q10. Explain the formation of scum when hard water is treated with soap.
Ans:
Soap does not work properly when the water is hard. A soap is a sodium or potassium salt of long chain fatty acids. Hard water contains salts of calcium and magnesium. When soap is added to hard water, calcium and magnesium ions present in water displace sodium or potassium ions from the soap molecules forming an insoluble substance called scum. A lot of soap is wasted in the process.
Reaction taking place are shown below.

$$Ca^{2+} + 2RCOONa \longrightarrow (RCOO)_2Ca + 2Na^+$$
(Hard water) (Soap) (Calcium salt ppt.)

$$Mg^{2+} + 2RCCONa \longrightarrow (RCOO)_2Mg + 2Na^+$$
(Hard water) (Soap) (Magnesium salt ppt.)

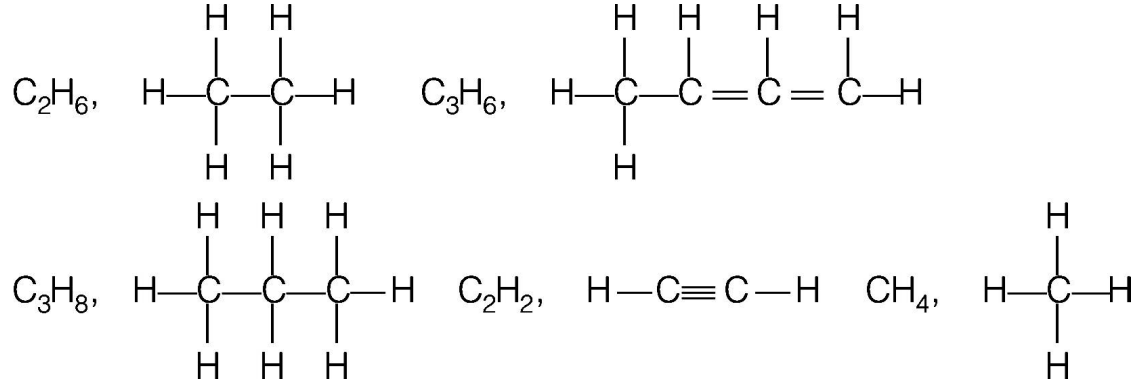
Q11. What change will you observe if you test soap with litmus paper (red and blue)?
Ans:
Since soap is basic in nature, it will turn red litmus blue. However, the colour of blue litmus will remain blue.

Q12. What is hydrogenation? What is its industrial application?
Ans:
Hydrogenation is the process of addition of hydrogen. Unsaturated hydrocarbons are added with hydrogen in the presence of palladium and nickel catalysts to give saturated hydrocarbons.



This reaction is applied in the hydrogenation of vegetables oils, which contain long chains of unsaturated carbons.

Q13. Which of the following hydrocarbons undergo addition reactions:
C_2H_6, C_3H_8, C_3H_6, C_2H_2 and CH_4.
Ans:
Unsaturated hydrocarbons containing double/ triple bond undergo addition reactions.



So, C_3H_6 and C_2H_2 will undergo addition reactions.

Q14. Give a test that can be used to differentiate chemically between butter and cooking oil.

Ans:

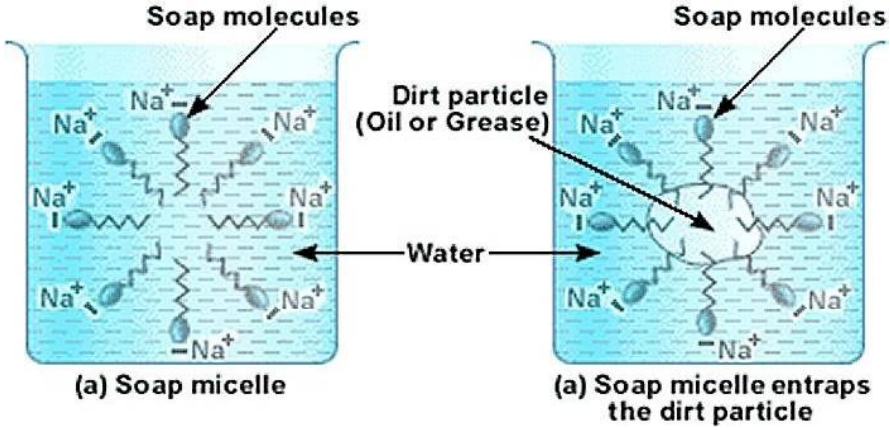
Butter contains saturated compounds while cooking oil contains unsaturated compounds. Since unsaturated compounds are oxidised by alkaline $KMnO_4$ with disappearance of its pink colour. ∴ When cooking oil is treated with a few drops of alkaline $KMnO_4$, pink colour of $KMnO_4$ disappears. With butter however, the pink colour $KMnO_4$ does not disappear

Q15. Explain the mechanism of the cleaning action of soaps.

Ans:

Cleansing action of soaps:

The dirt present on clothes is organic in nature and insoluble in water. Therefore, it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then, the molecules of soap arrange themselves in micelle formation and trap the dirt at the centre of the cluster. These micelles remain suspended in the water. Hence, the dust particles are easily rinsed away by water.



ASSIGNMENT QUESTIONS SET – 1
CHAPTER – 4
CARBON AND ITS COMPOUND

1. Which of the following is not a saturated hydrocarbon ?

i) Cyclohexane.

ii) Benzene.

iii) Butane

iv) isobutene

2. The bond between two identical non metallic atom has a pair of electron ?

i) un equally shared between two atoms.

ii) Transferred completely from one atom to another.

iii) With identical spins

iv) Unequally shared between them.

3. Covalent compounds are generally

i) Soluble in water

ii) Insoluble in water

iii) Ionize in water

iv) Hydrolyse in water

4. Propane with the molecular formula C_3H_8 has

i) 7covalent bonds

ii) 8 covalent bonds

iii) 9 covalent bonds

iv) 10 Covalent bonds.

5. A hydrocarbon reacts with ammonical cuprous chloride solution to form a red precipitate .The hydrocarbon is

i)ethane

ii) ethene

iii)butane

iv)1-propyne

6. Which of the following substance is added to denature Ethanol ?

i)methanol ii)pyridine

iii) copper sulphate iv)all of them

7. Which of the following is not an allotropic form of carbon

i)fluorine ii)fullerene

iii)diamond iv)graphite

8. Which of the following represents the correct decreasing order of hydrogen atoms ?

i)alkanes , alkenes , alkynes

ii)alkanes , alkaynes , alkenes

iii)alkenes , alkynes , alkanes

iv)alkynes , alkanes , alkenes

9. Detergents are sodium or potassium salts of long chain of ;-

i)aldehydes

ii)ketones

iii)carboxylic acid

iv)sulphonic acid

10. Which of the following represents the structure of N_2 Mmolecule ?

i) N≡ N

ii) N = N

iii) N - N

iv) None of the above

11. In double covalent bond there is sharing of

i) 2 electrons

ii) 4 electrons

iii) 6 electrons

iv) 3 electrons

12. Cation is formed when

i) atom gains electrons

ii) atom loses electrons

iii) proton is lost by the atom

iv) atom shared by electrons

13. The total no. of electrons that take part in forming a bond in N_2 is

i) 2

ii) 4

iii) 6

iv) 10

14. Which of the following has the weakest carbon-carbon strength?

i)C_2H_2

ii)C_2H_4

iii)C_2H_6

iv) all have the same bond strength

15. Which of the following salt when dissolved in water produce hard water.

i) calcium sulphate

ii) magnesium bicarbonate

iii) calcium chloride

iv) any of the above

16. Which of the following is not a saturated hydrocarbon ?

i) cyclohexane

ii) benzene

iii) butane

iv) isobutane

17. The bond between two identical nonmetallic atom has a pair of electron ?

i) unequally shared between two atoms

ii) transferred completely from one atom to another

iii) With identical spins

iv) Equally shared between them

18. Covalent compounds are generally –

i) Soluble in water

ii) insoluble in water

iii) Ionize in water

iv) hydrolyse in water

19. Propane with molecular formula C3H8 has –

i) 7 covalent bonds

ii) 8 covalent bonds

iii) 9 covalent bonds

iv) 10 covalent bonds

20. A hydrocarbon reacts with ammonical cuprous chloride solution to form a red precipitate, the hydrocarbon is –

i) Ethane

ii) ethane

iii) butane

iv) 1-propyne

21. Which of the following substance is added to denature Ethanol?

i) Methanol ii) pyridine

iii) copper sulphate iv) all of these

22. Which of the following is not an allotropic form of carbon ?

i) fluorine

ii) fullerene

iii) diamond

iv) graphite

23. Which of the following represents the correct deceasing order of hydrogen atoms ?

i) alkanes, alkenes, alkynes

ii) alkanes, alkynes, alkenes

iii) alkenes, alkynes, alkanes

iv) alkynes, alkanes, alkenes

24. Detergents are sodium or potassium salts of long chain of :

i) aldehydes

ii) ketones

iii) carboxylic acid

iv) sulphonic acid

25. In double covalent bond there is a sharing of

i) 2 electrons

ii) 4 electrons

iii) 6 electrons

iv) 3 electrons

26. Cation is formed when

i) atom gains electrons

ii) atom losses electrons

iii) proton is lost by the atom

iv) atom shared by electrons

27. The total number of electrons that take part in forming a bond in N_2 is

i) 2

ii) 4

iii) 6

iv) 10

28. Which of the following has the weakest carbon-carbon strength ?

i) C_2H_2

ii) C_2H_4

iii) C_2H_6

iv) all have the same bond strength

29. Which of the following salt when dissolved in water produce hard water ?

i) calcium sulphate

ii) magnesium bicarbonate

iii) calcium chloride

iv) any of the above.

30. The two colours seen at the extreme ends of the pH charts are:-

i) red and blue

ii)red and green

iii) green and blue

iv) orange and green

31. Carboxylic acids on heating with P_2O_5 gives:-

i) ethers

ii) alcohol

iii) carbonyl compounds

iv) anhydrides

32. Synthetic flavours contain:-

i) unsaturated acids

ii) esters

iii) dilute carboxylic acids

iv) hydroxyl acids

33. Out of the following which one is used as preservative for pickle and sauces:-

i) esters ii) acetone

iii) aldehyde iv) acetic acid

34. Brisk effervescences produced when a pinch of Na_2CO_3 is added to CH_3COOH is due to the formation of :-

i) H_2 gas ii) CO_2 gas

iii) CO gas iv) CH_4 gas

35. When an acetic acid reacts with an alcohol in the presence of conc. H_2SO_4:-

i) esters are formed ii) ketones are formed

iii) aldehydes are formed iv) none of these

36. Sodium bi carbonate solution is added to dilute Ethanoic acid. It is observed that:-

i) a gas evolves

ii) a solid settles at the bottom

iii) the mixture becomes vapour

iv) the colour of the mixture becomes light Yellow

37. Ethanoic acid was added to sodium bicarbonate sol. And the gas evolved was tested with a burning splinter. The following four observations were reported:-

1) the gas burns with the pop sound and the flame gets extinguished.

2) the gas does not burn out but the splinter burns with a pop sound

3) the flame extinguishes and the gas does not burn

4) the gas burns with a blue flame and the splinter burns brightly.

The correct observation is reported in:-

i) 1

ii) 2

iii) 3

iv) 4

38. 2ml of ethanoic acid was taken in each test tube 1 and 2 .A red litmus paper was introduced in test tube 1 and a pH paper was introduced in test tube 2. The experiment was performed by 4 students A, B, C, D and they reported their observation as given in the table. Student action on red action on litmus PH paper

A) Turned blue turned pink

B) Remains unchanged turned green

C) Turned blue turned blue

D) Remains unchanged turned pink

The correct observation is reported in

i) A

ii) B

iii) C

iv) D

39. Acetic acid was added to a solid X kept in a Test tube. A colourless, odourless gas Y was evolved. The gas was passed through the lime water, which turned milky. It concludes that:-

i) solid X is NaOH and the gas Y is CO_2

ii) solid X is Na_2CO_3 and the gas Y is CO_2

iii) solid X is sodium acetate and the gas y is CO_2

iv) solid X is sodium chloride and the gas Y is CO_2

40. Why is carbon tetravalent?

41. The formula of a hydrocarbon is C_nH_{2n}. Name the family to which it belongs and also predicts its nature.

42. What is the valency of carbon in CH_3-CH_3, CH_2=CH_2 and HC=CH ?

43. Out of butter and ground nut oil , which is unsaturated in Nature?

44. Why is high temperature not favourable for alcoholic fermentation?

45. Name a cyclic unsaturated hydrocarbon, containing three double bonds?

46. What is the difference in the molecular mass of any two adjacent homologues?

47. Which has triple bond ; C_2H_4 ,C_3H_6 and C_3H_4 ?

48. Which substance is added to denature ethyl alcohol?

49. Which ions are responsible for making water hard?

50. Name the catalyst commonly used in hydrogenation of oil to form fats?

51. Write the name and molecular formula of alcohol derived from butane ?

52. Which gas is evolved when sodium carbonate or bicarbonate is added to ethanoic acid?

53. What is SCUM ?

54. What are hydrophobic and hydrophilic parts in soaps?

55. How much percentage of earth's crust constitutes carbon element ?

56. What do you mean by covalency ?

57. What is covalent bond ?

58. What is functional group ?

59. What is organic chemistry ?

60. What name is given to the reaction which take place when Ethanoic acid reacts with ethanol in the presence of conc. Sulphuric acid ? Name the products obtained in this reaction.

61. What is bromination ? Write the structural formula of product obtained on bromination of propene.

62. Define covalency ?

63. Write the structural formula of the isomers of n-butane?

64. Name the organic acid present in vinegar. Write its Chemical formula also.

65. The structural formula of an ester is $HCOOCH_2CH_2CH_3$ write the formula of acid and the alcohol from which it is made ?

66. What happens when ethanol reacts with

(i) sodium

(ii) potassium permanganate solution.

67. Which of the following hydrocarbons undergo addition reactions : C_2H_6, C_3H_8, C_3H_6, C_2H_2 and CH_4.

68. What is hydrogenation? Write its industrial application.

69. Give a test that can be used to differentiate between butter and cooking oil ?

70. Give the names of the functional group;-

(i) –CHO

(ii) -C=O

(iii) –OH

(iv) –COOH

71. Explain the following terms :

a) Etherification

b) Saponification

c) Dehydration

72. An organic compound A having molecular fomula $C_2H_4O_2$ reacts with Sodium metal Na evolves a gas B which readily catches fire. A also reacts with Ethanol in the presence of concentrated Sulphuric acid to form a sweet smelling substance C in making perfumes.

a) Identify the compounds A, B and C.

b) Write balanced chemical equation to represent the conversion of

(i). Compound A to compound B.

(ii). Compound A to compound C.

73. Give the name of the following :

a) An Aldehyde derived from Ethane.

b) Ketone derived from Butane.

c) The compound obtained by the Oxidation of Ethanol by Chromic anhydride.

74. Write chemical equations of the reactions of Ethanoic acid with :

a) Sodium

b) Sodium Carbonate

c) Ethanol in the presence of conc. H_2SO_4.

75. Give a test to distinguish between:

a) Ethane and Ethene

b) Ethanol with Ethanoic acid.

c) Soaps and detergents.

76. Complete the following reactions:

a) $H_2C=CH_2 + H_2O\ H_2SO_4$

b) $HC\equiv CH + Br_2$

c) $C_2H_5OH + Na$

d) $CH_3COOH + C_2H_5OH$

77. Two carbon compounds A and B have the molecular formula C3H8 and C3H6 respectively. Which one of the two each most likely to show addition reaction? Justify your

answer. Explain with the help of a chemical equation, how an addition is useful in vegetable Ghee industry.

78. What substance should be oxidised to prepare acetic acid (CH_3COOH)? How can ethanol and Ethanoic acid be differentiated?

79. Write down the difference between soap and detergents.

80. An organic compound A is widely used as a preservative in pickles and has a molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound B.

i) Identify the compound A.

ii) Write the chemical equation for its reaction with Ethanol to form compound B.

iii) How can we get compound A back from B?

iv) Name the process and write corresponding chemical equation.

v) Which gas is produced when compound A reacts with washing soda? Write the chemical equation

81. An organic compound X with a molecular formula C_2H_6O undergoes oxidation with in presence of alkaline $KMnO_4$ to form a compound Y. X on heating in presence of Conc. H_2SO_4 at 443K gives Z.which on reaction with H_2O in presence of H_2SO_4 gives back `X.` `Z` reacts with Br_2 (aq) and decolorizes it. Identify X, Y, & Z.and write thereactions involved.

82. An organic compound 'A' is widely used as a preservative in pickles and has a molecular formula $C_2H_2O_2$. This compound reacts with ethanol to form a sweet smelling compound 'B.

(i) Identify the compound 'A'

(ii) Write the chemical equation for its reaction with ethanol to form compound 'B'. (iii) How can we get compound 'A' back from 'B'?

(iv) Name the process and write corresponding chemical equation.

(v) Which gas is produced when compound 'A' reacts with washing soda? Write the chemical equation.

83. Hydrocarbon `X` and `Y` having molecular formulae C_3H_8 and C_3H_6 respectively. Both are burnt in different spatula on the bunsen flame. Indicate the color of the flameproduced by `X` and `Y`. Identify `X` and `Y`. Write the structural formulae.

84. A compound `X` has molecular formula C_4H_{10}. It undergoes substitution reaction readily than addition reaction. It burns with blue flame and is present in LPG. Identify `X` and give the balanced equation for its combustion and substitution reaction with Cl_2 in presence of sunlight.

85. `A` compound works well with hard water. It is used for making shampoos & products for cleaning clothes. A is not 100% biodegradable and causes water pollution. `B` does not work well with hard water. It is 100% biodegradable and does not create water pollution. Identify A & B.

86. An organic compound P with molecular formula C_2H_6O is an active ingredient of all alcoholic drinks. It is also used in medicines such as tincture iodine, cough syrups. Identify `P`. Drop a small piece of sodium into the test tube containing `P`.A new compound `Q` is formed with the evaluation of colorless and odorless gas Name the gas evolved and compound `Q` write the chemical reaction.

87. A cyclic compound `X` has molecular formula C_6H_6. It is unsaturated and burns with sooty flame. Identify `X` and write its structural formula. Will it decolorize bromine water or not and why?

88. An organic compounds `A` is a constituent of antifreeze and has the molecular formula C_2H_6O. upon reaction with alkaline $KMnO_4$, the compound `A` is oxidized to another `B` with formula $C_2H_6O_2$. Identify the compound A` and `B`. Write the chemical equation for the reaction which leads to the formulation of `B`

89. Two compounds `X` and `Y` have the same formula $C_2H_4O_2$. One of them reacts with sodium metal to liberate H_2 and CO_2 with $NaHCO_3$. Second one does not reacts with Na metal and $NaHCO_3$ but undergo hydrolysis with NaOH to form salt of carboxylic acid and compound `Z` which is called wood spirit. Identify `X`, `Y`, and `Z` and write chemical equation for the reaction involved.

90. A compound `X` with molecular formula C_2H_4 burns with a sooty flame. It decolourise bromine water. Identify `X`. Will it dissolve in water or not? Will it conduct electricity in aq. Solution? Will it have high melting point or low melting point ?

ASSIGNMENT QUESTIONS SET – 2
CHAPTER – 4
CARBON AND ITS COMPOUND

1. Carbon exists in the atmosphere in the form of

(a) carbon monoxide only

(b) carbon monoxide in traces and carbon dioxide

(c) carbon dioxide only

(d) coal

2. Which of the following statements are usually correct for carbon compounds? These

(i) are good conductors of electricity

(ii) are poor conductors of electricity

(iii) have strong forces of attraction between their molecules

(iv) do not have strong forces of attraction between their molecules

(a) (i) and (iii) (b) (ii) and (iii)

(c) (i) and (iv) (d) (ii) and (iv)

3. A molecule of ammonia (NH_3) has

(a) only single bonds

(b) only double bonds

(c) only triple bonds

(d) two double bonds and one single bond

4. Buckminsterfullerene is an allotropic form of

(a) phosphorus

(b) sulphur

(c) carbon

(d) tin

5. Oils on treating with hydrogen in the presence of palladium or nickel catalyst form fats. This is an example of

(a) Addition reaction

(b) Substitution reaction

(c) Displacement reaction

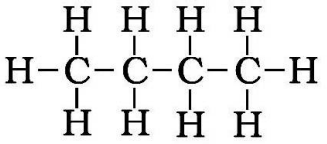
(d) Oxidation reaction

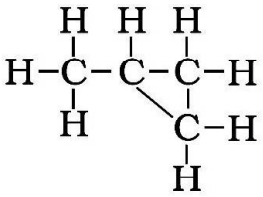
6. In which of the following compounds, — OH is the functional group?

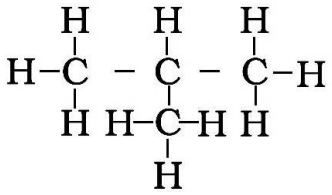
(a) Butanone (b) Butanol

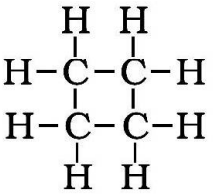
(c) Butanoic acid (d) Butanal

7. Which of the following are correct structural isomers of butane?

(i) 

(iii) 

(ii) 

(iv) 

(a) (i) and (iii) (b) (ii) and (iv)

(c) (i) and (ii) (d) (iii) and (iv)

8. In the below given reaction, alkaline KMnO4 acts as

$$CH_3 - CH_2 - OH \xrightarrow{\text{Alkaline } KMnO_4 + \text{Heat}} CH_3 - COOH$$

(a) reducing agent

(b) oxidising agent

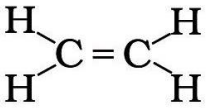
(c) catalyst

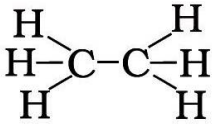
(d) dehydrating agent

9. Structural formula of ethyne is

(a) $H - C \equiv C - H$

(b) $H_3 - C \equiv C - H$

(c) 

(d) 

10. The soap molecule has a

(a) hydrophilic head and a hydrophobic tail

(b) hydrophobic head and a hydrophilic tail

(c) hydrophobic head and a hydrophobic tail

(d) hydrophilic head and a hydrophilic tail

11. Which of the following is the correct representation of electron dot structure of nitrogen?

(a) :N̈ : N̈:

(b) :Ṅ : : Ṅ:

(c) :N̈ : Ṅ:

(d) :N ⋮⋮ N:

12. Identify the unsaturated compounds from the following

(i) Propane

(ii) Propene

(iii) Propyne

(iv) Chloropropane

(a) (i) and (ii) (b) (ii) and (iv)

(c) (iii) and (iv) (d) (ii) and (iii)

13. Chlorine reacts with saturated hydrocarbons at room temperature in the

(a) absence of sunlight

(b) presence of sunlight

(c) presence of water

(d) presence of hydrochloric acid

14. In the soap micelles

(a) the ionic end of soap is on the surface of the cluster while the carbon chain is in the interior of the cluster.

(b) ionic end of soap is in the interior of the cluster and the carbon chain is out of the cluster.

(c) both ionic end and carbon chain are in the interior of the cluster

(d) both ionic end and carbon chain are on the exterior of the cluster

15. 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

16. Ethanol reacts with sodium and forms two products. These are

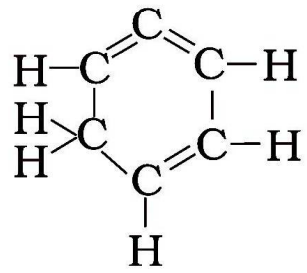
(a) sodium ethanoate and hydrogen

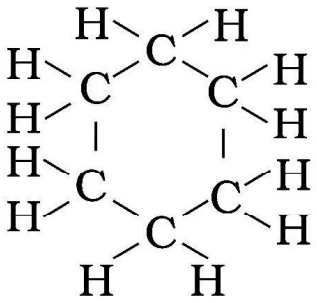
(b) sodium ethanoate and oxygen

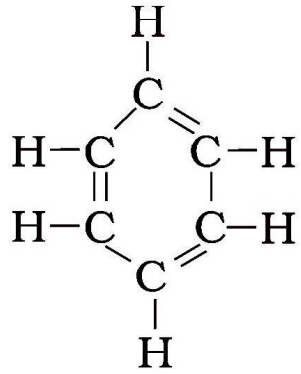
(c) sodium ethoxide and hydrogen

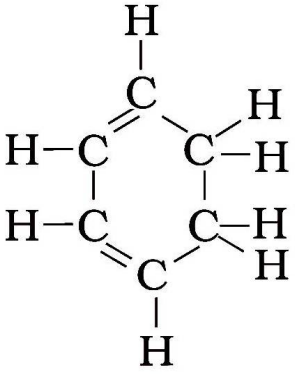
(d) sodium ethoxide and oxygen

17. Structural formula of benzene is:

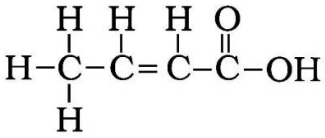
(a) 

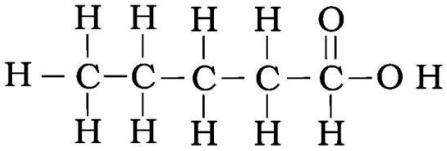
(b) 

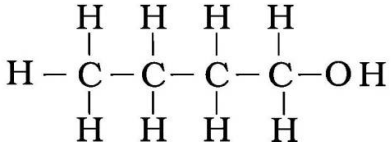
(c) 

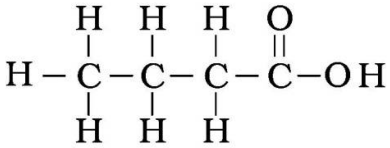
(d) 

18. The correct structural formula of butanoic acid is

(a) 

(b) 

(c) 

(d) 

19. Vinegar is a solution of

(a) 50% – 60% acetic acid in alcohol

(b) 5% – 8% acetic acid in alcohol

(c) 5% – 8% acetic acid in water

(d) 50% – 60% acetic acid in water

20. Mineral acids are stronger acids than carboxylic acids because

(i) mineral acids are completely ionised

(ii) carboxylic acids are completely ionised

(iii) mineral acids are partially ionised

(iv) carboxylic acids are partially ionised

(a) (i) and (iv) (b) (ii) and (iii) (c) (i) and (ii) (d) (iii) and (iv)

21. Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms, e.g. hydrogen. After the formation of four bonds, carbon attains the electronic configuration of

(a) helium

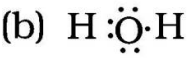
(b) neon

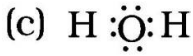
(c) argon

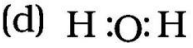
(d) krypton

22. The correct electron dot structure of a water molecule is

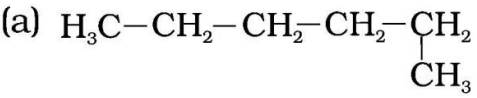
(a) 

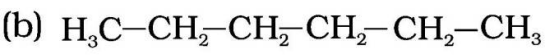
(b) 

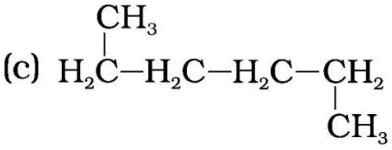
(c) 

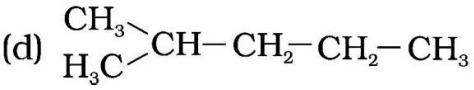
(d) 

23. Which of the following is not a straight chain hydrocarbon?

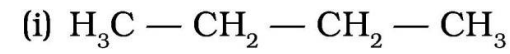
(a) 

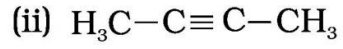
(b) 

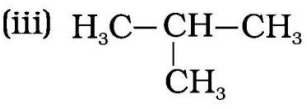
(c) 

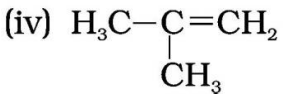
(d) 

24. Which among the following are unsaturated hydrocarbons?

(i) 

(ii) 

(iii) 

(iv) 

(a) (i) and (iii) (b) (ii) and (iii)

(c) (ii) and (iv) (d) (iii) and (iv)

25. Which of the following does not belong to the same homologous series?

(a) CH_4 (b) C_2H_6

(c) C_3H_8 (d) C_4H_8

26. The name of the compound $CH_3 — CH_2 — CHO$ is

(a) Propanal

(b) Propanone

(c) Ethanol

(d) Ethanal

27. 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)

28. Which of the following represents saponification reaction?

(a) $CH_3COONa + NaOH \xrightarrow{CaO} CH_4 + Na_2CO_3$

(b) $CH_3COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3\ COOC_2H_5 + H_2O$

(c) $2CH_3COOH + 2Na \rightarrow 2CH_3\ COONa + H_2$

(d) $CH_3COOC_2H_5 + NaOH \rightarrow CH_3\ COONa + C_2\ H_5OH$

29. The first member of alkyne homologous series is

(a) ethyne

(b) ethene

(c) propyne

(d) methane

30. Draw the electron dot structure of ethyne and also draw its structural formula

31. Why detergents are better cleansing agents than soaps? Explain.

32. Name the functional groups present in the following compounds

(a) $CH_3\ CO\ CH_2\ CH_2\ CH_2\ CH_3$

(b) $CH_3\ CH_2\ CH_2\ COOH$

(c) $CH_3\ CH_2\ CH_2\ CH_2\ CHO$

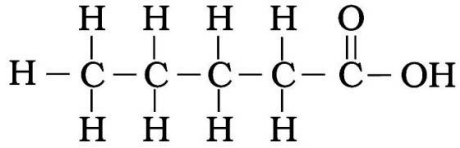
(d) $CH_3\ CH_2\ OH$

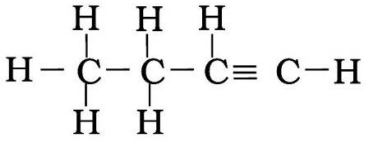
33. How is ethene prepared from ethanol? Give the reaction involved in it.

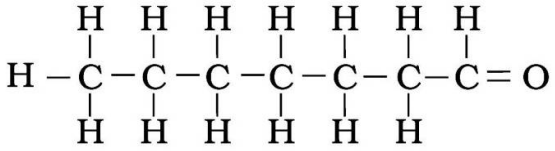
34. Intake of small quantity of methanol can be lethal. Comment.

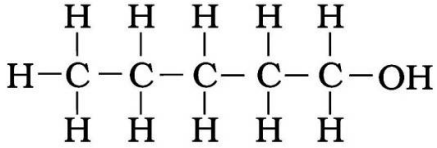
35. A gas is evolved when ethanol reacts with sodium. Name the gas evolved and also write the balanced chemical equation of the reaction involved.

36. Write the names of the following compounds

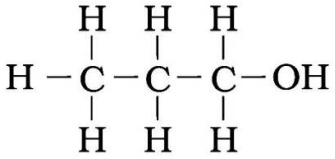
(a) 

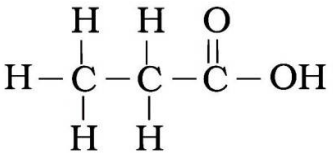
(b) 

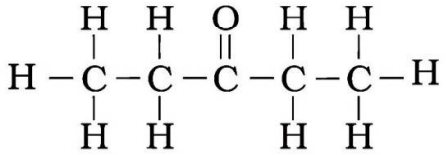
(c) 

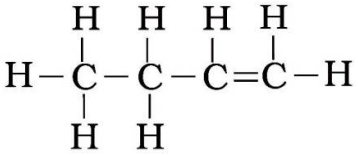
(d) 

37. Identify and name the functional groups present in the following compounds.

(a) 

(b) 

(c) 

(d) 

38. A compound X is formed by the reaction of a carboxylic acid $C_2H_4O_2$ and an alcohol in presence of a few drops of H_2SO_4. The alcohol on oxidation with alkaline $KMnO_4$ followed by acidification gives the same carboxylic acid as used in this reaction. Give the names and structures of (a) carboxylic acid, (b) alcohol and (c) the compound X. Also write the reaction.

39. Ethene is formed when ethanol at 443 K is heated with excess of concentrated sulphuric acid. What is the role of sulphuric acid in this reaction? Write the balanced chemical equation of this reaction.

40. Carbon, Group (14) element in the Periodic Table, is known to form compounds with many elements. Write an example of a compound formed with

(a) chlorine (Group 17 of Periodic Table)

(b) oxgygen (Group 16 of Periodic Table)

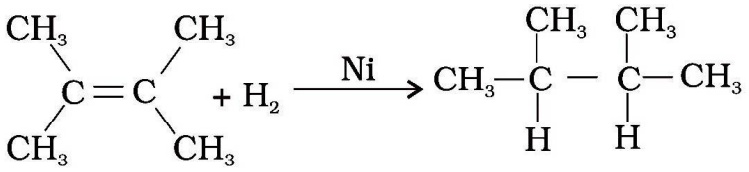
41. In electron dot structure, the valence shell electrons are represented by crosses or dots. (a) The atomic number of chlorine is 17. Write its electronic configuration (b) Draw the electron dot structure of chlorine molecule.

42. Catenation is the ability of an atom to form bonds with other atoms of the same element. It is exhibited by both carbon and silicon. Compare the ability of catenation of the two elements. Give reasons.

43. Unsaturated hydrocarbons contain multiple bonds between the two C-atoms and show addition reactions. Give the test to distinguish ethane from ethene.

44. Write the structural formulae of all the isomers of hexane.

45. What is the role of metal or reagents written on arrows in the given chemical reactions?

(a) 

(b) $CH_3\,COOH + CH_3\,CH_2\,OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3\,COOC_2\,H_5 + H_2O$

(c) $CH_3\,CH_2\,OH \xrightarrow[\text{Heat}]{\text{Alk. } KMnO_4} CH_3\,COOH$

46. A salt X is formed and a gas is evolved when ethanoic acid reacts with sodium hydrogencarbonate. Name the salt X and the gas evolved. Describe an activity and draw the diagram of the apparatus to prove that the evolved gas is the one which you have named. Also, write chemical equation of the reaction involved.

47. What are hydrocarbons? Give examples.

48. Give the structural differences between saturated and unsaturated hydrocarbons with two examples each.

49. What is a functional group? Give examples of four different functional groups.

50. Name the reaction which is commonly used in the conversion of vegetable oils to fats. Explain the reaction involved in detail.

51. Write the formula and draw electron dot structure of carbon tetrachloride.

52. What is saponification? Write the reaction involved in this process.

53. Esters are sweet-smelling substances and are used in making perfumes. Suggest some activity and the reaction involved for the preparation of an ester with well labeled diagram.

54. A compound C (molecular formula, $C_2H_4O_2$) reacts with Na – metal to form a compound R and evolves a gas which burns with a pop sound. Compound C on treatment with an alcohol A in presence of an acid forms a sweet smelling compound S (molecular formula, $C_3H_6O_2$). On addition of NaOH to C, it also gives R and water. S on treatment with NaOH solution gives back R and A. Identify C, R, A, S and write down the reactions involved.

55. Draw the possible isomers of the compound with molecular formula C_3H_6O and also give their electron dot structures.

56. How would you bring about the following conversions? Name the process and write the reaction involved.

(a) ethanol to ethene.

(b) propanol to propanoic acid.

Write the reactions.

57. Explain the given reactions with the examples

(a) Hydrogenation reaction

(b) Oxidation reaction

(c) Substitution reaction

(d) Saponification reaction

(e) Combustion reaction

58. An organic compound A on heating with concentrated H_2SO_4 forms a compound B which on addition of one mole of hydrogen in presence of Ni forms a compound C. One mole of compound C on combustion forms two moles of CO_2 and 3 moles of H_2O. Identify the compounds A, B and C and write the chemical equations of the reactions involved.

59. Define Allotropy.

60. What is vinegar ?

61. What is combustion ?

62. How can you differentiate saturated and unsaturated Hydrocarbon on the basis of burning behaviour ?

63. Give two advantages of synthetic detergents over soaps ?

64. What are substitution reactions ?

65. Differentiate between diamond and graphite.

66. Discuss the method of preparation of soap in the laboratory.

67. Write five ill effects of alcohol drinking.

68. Differentiate between ionic compounds and covalent compounds.

69. Give some important properties of ethanol (ethyl alcohol).

70. Give five main advantages of synthetic detergents over soaps.

71. Write important uses of (a) ethanol and (b) ethanoic acid.

72. What happens when ethanol reacts with (i) sodium (ii) potassium permanganate solution.

73. An organic acid 'X' is a liquid which often freezes during winter time in cold countries, has the molecular formula, $C_2H_4O_2$. On warming it with ethanol in the presence of a few drops of concentrated sulphuric acid, a compound 'Y' with a sweet smell is formed

(i) Identify 'X' and 'Y'. (ii) Write a chemical equation for the reaction involved.

74. Write name of the following –

i. Alkaline earth metal belonging to the third period

ii. The alkali metal atom having largest atomic radius

iii. The halogen atom belonging to fourth period

iv. The element having lowest ionization energy

v. The element having second lowest electronegativity

75. Organic compound 'x' of molecular formula $C_2H_4O_2$ gives brisk effervescence with sodium bi carbonate . give name and molecular formula of x with balanced equation

76. Soaps are not considered as effective cleansing agent. Why?

77. How does melting and boiling points of hydrocarbon change with the increase in molecular mass ?

78. Write down the relevant chemical equation involved in decolourisation.

79. A compound X has molecular formula C3H4 one mole of X reacts with 2 moles of hydrogen to yield a compound Y deduce the structure of X and Y.

80. What is dehydration reaction? Give one example.

81. What is hydrolysis?

82. Why doesn't soap form micelles in ethanol as they form in water?

83. Three elements X,Y and Z belong to 17TH group but to 2nd 3th and 4th period respectively. Number of valance electrons in X is 7Find the number of valance electrons in X and Z.

84. What is the use of oxyacetylene flame?

85. What is observed on adding 5% solution of alkaline potassium permanganate solution drop by drop to some warm ethanol taken in testube.

86. Write the name of the compound formed during chemical reaction.

87. How would you distinguish experimentally between an alcohol and a carboxylic acid on the basis of a chemical property?

88. Why are vegetable oils healthy as compared to vegetable ghee ? how are vegetable oils converted into vegetable ghee name the process.

89. When acetic acid reacts with X, a salt is formed which on reaction with soda lime gives a gas Y. Identify X and Y

90. "Alkenes form a homologous series" Explain.

91. Why does Ethanoic acid called glacial acetic acid? (Imp.)

92. Why is the conversion of ethanol to ethanoic acid an oxidation reaction? (Imp.)

93. A mixture of ethyne and oxygen is burnt for welding. Can you tell why a mixture of ethyne and air is not used? (Imp.)

94. Why is the conversion of ethanol to ethanoic acid considered an oxidation reaction?

95. Who was the first to suggest the classification of chemical compounds into inorganic compounds and organic compounds?

96. Why are the compounds of carbon studied as a separate branch of chemistry?

97. Compounds like calcium carbide, carbon monoxide, carbon dioxide, calcium carbonate etc., are considered as inorganic compounds although they have carbon atoms in their molecule. Give reason.

98. Why compounds like B-B, Si-Si, and S-S do not exist in nature?

99. What is "Buckminster fullerene"? And why it is called so?

100. Name the first organic compound obtained from an inorganic source in the laboratory. Who synthesized it?