

CHEMISTRY OF CARBON COMPOUNDS

1. What is chemistry of carbon compounds?

A) The chemistry of carbon compounds is the study of carbon-containing compounds, also known as organic compounds.

2. What type of compounds formed by carbon? Explain. (OR) Why carbon doesn't form ionic compounds?

A) i. The electronic configuration of carbon is 2,4.

ii. So, it forms mainly covalent compound as it can neither lose nor gain four-electron to complete its octet.

iii. Carbon cannot form C^{4+} ion, because it would require a large amount of ionization energy to remove 4 electrons

iv. Carbon cannot form C^{4-} ion, because it would be difficult for the nucleus with 6 protons to hold on to 10 electrons.

3. What is covalent bond?

A) The bond formed by sharing of electrons between atoms is known as a covalent bond. Molecules of compounds containing such bonds are known as covalent compounds.

4. What is single covalent bond?

A) A covalent bond is existed between two atoms by sharing of one pair of electrons is called single covalent bond or single bond.

Ex:

1. H_2 Molecule



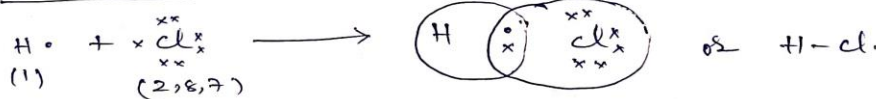
2. Cl_2 Molecule



3. F_2 Molecule



4. HCl Molecule

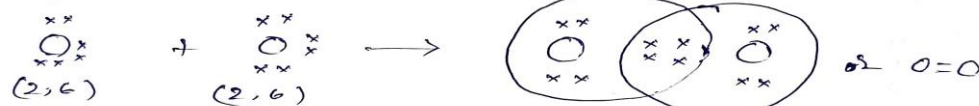


5. What is double covalent bond?

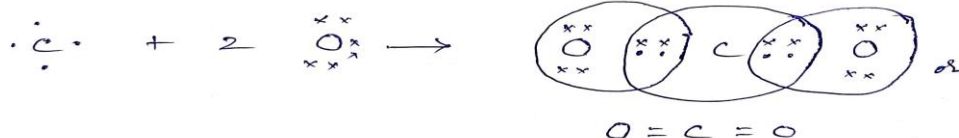
A) A covalent bond is existed between two atoms by sharing of two pairs of electrons is called double covalent bond or double bond.

Ex:

Oxygen Molecule (O_2)



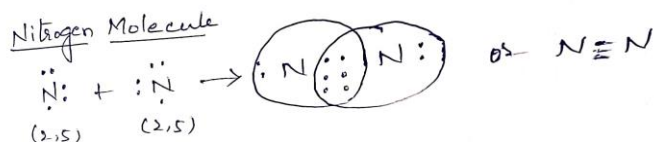
Carbon dioxide Molecule (CO_2)



6. What is triple covalent bond?

A) A covalent bond existed between two atoms by sharing of three pairs of electrons is called triple covalent bond or triple bond.

Ex: N_2 molecule (electron dot structure)



8. Write the properties of covalent compounds.

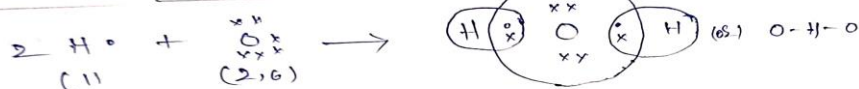
A). The properties of covalent compounds are as follows:

- (1) They have low melting points and boiling points.
- (2) They possess weak force of attraction between the molecules.
- (3) They are non-conductors of electricity.
- (4) They exist in solid, liquid or gaseous states.
- (5) They are usually insoluble in water but soluble in organic solvents.

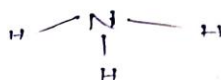
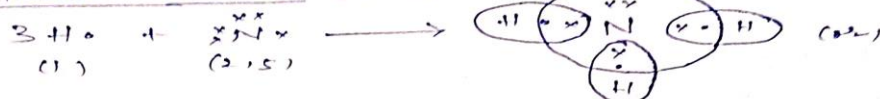
7. Draw electron dot structure of water, ammonia, methane, and sulphur molecules.

A)

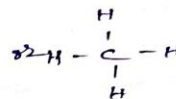
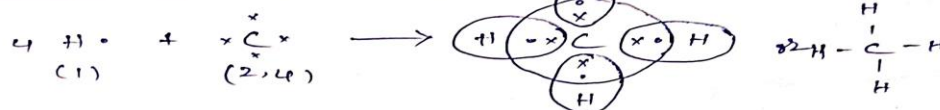
Water Molecule (H_2O)



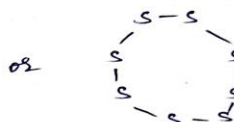
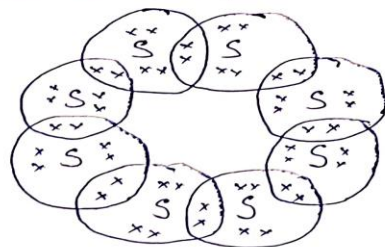
Ammonia Molecule (NH_3)



Methane Molecule (CH_4)



Sulphur Molecule (S_8)



9. Why covalent compounds are having low melting and boiling points than ionic compounds?

- A) i. Covalent compounds have weak forces of attraction called Vander Waal forces between the binding molecules.
 ii. Thus less energy is required to break the force of bonding. Therefore, covalent compounds have low melting and boiling point.
 iii. Ionic compounds have high melting and boiling points because of the strong electrostatic forces of attraction between oppositely charged ions in the compound

10. What is allotropy? Give examples.

- A) i. Allotropy is the property of some chemical elements to exist in two or more different forms, in the same physical state,
 ii. Allotropes have different physical properties, such as strengths, melting points, and electric conductivity.
 iii. Allotropes have the same chemical properties due to the same chemical composition.

Examples: a) Carbon: i. Graphite
 ii. Diamond, and
 iii. buckminsterfullerene are three main types of carbon allotropes.

b) Sulphur: Three are the most important allotropes of Sulphur.

They are

- i. rhombic Sulphur
 ii. monoclinic Sulphur and
 iii. plastic sulphur.

11. Write the differences between diamond and graphite.

A)

Diamond	Graphite
i. It is hardest natural substance	i. It is soft and brittle
ii. It has tetra hederal structure	ii. It has a layered structure of hexagonal rings
iii. It appears transparent and brilliant	iii. It is opaque and gray in colour
IV. It is a poor conductor of electricity.	iv. It is a good conductor of electricity
v. The density of diamond is 3.5 gm/cc	v. Its density is 2.25 gm/cc

12. What are the uses of diamond and graphite?

A) Diamond:
i. It is used in making of jewelry.
ii. It is used as glass cutter
iii. It used as surgical tool in cataract surgery.

Graphite:
i. It is used as pencil lead
ii. It is used as lubricating substance
iii. It is used as electrodes in batteries.

13. How can you differentiate between artificial diamond and natural diamond?

A) Synthetic diamonds are smaller than natural diamonds. But are otherwise indistinguishable from natural diamonds.

14. Why graphite is a good conductor of electricity, whereas diamond is not?

A) i. Graphite is a good conductor of electricity because its carbon atoms are arranged in layers, with each atom bonded to three others. This leaves one free electron per carbon atom, which can move freely between layers, allowing electric current to pass.
ii. Diamond, on the other hand, has each carbon atom bonded to four others in a strong 3D structure, leaving no free electrons to carry an electric charge. This makes diamond an insulator, unable to conduct electricity.

15. Why carbon is so versatile? Explain (OR) What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

A) Carbon is so versatile because

- i. Tetra valence
- ii. Catenation

i. Tetra valence: a) Carbon has four electrons in its outermost shell that it can share with other atoms to achieve a complete octet.
b) So, carbon can form single, double, and triple bonds with other carbon atoms and atoms of other elements.

- ii. Catenation:** a) Self-linking property of carbon atoms by covalent bonding is called catenation.
- b) Carbon can bond with other carbon atoms to form chains, rings, and other structures.

16. List some of the elements other than carbon show catenation property

A) i. Here are some elements that exhibit catenation, the ability to form chains and rings of atoms of the same element.

ii. Examples: a) Carbon, b) Silicon, c) Sulphur, d) Boron, e) Phosphorus etc

Silicon: Exhibits catenation to a good extent. Silicon chains can have up to 8 silicon atoms.

Sulphur: Exhibits catenation, but has a low catenation property because it has 2 electrons in its valence shell and cannot reach octet state by bonding with itself.

17. What are hydrocarbons? Explain.

A) i. Hydrocarbons are organic compounds made up of only carbon and hydrogen atoms

ii. Hydrocarbons are basically classified into two types: Saturated Hydrocarbons. Unsaturated Hydrocarbon.

A) Saturated hydrocarbons: Hydro carbon contain only single bonds between carbon atoms, and have the general formula $C_nH_{(2n+2)}$.

B) Unsaturated hydrocarbons: Contain at least one double or triple bond between carbon atom.

1. Alkenes are unsaturated hydrocarbons with double bonds between carbon atoms, and have the general formula C_nH_{2n} .

2. Alkynes are unsaturated hydrocarbons with triple bonds between carbon atoms, and have the general formula $C_nH_{(2n-2)}$.

18. What are alkanes, alkenes and alkynes? Write the differences between them.

A)

Alkanes	Alkenes	Alkynes
1. Hydro carbons contain only single bonds between all carbon atoms are called alkanes.	1. Hydro carbons contain at least one double bond between two carbon atoms are called alkenes.	1. Hydro carbons contain at least one triple bond between two carbon atoms are called alkynes.
2. The general formula of Alkanes is $C_nH_{(2n+2)}$.	2. The general formula of Alkanes is C_nH_{2n}	2. The general formula of Alkanes is $C_nH_{(2n-2)}$.
3. Alkanes are saturated hydro carbons	3. Alkenes are unsaturated hydro carbons.	3. Alkynes are unsaturated hydro carbons.

4. Alkanes are very low reactive.	4. Alkenes are highly reactive.	4. Alkynes are highly reactive.
5. Alkanes are participating in substitution reactions	5. Alkenes are participating in addition reactions.	5. Alkynes are participating in addition reactions
Examples. 1. Methane: (CH ₄) 2. Ethane: (CH ₃ —CH ₃) or (C ₂ H ₆) 3. Propane: (CH ₃ —CH ₂ —CH ₃) Or (C ₃ H ₈). 4. Butane: (CH ₃ —CH ₂ —CH ₂ —CH ₃) Or (C ₄ H ₁₀) etc	Examples: 1. Ethene: (CH ₂ =CH ₂) or (C ₂ H ₄). 2. Propene: (CH ₃ —CH=CH ₂) or (C ₃ H ₆) 3. Butene: (CH ₃ —CH ₂ —CH=CH ₂) Or (C ₄ H ₈). 4. Pentene: (CH ₃ —CH ₂ —CH ₂ —CH=CH ₂) or (C ₅ H ₁₀)	Examples: 1. Ethyne: (CH≡CH) or (C ₂ H ₂) 2. Propyne: (CH ₃ —C≡CH) or (C ₃ H ₄) 3. Butyne: (CH ₃ —CH ₂ —C≡CH) or (C ₄ H ₆) 4. Pentyne: (CH ₃ —CH ₂ —CH ₂ —C≡CH) or (C ₅ H ₈).

19. What is isomerism? Give examples.

A) i. Organic compounds which are having one molecular formula with different molecule structure is called isomerism. And the compounds are called isomers.

ii. At least four carbon atoms must be present in compound to exist isomerism in hydrocarbons.

Examples:

Butane: Butane (C₄H₁₀) has two isomers

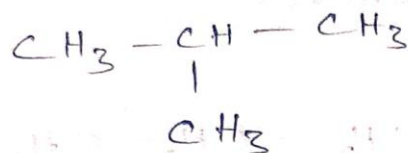
ISOMERS OF BUTANE (C₄H₁₀)

There are two isomers are existed for butane.

1. n-Butane



2. Iso-Butane (2-methyl propane)

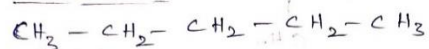


Pentane: Pentane (C_5H_{12}) has three isomers

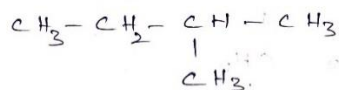
ISOMERS OF PENTANE (C_5H_{12})

There are three isomers are existed for Pentane

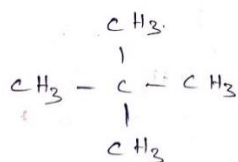
1. n-Pentane



2. Iso-Pentane (2-methyl butane)



3. neo-Pentane (2,2-dimethyl propane)



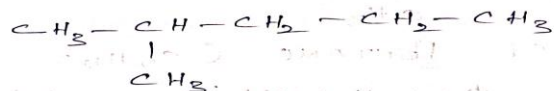
Hexane:

ISOMERS OF HEXANE (C_6H_{14})

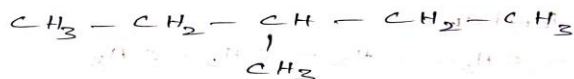
1. Hexane



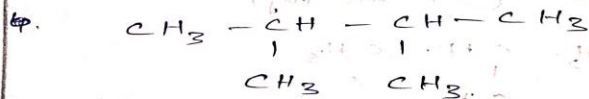
2. 2-methyl pentane



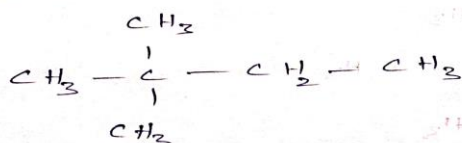
3. 3-Methyl Pentane



4. 2,3-di methyl butane

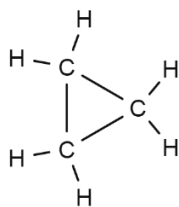


5. 2,2-di methyl butane



20. What are cyclic hydro carbons?

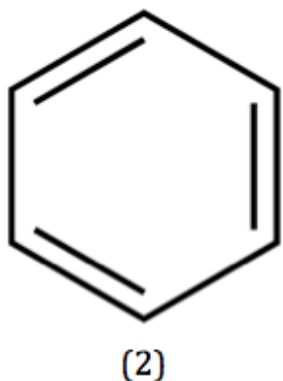
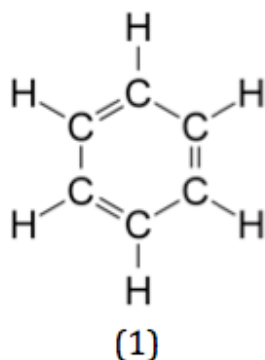
- A) i. Cyclic hydrocarbons are organic compounds that form when carbon atoms join to form a ring.
ii. The minimum number of carbon atoms required to form a cyclic hydrocarbon is three.
iii. The simplest cyclic hydrocarbon is cyclopropane, which has the formula C_3H_6



21. What is benzene? Draw its structure?

- A) i. Benzene is a colorless liquid with a characteristic odoured compound of formula C_6H_6 .
ii. Benzene is a closed ring of six carbon atoms linked by bonds that alternate between single and double bonds. Each carbon atom is bound by a single hydrogen atom.
iii. Its structure as follows

Benzene: C_6H_6



22. What are hetero atoms?

- A) The elements such as halogens, oxygen, nitrogen and sulphur etc are replacing hydrogen from Hydro carbon chain is referred to as hetero atoms.

23. What are functional groups? Give examples

- A) i. An atom or group of atoms joined in a specific manner which is responsible for the characteristics chemical properties of the organic compounds is called a functional group
ii. Examples are
a) Hydroxyl group (or) alcohol group (-OH),
b) Aldehyde group (-CHO)
c) Ketone group (-CO-)
d) Carboxylic acid group(-COOH).

24. Write a short note on alcohol functional group.

- A) i. An alcohol is an organic compound with a hydroxyl (-OH) functional group
ii. General formula of Alcohols is R-OH where R is an alkyl group.

Note: Alkyl group: C_nH_{2n+1}

iii. Alcohol is used as a functional group we use '-ol' as a suffix.

iv. Examples of alcohols:

a) Methanol (Methyl alcohol): $CH_3 - OH$

b) Ethanol (Ethyl alcohol): $CH_3 - CH_2 - OH$ Or (C_2H_5OH)

c) Propanol (Propyl alcohol): $CH_3 - CH_2 - CH_2 - OH$ Or (C_3H_7OH)

d) Butanol (Butyl alcohol): $CH_3 - CH_2 - CH_2 - CH_2 - OH$ Or (C_4H_9OH)

25. Write a short note on aldehydes?

A) i. Aldehydes are organic compounds that contain a functional group " $-CH=O$ "

ii. The general formula of aldehydes is R - CHO. Here, R is H or alkyl group

iii. Aldehyde used as functional group we use "al" as a suffix.

iv. Examples of aldehydes

a). Methanal (Formaldehyde): $H-CHO$

b). Ethanal (Acetaldehyde): CH_3-CHO

c). Propanal (propan aldehyde): CH_3-CH_2-CHO (or) (C_2H_5CHO)

d). Butanal (Butan aldehyde): $CH_3-CH_2-CH_2-CHO$ (or) (C_3H_7CHO)

26. Write a short note on ketones.

A) i. Ketones are organic compounds that contain a functional group ($-CO-$)

ii. The general formula of ketones is $R-CO-R'$, here R and R' are alkyl groups.

iii. Ketones used as functional group we use "one" as a suffix.

IV. At least three carbon atoms are required to form a ketone:

V. Examples:

a) The first member of ketones i.e. simplest ketone is propanone (acetone): $CH_3-CO-CH_3$

b) butanone: $CH_3-CH_2-CO-CH_3$ (or) $(C_2H_5-CO-CH_3)$

c) pentanone: $CH_3-CH_2-CH_2-CO-CH_3$ (or) $(C_3H_7-CO-CH_3)$

NOTE: Aldehydes and ketones are isomers

27. Write a short note on carboxylic acids?

A) i. Carboxylic acids are organic compounds with a carboxyl group ($-COOH$) attached to a side chain.

ii. The general formula of carboxylic acids is $R-COOH$.

iii. Carboxylic acids used as functional group we use "oic acid" as suffix.

iv. Examples of carboxylic acids:

a) Methanoic acid $\rightarrow HCOOH$

b) Ethanoic acid (acetic acid) $\rightarrow CH_3-COOH$

c) Propanoic acid \rightarrow $\text{CH}_3\text{-CH}_2\text{-COOH}$ (or) $(\text{C}_2\text{H}_5\text{COOH})$

d) Butanoic acid \rightarrow $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COOH}$ (or) $(\text{C}_3\text{H}_7\text{COOH})$

NOTE: Carboxylic acids also represents with another general formula $\text{C}_n\text{H}_{2n}\text{O}_2$

28. What is homologous series? Write its characteristics.

A) A homologous series is a series of compounds with the same functional group and similar chemical properties

characteristics of a homologous series:

- All compounds in the series having same functional group.
- The general formula is the same for all compounds
- The difference in molecular formula of any two successive compounds is $-\text{CH}_2$
- The difference in molecular mass of any two successive compounds is 14U.
- Chemical properties of all compounds in the series are same.
- There is a regular gradation in physical properties like melting point, boiling point etc as the molecular mass increases.
- Examples: Alkanes, alkenes, Alkynes, alcohols, aldehydes, ketones etc.

29. What is nomenclature of carbon compounds?

A) The nomenclature of carbon compounds is a system for naming carbon compounds based on certain rules

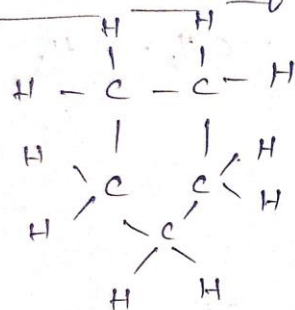
Naming a carbon compound can be done by the following method:

- Find the longest chain of carbon atoms in the compound i.e. identify the number of carbon atoms in the compound.
- If a functional group is present, indicate it with a prefix or suffix.
- If a suffix is added, remove the final 'e' from the carbon chain name.
- If the carbon chain is unsaturated, then the final 'ane' is substituted by 'ene' or 'yne'.

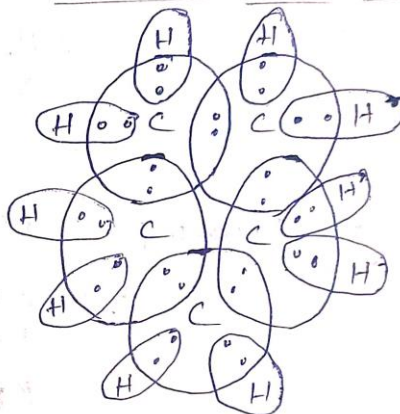
30. What will be the formula and electron dot structure of cyclo-pentane?

A) The chemical formula of Cyclo-pentane is C_5H_{10} .

The structural formula



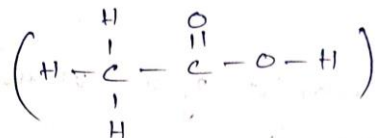
The electron dot structure



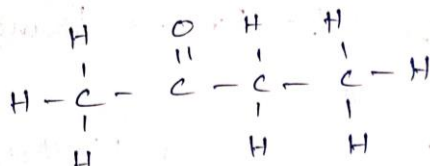
31. Draw the structures of the following compounds.

A)

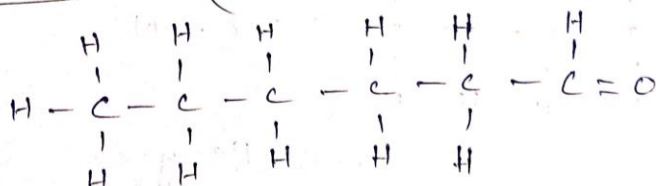
i) Ethanoic acid $\rightarrow (CH_3 - COOH)$



ii) Butanone $\rightarrow (CH_3 - CO - CH_2 - CH_3)$

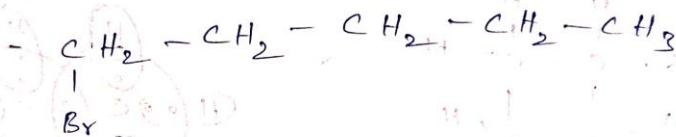
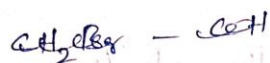


iii) Hexanal $\rightarrow (CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CHO)$

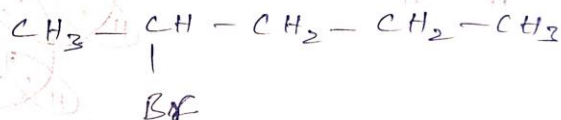


iv) Bromo pentane $(C_5H_{11}Br)$

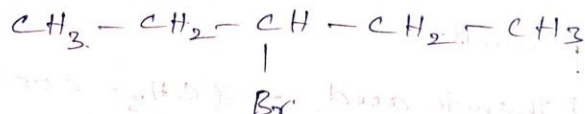
i. 1-Bromo pentane



ii) 2-Bromo pentane

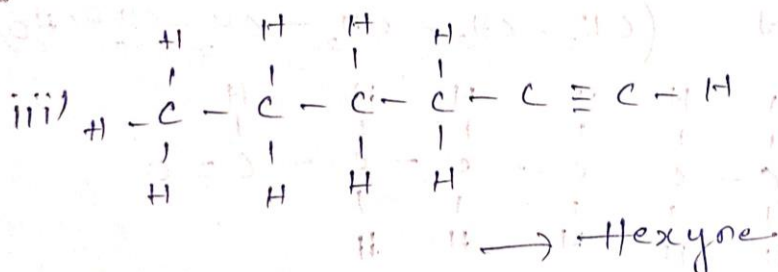
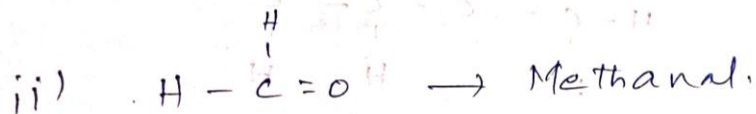
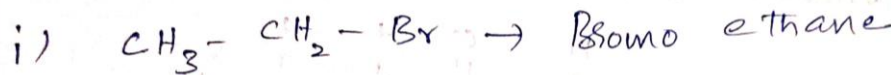


iii) 3-Bromo Pentane



32. How would you name the following compounds.

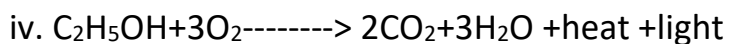
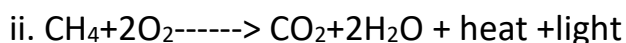
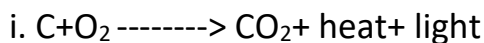
A)



33. What is combustion? Give examples.

A) Burning of any substance in the presence of oxygen and produce heat and light is called combustion

Examples:



34. Why carbon compounds are used as fuels?

A) i. Carbon compounds have high calorific values, i.e. they produce a large amount of heat when burned.

ii. Carbon compounds burn with a clean flame and produce little to no smoke.

iii. Carbon compounds have an optimum ignition temperature.

35. What is complete combustion and incomplete combustion?

A) **Complete combustion:** i. A substance burns completely without leaving any residue with a blue colour flame is called complete combustion.

ii. Generally saturated carbon compounds are burning with blue colour flame

Incomplete combustion: i. A substance burns incomplete and leave some residue in the form of smoke and soot with a yellow colour flame is called incomplete combustion.

ii. Generally unsaturated carbon compounds are burning with yellow colour flame.

36. Why burners are used in kerosene and gas stoves?

A) To provide sufficient oxygen for complete combustion and produce clean flame i.e. blue colour flame.

37. A mixture of oxygen and ethyne is burnt for welding, can you tell why a mixture of ethyne and air is not used?

A) i. A mixture of oxygen and ethyne is used for welding because it produces a clean, high-temperature flame that is suitable for welding.

ii. When ethyne is burned in air, it produces a sooty flame due to incomplete combustion. This is because air has a limited supply of oxygen, so the heat liberated is not enough for welding.

38. Why do substances burn with or without flame?

A) i. The substances which vapourise during burning, give flames.

ii. Example: kerosene oil and molten wax rise through the wick and are vapourised during burning and forming flames.

iii. Charcoal, on the other hand, does not vapourise and so does not produce a flame.

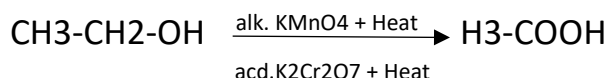
39. What is oxidising agent?

A) Substances are capable of adding oxygen to other substance are called oxidising agents.

40. What happens if an alcohol is oxidised?

A) Alcohols are oxidised into carboxylic acids in the presence of oxidising agents like alkaline potassium permanganate (alk. KMnO_4) or acidified potassium dichromate(acd. $\text{K}_2\text{Cr}_2\text{O}_7$).

Example:



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

A) In this process oxygen atom is added to ethanol, so this process is called oxidation.

42. What is addition reaction? What are participating in this reaction?

A). The process of conversion of unsaturated carbon compounds in to saturated carbon compounds by adding hydrogen is called addition reaction.

43. What is hydrogenation? Give its important application?

A) i. Hydrogenation is a chemical reaction that adds hydrogen to an unsaturated carbon compound usually in the presence of a catalyst like palladium or nickel.

ii. It's used mainly in hydrogenation of oils.

Oils + H_2 -----> fats

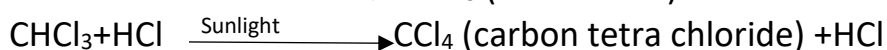
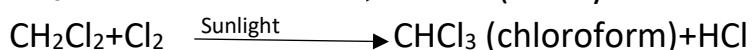
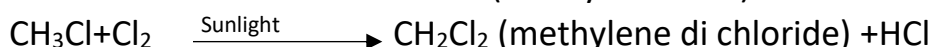
44. Which of the following are healthy either oils or fats for cooking? Why?

- A) i. Vegetable oils are healthier than fats
ii. Because vegetable oils contain unsaturated fatty acids whereas fats contain saturated fatty acids.
iii. So unsaturated fatty acids digest easier than saturated fatty acids.
-

45. What is substitution reactions? Explain how alkanes are participating in substitution reactions?

- A) i. A reaction in which hydrogen atoms in a given saturated carbon compound are replaced by some other atoms or group of atoms is called a substitution reaction.
ii. Generally saturated carbon compounds are very low reactive; hence they participate in this reaction.
iii. Alkanes are least reactive; however, they participate in substitution reaction with chlorine in the presence of Sun light

iv. Example: Substitution reaction of methane with chlorine



46. Write the physical properties of ethanol (Ethyl alcohol).

- A) i. Ethanol is a clear, colorless liquid at room temperature.
ii. Ethanol has a characteristic pleasant odor and burning taste.
iii. It is highly flammable.
iv. The melting point of ethanol is 78.3°C (351.3K)
iv. Ethanol is soluble in water in any proportion
-

47. Write the uses of ethanol.

- A) i. Ethanol is a widely used industrial solvent, next only to water.
ii. Ethanol is used in medicine such as tincture iodine, cough syrups and many tonics
iii. Ethanol is the active ingredient of all alcoholic drinks.
iv. Ethanol is used as an additive to gasoline to form gasohol a fuel.
-

48. Why consumption of alcohol by humans is a condemned practice?

- A) i. Consumption of alcohol in the form of beverages is harmful to health
ii. It causes severe damage to blood circulation system and nervous system
iii. Addiction to alcohol drinking leads to heart diseases and damages the liver
iv. It also causes ulcers in the small intestine due to increased acidity and damages the digestive system.
-

49. What is absolute alcohol?

- A) The purest form of ethanol (100% ethanol) is called absolute alcohol.
-

50. What is denatured alcohol?

- A) i. Denatured alcohol is ethanol that contains impurities that make it undrinkable
ii. The added impurities are methanol, pyridine etc.
-

51. Write the chemical properties of ethanol.

A) i. **Combustion of ethanol:**

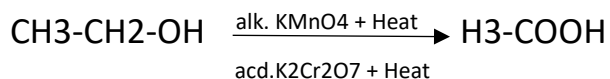
By combustion of alcohol produce heat and light



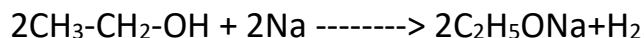
ii. **Oxidation of ethanol:**

Alcohols are oxidised into carboxylic acids in the presence of oxidising agents like alkaline potassium permanganate (alk. KMnO_4) or acidified potassium dichromate (acd. $\text{K}_2\text{Cr}_2\text{O}_7$).

Example:

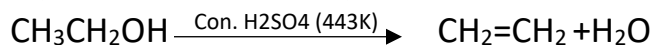


- iii. **Reaction with sodium:** Alcohols react with sodium leading to the evolution of hydrogen and other product sodium ethoxide ($\text{C}_2\text{H}_5\text{ONa}$)



NOTE: In this reaction, hydrogen gas is liberated in the form gas bubbles as rapid effervescence when addition of sodium to alcohol. So, it is a test to identify the ethanol.

- iv. **Dehydration of alcohol:** Reaction to give unsaturated hydro carbons by dehydration of ethanol in the presence of con. Sulphuric acid at 443K temperature.



52. Write the physical properties of ethanoic acid (acetic acid)

- A) i. It is a colorless liquid at room temperature.
ii. It has a sour taste and smell of vinegar
iii. The melting point of pure acetic acid is 290K
iv. When pure acetic acid is cooled, it freezes and form ice like solid
v. Ethanoic acid is dissolved in water in all proportions.
-

53. Write the uses of ethanoic acid

- A) i. Used in production of vinegar used as food preservative
ii. Used in production of esters
-

54. What is vinegar?

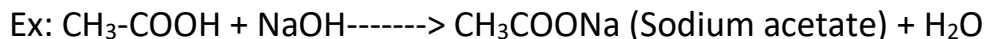
- A) 5-8% solution of acetic acid in water is called vinegar.
-

55. Why pure acetic acid (ethanoic acid) is called as glacial acetic acid?

- A). The melting point of acetic acid is 290K and hence it often freezes during winter in cold climates, hence it is called as glacial acetic acid.
-

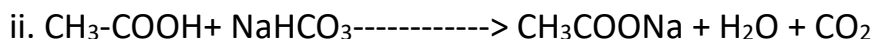
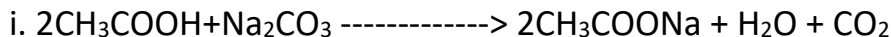
56. Write the chemical properties of ethanoic acid (acetic acid)

A) a) **Reaction with base:** Like mineral acids acetic acid also neutralizes with bases



b) **Reaction with carbonates and hydrogen carbonates:** Ethanoic acid reacts with carbonates and hydrogen carbonates to give salt, water and carbon dioxide

Ex:



57. What is esterification?

A) Esterification is the process of combining an organic acid (RCOOH) with an alcohol (ROH) to form an ester, a sweet-smelling substance (RCOOR) and water



58. What are esters?

A) Esters are sweet smelling organic chemical compounds that are formed when an alcohol group reacts with an organic acid.

Example:



59. Write the uses of esters

A) i. Esters that have fragrant odors are used as a constituent of perfumes, essential oils, food flavorings, cosmetics, etc.

ii. It is used as an organic solvent.

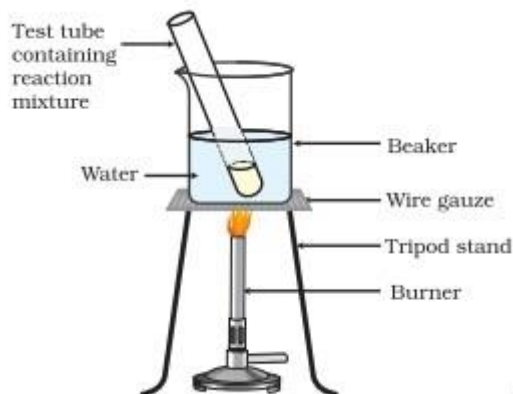
iii. Tri esters of fatty acids are used in producing soaps.

60. Explain the esterification reaction with an activity?

A) **Aim:** study about esterification

Apparatus: Glass beaker, test tube, water, burner, ethanol, ethanoic acid and concentrated Sulphuric acid.

Diagram:



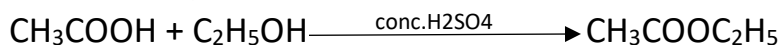
Procedure:

- Take 1ml of ethanol (absolute alcohol) and 1ml of glacial acetic acid along with few drops of con.H₂SO₄
- Warm in a water bath for at least five minutes
- Pour into a beaker containing 50ml of water and smell the mixture.

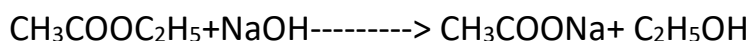
Observation: The products is sweet smelling substance.

Conclusion: 1. Esters are sweet smelling substances.

2. Esters are produced by the reaction between carboxylic acids and alcohols

Chemical equation:**61. What is saponification? Give an example**

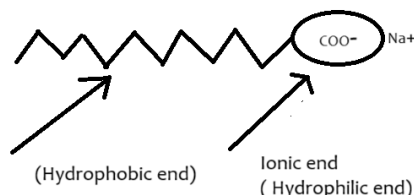
A). The alkaline hydrolysis of tri esters of fatty acids is called saponification. (Or) The reaction between esters and strong bases produce basic salt and alcohol is also called saponification

**62. What are soaps?**

A) Soaps are the sodium or potassium salts of long chain carboxylic acids.

63. Explain the structure of the soap molecule

A)



i. A soap molecule is made up of two parts.

ii. A long hydrocarbon part and a short ionic part containing the COO^- and Na^+ group.

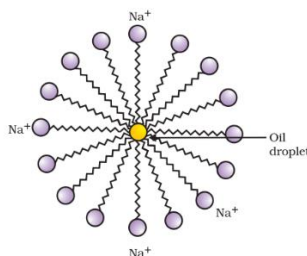
iii. The long hydrocarbon chain is hydrophobic (water-repelling) in nature.

iv. The hydrocarbon part of the soap molecule is insoluble in water, but it is soluble in grease and oil

64. What is a micelle?

A) A spherical aggregate of soap molecules in the soap solution in water is called a micelle.

Diagram of micelle



65. Write the cleansing action of soap?

- A) i. The cleansing action of soap is due to the way soap molecules interact with dirt and water.
- ii. When soap is dissolved in water, the soap molecules' hydrophobic ends attach to dirt and the hydrophilic ends remain in contact with water molecules.
- iii. The soap molecules form micelles, which are spherical in shape, that trap the dirt in the center.
- iv. The hydrocarbon ends of the soap molecules clump together on the inside of the micelle, while the polar heads face the outside.
- V. The micelles remain suspended in water, forming a colloidal solution.
- vi. The trapped dirt can be easily rinsed away with water.
-

66. What is soft water?

- A) Water that forms more lather directly with soap is called soft water
-

67. What is hard water? Why water becomes hard?

- A) i. Water doesn't give much lather with soaps is called hard water.
- ii. Water becomes hard due to presence of bicarbonate, sulphate, chloride salts of calcium and magnesium.
-

68. How can you identify the given water is soft or hard?

- A) **AIM:** To identify the hardness and softness of water.

APPARATUS: Two test tubes, soap solution, tap water and well water having salty taste

PROCEDURE:

- i. Take 10ml of tap water and well water in two test tubes
- ii. Now add few drops of soap solution in both the test tubes.
- iii. Then shake both the test tubes vigorously

OBSERVATION:

We are observed that lather is formed in two test tubes is not same.

CONCLUSION:

Water which forms much lather is soft water and water doesn't form much lather is hard water.

69. Why soap is not a good cleaning agent in hard water? (or) How scum is formed with hard water?

- A) Soap is not suitable for washing clothes with hard water.

Because, when soap is used for washing clothes with hard water, a large amount of soap is reacting with the calcium and magnesium ions of hard water to form insoluble precipitate is called scum.

scum sticks to the clothes being washed, so large amount of soap is needed for washing clothes with hard water.

70. What are detergents?

- A) i. Detergents are used as cleaning agents in hard water
ii. Detergents are generally sodium salts of sulphonic acids or ammonium salts with chloride or bromide ions.

71. How detergents are good cleaning agents in hard water?

- A) i. Detergents are also having long hydro carbon chain and ionic end like soaps.
ii. But the ionic end of detergents is not form insoluble precipitate with the calcium and magnesium ions in hard water.
iii. Thus they remain effective cleaning agents in hard water.
iv. Detergents are usually used to make shampoos and washing powder etc.

72. Would you able to check hardness of water with detergents?

- A) No, you cannot use a detergent to check if water is hard because detergents form lather easily in both hard and soft water.

73. Why is agitation necessary to get clean clothes?

- A) i. Agitation is mainly necessary for cleaning clothes as it helps to get rid of oil, grease, and other impurities trapped inside the soap micelles.
ii. The particles are separated from the surfaces of the clothes and fall into the water, which helps in effectively cleaning the clothes.

74. Write the differences between soaps and detergents.

A)

SOAPS	DETERGENTS
i. Soaps are sodium or potassium salts of the long chain carboxylic acids.	i. Detergents are generally sodium salts of sulphonic acids or ammonium salts with chloride or bromide ions.
ii. The ionic group of the soap is $\text{-COO}^-\text{Na}^+$	ii. The ionic group of detergent is $\text{-SO}_4^-\text{Na}^+$
iii. Soaps are relatively weak cleansing action.	iii. Detergents have a strong cleansing action.
iv. Soaps are biodegradable.	iv. Some of the detergents are non-biodegradable
v. Soaps are not suitable for washing clothes in hard water.	v. Detergents can be used cleaning agents in both hard water and soft water.

75. Explain the nature of the covalent bond using the bond formation in CH_3Cl ?

- A) i. CH_3Cl is called mono chloro methane.
ii. In this molecule carbon contribute 4 electrons for bonding, because whose valence is tetra valance.
iii. Carbon shares three pairs of electrons with three hydrogen atoms and one pair with a chlorine atom.

iv. Like this carbon forms 4 single covalent bonds with three hydrogen atoms and one chlorine atom.

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

A) BY PHYSICAL PROPERTIES:

SMELL: Ethanol has a pleasant smell whereas ethanoic acid has a pungent smell like vinegar

TASTE: Ethanol has a burning taste whereas ethanoic acid has a sour taste

BOILING POINT: The boiling point of ethanol is low (78.5°C) whereas the boiling point of ethanoic acid is comparatively high (118°C)

BY CHEMICAL PROPERTIES:

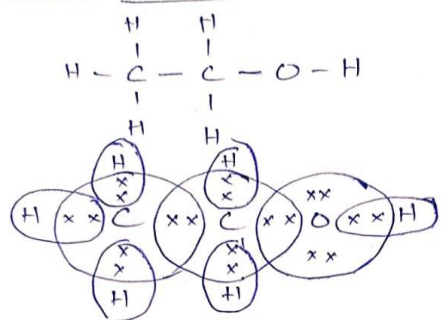
a. Ethanol has no action on any litmus but ethanoic acid turns blue litmus to red

b. Ethanol has no reaction with sodium hydrogen carbonate but ethanoic acid gives brisk effervescence of CO_2 with sodium hydrogen carbonate.

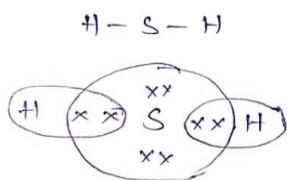
77. Draw the electron dot structures for Ethanoic acid, H_2S , propanone

A)

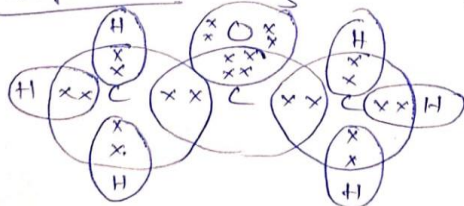
Ethanoic acid $\text{C}_2\text{H}_4\text{O}_2$



Hydrogen Sulphide (H_2S)



Propanone $\text{CH}_3-\text{CO}-\text{CH}_3$



78. What change will you observe if you test soap with litmus paper?

A) Soap solution turns red litmus to blue, because soaps are basic in nature.

79. Write the differences between Esterification and Saponification.

A)

Esterification	Saponification
i. This process is used to produce esters.	i. This process is used to produce soaps
ii. The reaction between carboxylic acids and alcohols is called 'Esterification'	ii. The alkaline hydrolysis of long chains of tri-esters of fatty acids is called 'Saponification'.
iii. Here products are sweet smelling substances	iii. Here products are soaps which are slippery in nature.
iv. In this reaction by-product is water	iv. In this reaction by-product is glycerol is an alcohol.
v. The chemical equation of Esterification is $\text{R-COOH} + \text{R-OH} \longrightarrow \text{R-COO-R} + \text{H}_2\text{O}$ <p style="text-align: center;">(Ester)</p>	v. The chemical equation of Saponification is $\text{R-COO-R} + \text{NaOH} \longrightarrow \text{R-COONa} + \text{R-OH}$ <p style="text-align: center;">(Soap) (Alcohol)</p>

-Prepared By: Bale Bhadrendra Mouli