

## Chapter -14

# Carbon and its Compounds

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### SYNOPSIS

Due to allotropy, the carbon forms many compounds. Another penults behavior of carbon is its ability to form longest chains with its own atoms.

The compounds containing only carbon and hydrogen in their molecular are called Hydrocarbons. Hydrocarbons are classified into two categories known as - open chain hydro carbons and closed chain hydrocarbons. Open chain hydrocarbons also called aliphatic hydrocarbons or acyclic hydrocarbons. All hydrocarbons are again classified as Alkanes, Alkenes and Alkynes.

We have millions of orgasmic compounds. As number of organic compounds is very big, it is difficult to remember their names individually. To overcome this problem they have to be properly named. For this, the International Union of Pure and Applied Chemistry (IUPAC) has been formed. This organization gives information about the nomenclature of organic compounds.

Some important chemical properties of carbon compounds are

- 1) Combustion;
- 2) Oxidation;
- 3) Addition;
- 4) Substitution.

Some important carbon compounds are -

- 1) Ethanol (Ethyl alcohol);
- 2) Ethanoic acid.

## 2Mark Questions

### 1. What are the general molecular formulae of alkanes, alkenes and alkynes? (AS1)

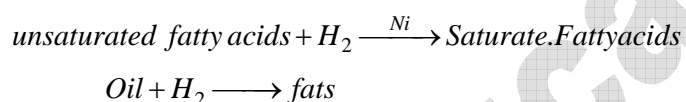
A. the general molecular formulae of alkane:  $C_nH_{2n+2}$

for alkene:  $C_nH_{2n}$

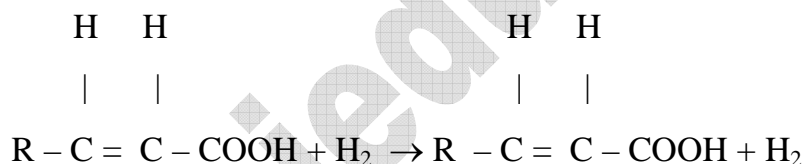
alkyne:  $C_nH_{2n-2}$

### 2. How an addition reaction is used in vegetable ghee industry? Explain with the help of a chemical equation. (AS1)

A. Hydrogenation of oils converts fats in vegetable ghee industry. During this addition reaction, unsaturated fatty acids (contain double bond) are converted into saturated fatty acids (contain single bond).



Eg:

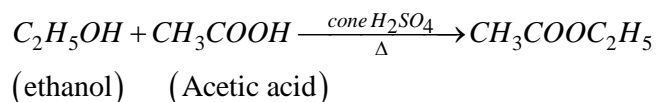


### 3. Give an example for esterification reaction.

A. The reaction between a carboxylic acid and an alcohol in the presence of conc.  $H_2SO_4$  form a fruity ordered substance, which is ester. This process is known as esterification reaction.

**For example:**

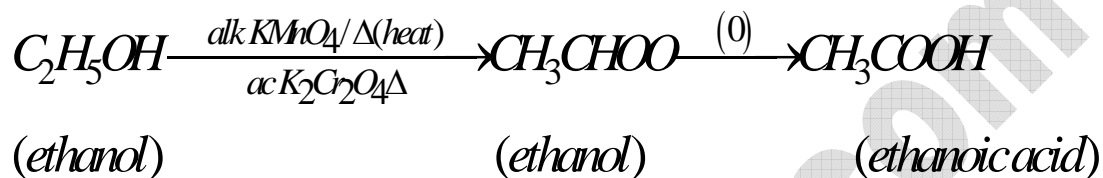
Ethyl alcohol reacts with ethanoic acid in the presence of conc.  $H_2SO_4$  to form ethyl acetate, an ester with sweet odour.



**4. Name the product obtained when ethanol is oxidized by either chromic anhydride or alkaline potassium permanganate. (AS1)**

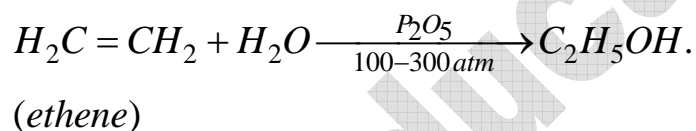
- A. When ethanol undergoes Oxidation, it forms the product acetaldehyde initially and acetic acid finally.

The reaction is as follows:



**5. Write the chemical equation representing the reaction of preparation of ethanol from ethane.**

- A. Ethene(C<sub>2</sub>H<sub>4</sub>) by the addition of water vapor to it in the presence of catalyst like P<sub>2</sub>O<sub>5</sub>, tungsten Oxide at high pressure and temperature.



**6. Write the IUPAC name of the next homologous of CH<sub>3</sub>OHCH<sub>2</sub>CH<sub>3</sub>. (AS1)**

- A. Given homologous:

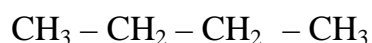


1 - propanol

Next homologous:

OH

|



2- Butanol.

7. Give the names of following functional groups-

(i) -CHO

O

||

(ii)  $\text{-C}=\text{O} \left( \begin{array}{c} \text{C} \\ / \quad \backslash \end{array} \right)$

A. (i) -CHO is aldehyde

(ii)  $\text{-}\overset{\text{O}}{\text{C}}\text{=O}$  is ketone

8. Why does carbon form compounds mainly by covalent bonding? (AS1)

A. Carbon has 4 electrons in its valence shell. The formation of  $\text{C}^{+4}$  ions by losing 4 electrons or the formation of  $\text{C}^{-4}$  ions by gain of 4 electrons is very difficult process. So it has to form four covalent bonds either with its own atoms or atoms of other elements.

9. Allotropy is a property shown by which class substance: elements, compounds or mixtures? Explain allotropy with suitable examples.

A. Allotropy is the property of an element to exist in 2 or more physical forms having more or less similar chemical properties but different physical properties is called as allotropy.

**Eg:** The allotropes of carbon are classified into 2 types they are-

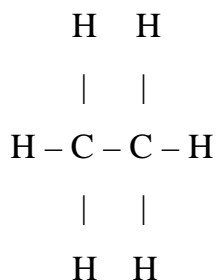
1) **Amorphous form:** Coal, Coke, Camp black etc,

2) **Crystalline form:** Diamond, Graphite, and Buckminster fullerene.

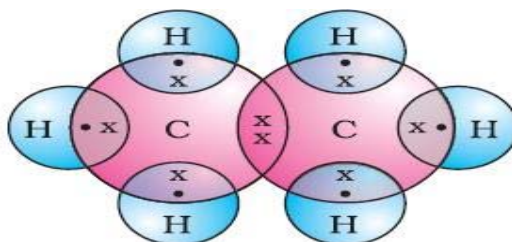


**13. Draw the electronic dot structure of ethane molecule (C<sub>2</sub>H<sub>6</sub>). (AS5)**

**A. Ethane- C<sub>2</sub>H<sub>6</sub>:**



**Electronic dot structure:**



**14. How do you appreciate the role of esters in everyday life?**

**A. Esters are very useful to our daily life. The uses of esters are:**

1. Esters are used for making artificial flavors and essences there are used in cold drinks, ice – creams sweets and perfumes
2. Esters are used as solvents for oils, fats, gums, resins, cellulose, paints, varnishes etc.
3. Esters are used as plasticizers.

**15. Mention the hybridization of carbon in the following compounds.**

**a) C<sub>2</sub>H<sub>4</sub>;    b) CH<sub>4</sub>;    c) C<sub>2</sub>H<sub>2</sub>**

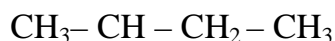
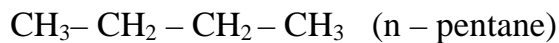
- A.**
- a) C<sub>2</sub>H<sub>4</sub> — sp<sup>2</sup>
  - b) CH<sub>4</sub> — sp<sup>3</sup>
  - c) C<sub>2</sub>H<sub>2</sub> — sp

**16. Carbon is versatile in nature. Justify the statement.**

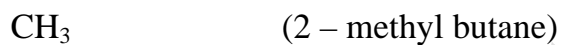
- A.** The ability of carbon to form bonds in so many ways made it as versatile in nature i.e.,
- To form largest carbon compounds
  - Catenation
  - To form various types of bonds.

**17. Draw the isomers of  $C_5H_{12}$  &  $C_6H_{14}$ .**

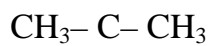
**A. For  $C_5H_{12}$ :**



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|



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**For  $C_6H_{14}$ :**

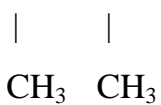
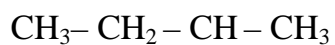


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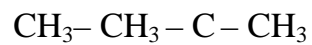


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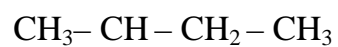




(2,3 - dimethyl butane)



(2,2 dimethyl butane)



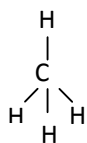
(2 ethyl butane)



## 1 Mark Questions

1. Name the simplest hydrocarbon. (AS1)

A. The simplest hydrocarbon is methane (CH<sub>4</sub>)



2. Name the carboxylic acid used as a preservative. (AS1)

A. Acetic acid (or) ethanoic acid (CH<sub>3</sub>COOH) is used as a preservative.

3. Name the product other than water formed on burning of ethanol in air (AS1).

A. When ethanol is burnt in air the product formed other than water is carbon dioxide (CO<sub>2</sub>).

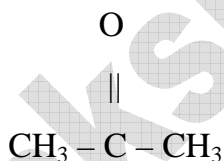
The reaction is as follows



4. Name the simplest ketone and write its molecular formula (AS1)

A. The simplest ketone is acetone.

Formula:



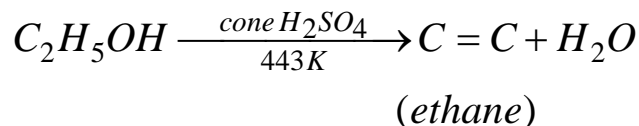
IUPAC Name: 2 – propanone

5. What do we call the self linking property of carbon?

A. The self linking property of carbon is called “Catenation”. If any element forms bonds between its own atoms to give any big molecule, we call this property as catenation property.

**6. Name the compound formed by heating ethanol at 443 K with excess of conc. H<sub>2</sub>SO<sub>4</sub>. (AS1)**

- A. Ethanol when heating with excess of conc. H<sub>2</sub>SO<sub>4</sub> at 443K produces ethane



It is a dehydration reaction.

H<sub>2</sub>SO<sub>4</sub> is an dehydrating agent and removes H<sub>2</sub>O.

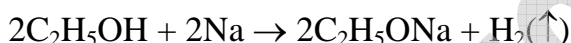
**7. Name the acid present in vinegar. (AS1)**

- A. The acid present in vinegar is us 5 - 8% ethanoic acid (or) Acetic acid.

Its formula is CH<sub>3</sub>COOH.

**8. What happens when a small piece of sodium is dropped into ethanol?**

- A. When a small piece of sodium is dropped into ethanol releases hydrogen gas.



**9. Give the electronic configurations of carbon in both group state and excited states.**

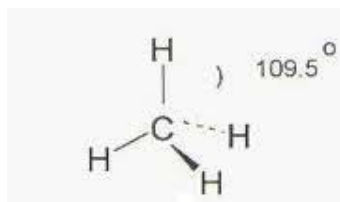
- A. Electronic configuration of carbon atom,

In ground states  $\rightarrow 1s^2 2s^2 sp^2$

In excited state  $\rightarrow 1s^2 2s^1 2p^3$

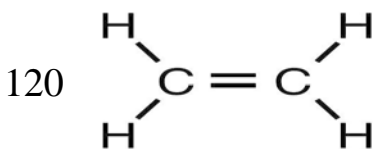
**10. Mention the bond angles between H-C-H in**

- a) CH<sub>4</sub>  
 b) C<sub>2</sub>H<sub>4</sub>  
 c) C<sub>2</sub>H<sub>2</sub>

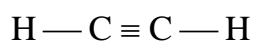


- A. a) CH<sub>4</sub> ---- 109°28'

b) C<sub>2</sub>H<sub>4</sub>



c) C<sub>2</sub>H<sub>2</sub> - 180°



**11. How are Allotropes formed?**

A. Allotropes are formed due to difference in arrangement of atoms in the molecule.

**12. Mention the structure of each carbon atom in diamond & graphite.**

A. Diamond – tetragonal

Graphite – trigonal

**13. What is meant by homologous?**

A. The individual compound in a homologous series is known as homologs.

**14. Define combustion reaction?**

A. The process of burning of carbon (or) carbon compounds in excess of Oxygen to give heat & light is termed as combustion reaction.

## 4 Mark Questions

1. Give the IUPAC name of the following compounds. If more than one compound is possible name all of them.

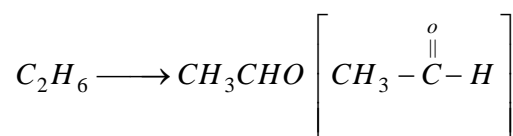
i. An aldehyde derived from ethane.

ii. A ketone derived from butane.

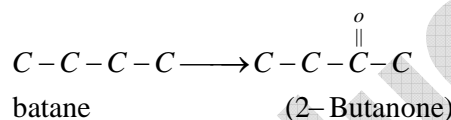
iii. A chloride derived from propane.

iv. An alcohol derived from pentane.

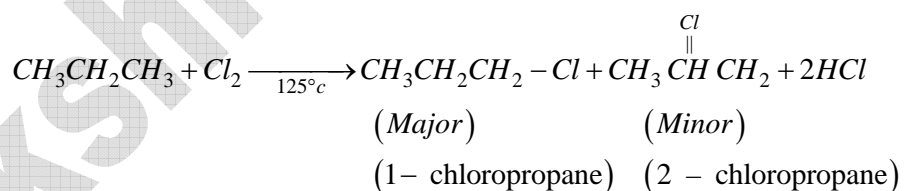
A. i. Ethanol is the aldehyde derived from ethane



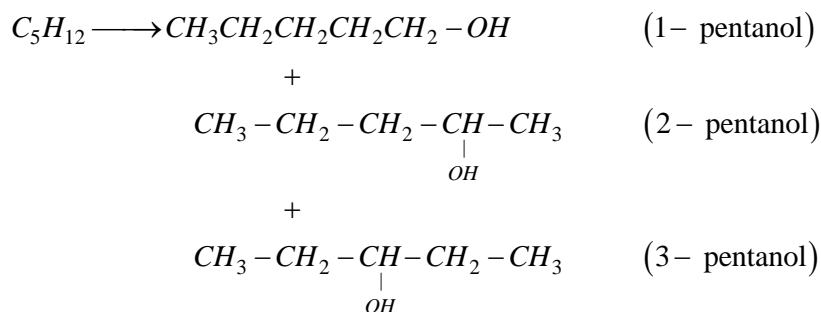
ii. 2-Butanone is the ketone derived from butane



iii. On reaction of propane with chlorine gas it forms, 1- chloropropane and 2 – chloropropane



iv.



**2. A mixture of oxygen and ethyne is burnt for welding; can you tell why a mixture of ethyne and air is not used? (AS1)**

A.

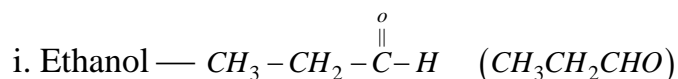
- 1) The heat and temperature produced by an acetylene flame depend upon the amount of oxygen used to burn it.
- 2) Air-acetylene produces a flame temperature of around (4000°F) 2200°C. This is hot enough to solder aluminum work glass, repair radiators and braze plumbing fixtures. It is not hot enough to weld steel.
- 3) When acetylene is burned in pure oxygen, the flame temperature may be as high as 5730°C (3166°C). However, the flame temperature and the amount of heat generated (Measured as BTUs (or) kilogram calories) depend upon the ratio of oxygen to acetylene used.

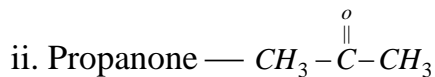
**3. a. What are the various possible structural formulae of a compound having molecular formula C<sub>3</sub>H<sub>6</sub>O?**

**b. Give the IUPAC names of the above possible compounds and represent them in structures.**

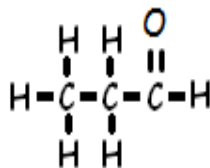
**c. What is the similarity in these compounds?**

A. a) For molecular formula (C<sub>3</sub>H<sub>6</sub>O):

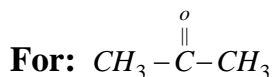




b) For ethanol ---



IUPAC NAME: Propanal



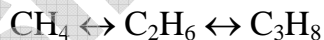
IUPAC NAME: propanone

c) In both the compounds

- i. Contains functional groups ( $-\overset{O}{\parallel}C-$ ) [Carbonyl functional group]
- ii. Having same molecular formula
- iii. Both are having  $2sp^3$  hybridised carbons and one  $sp^2$  hybridised carbon atom.

**4. Define homologous series of carbon compounds. Mention any 2 characteristics of homologous series.**

A. Homologous Series: The series of carbon compounds in which successive series compounds differ by  $[CH_2]$  unit is called Homologous series.



difference                      difference  
by  $CH_2$  group                  by  $CH_2$  group

**Characteristics of Homologous Series:**

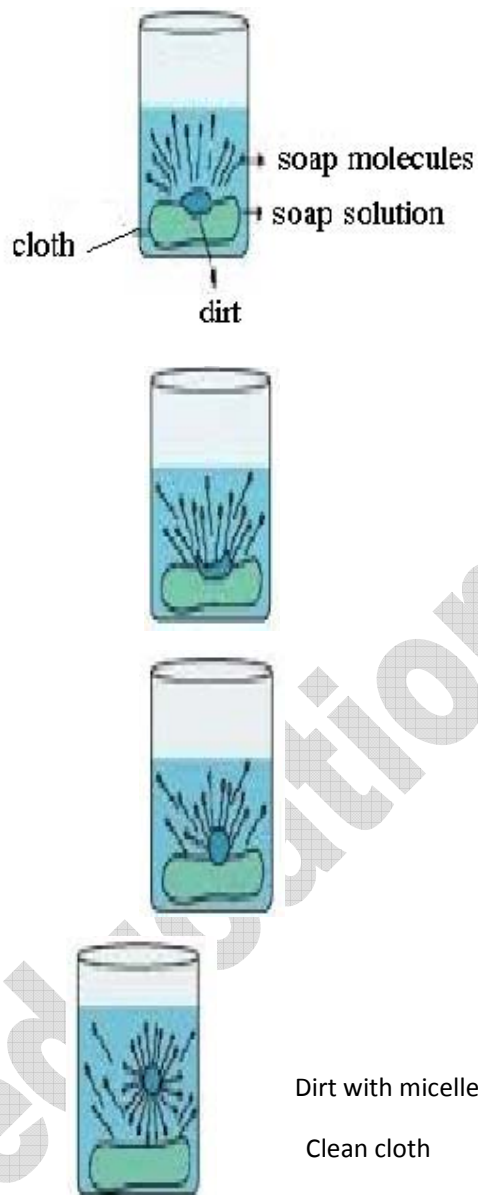
- i. They have general formula.  
General formulas of alkanes —  $C_nH_{2n+2}$   
alkanes —  $C_nH_{2n}$   
alkynes —  $C_nH_{2n-2}$
- ii. Successive compounds in the series possess a difference of  $(CH_2)$  unit.

- iii. They possess similar chemical properties due to same functional group.
- iv. They show a regular gradation in their physical properties.

**5. Explain the cleaning action of soap.**

**A.**

- i. Soaps and detergents make oil and dirt present on the cloth come out into water, thereby making the cloth clean.
- ii. Soap has one polar end (the end with  $-\overset{\overset{O}{\parallel}}{C}-OH$  carboxyl) and one non-polar end (the end with hydrocarbon chain) as shown here.
- iii. The polar end is hydrophilic in nature and attracted towards water.
- iv. The non-polar end is hydrophobic in nature and attracted towards grease or oil on the cloth, but not towards water.
- v. When soap dissolves in water, its hydrophobic ends attach themselves to dirt and remove it from cloth, as shown sequentially in the figure.
- vi. The hydrophobic end of the soap molecules move towards the dirt or grease particle.
- vii. The hydrophobic ends attach themselves to dirt particle and try to pull out.
- viii. The molecule of soap surrounds the dirt particles at the centre of the cluster and forms a spherical structure called micelle.
- ix. These micelles remain suspended in water-like particles in a colloidal solution.
- x. The various micelles present in water do not come together to form a precipitate as each micelle repels the other because of the ion-ion repulsion.
- xi. Thus, the dirt particles remain trapped in micelles and are easily rinsed away with water. Hence, soap micelles remove dirt by dissolving in water.



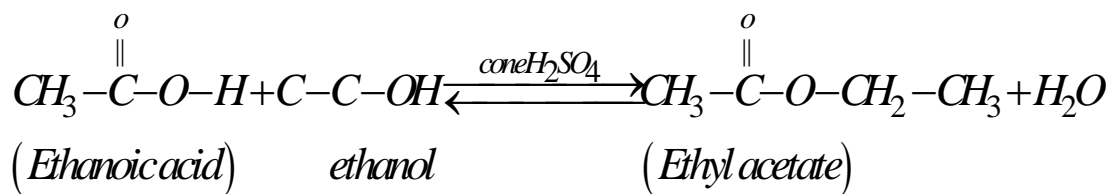
**6. Distinguish between Esterification and Saponification reactions of organic compounds.**

**A. Esterification:**

Esterification is the reaction in which a carboxylic acid combines with an alcohol in the presence of little conc.  $H_2SO_4$  to form an ester. These esters so formed are pleasant smelling.



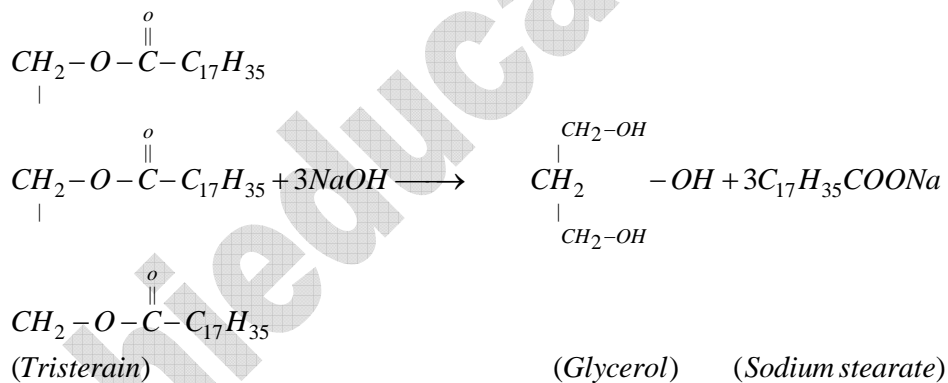
Ex:



- This is a reversible reaction
- This is an example of dehydration reaction
- This is used to prepare different types of esters.

### Saponification:

Saponification is defined as the hydrolysis of oil under basic conditions leading to the formation of sodium salt of carboxylic acid and glycerol.



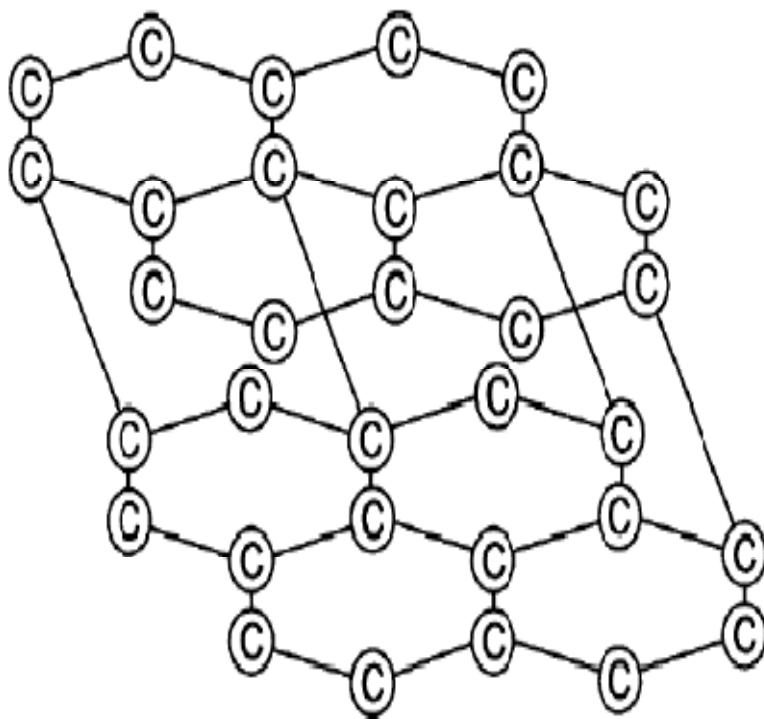
- This is irreversible reaction
- This reaction is an example for hydrolysis
- It is used to prepare soaps from long chain esters or glycerol

**7. Explain the structure of graphite in term of bonding and give one property based on this structure.**

A.

1. Graphite forms a 2 dimensional layer structure with c-c bonds within the layers. There are relatively weak interaction between the layers

2. In a layer structure, the carbon atoms are in a trigonal planar environment. This is consistent with each carbon atom in  $sp^2$  hybridisation
3. Integrations between  $sp^2$  orbitals leads to the formation of c – c bonds
4. Each carbon atoms is with one unhybridised 'p' orbital.
5. The unhyrdised 'p' orbital interacts to form 'x' system that is delocalized over the whole layer.
6. The interactions (or) London dispersion forces between the layers which are separated by a distance of  $3.35^0\text{A}$  are weakened by the presence of water molecules so that it is easy to leave graphite.
7. For this reason graphite is used as lubricant and as the 'lead' in pencils.



**8. Suggest a test to find the hardness of water and explain the procedure.**

A. Hardness of water can be tested with the help of good quality soap.

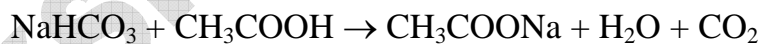
**Procedure:**

1. Take 50ml of water from different sources i.e., tap water, well water, lake water, pond water, rivers water, etc, in different test tubes and label them as A, B, C, D etc.,
2. Add 1gm of good quality soap to each test tube.
3. Close the each test tube with rubber corks.
4. Shake test tube A for 15 seconds and keep it. Undisturbed for 30 seconds. Measure the height of the foam formed. Note the height of foam in our notebook.
5. Repeat the process for each test tube and record your observation in your notebook.
6. The water which gives less foam is considered as hard water.

**9. Suggest a chemical test to distinguish between ethanol and ethanoic acid & explain the procedure.**

A.

1. Take ethanol and ethanoic acid in 2 different test tubes
2. Add nearly 18ml of sodium bicarbonate ( $\text{NaHCO}_3$ ) to each test tube.
3. Lots and lots of bubbles and foam can be observed from the test tube containing ethanoic acid. This is due to release of  $\text{CO}_2$ .



4. Ethanol will not react with sodium bicarbonate and thus we won't observe any change in the test tube containing ethanol.

Thus we can distinguish ethanol from ethanoic acid.

9. An organic compound 'x' with molecular formula  $C_2H_6O$  undergoes Oxidation with alkaline  $KMnO_4$  and forms the compound y, which has molecular formula  $C_2H_4O_2$ .

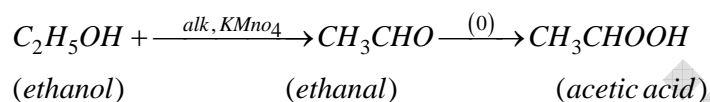
a) Identify X and Y.

b) Write your observation regarding the product when the compound 'X' is made to react with compound 'Y' which is used as a preservative for pickles.

A. a) X – ethanol [ $C_2H_6O$ ]

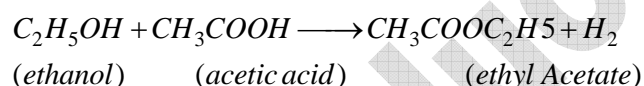
Y – Ethanoic Acid [ $C_2H_4O_2$ ]

Ethanol undergoes Oxidation to form the product Acetaldehyde and finally forms acetic acid.



Here  $CH_3COOH$  is used as a preservative for pickles.

b) When (X) ethanol reacts with y (Acetic acid) produces an ester, a ethyl acetate which is used as a preservative for pickles



## 10. Collect information about artificial ripening of fruits by ethylene. (AS4)

### A. Chemistry of Ripening:

- 1) During ripening, the starch in the fruit breaks down to form sugar. The colour of fruit skin changes.
- 2) The ripening of fruit depends on the season. The plant can detect the changes in season, produces ethylene ( $C_2H_4$ ) and spreads across the plant.
- 3) When ethylene reaches the fruits, it sends a signal to all the cells in the fruit to make enzymes which breaks starch into sugar.
- 4) The cell in the start making pigments, which give the fruit its colour.

### **Artificial Ripening:**

1. Raw fruits are kept in hay-lined wooden boxes called crates. These crates are stacked on shelves and a wood fire is lit below them. The smoke contains ethylene and acetylene gases and they induce ripening.
2. Fruits are placed in a room in which ethylene gas (or) acetylene gas is introduced.
3. In another method calcium carbide ( $\text{CaC}_2$ ) is applied over fruits. It reacts with moisture to form acetylene, which induces ripening.

### **11. How do you condemn the use of alcohol as a social practice?**

**A.** Consumption of alcohol leads to the many problems in the society and it must be regulated in the society; otherwise we may face so many social problems. We may condemn the use of alcohols by -

1. Educate people on positive values that would help them to avoid alcohol. The alcohol consumption adversely affects the country's development. We need to regret over the manner in which have taken to alcohol.
2. There are inscriptions on the bottles of such drinks saying they are only meant for those above 18. However, many times this rule is not being observed.
3. Take the initiative of developing a bye-law that will debar the drinking bar keepers from selling alcoholic beverages.
4. The government must control the alcohol consumption, if not entirely bars it, by taking measures such as issuing less number of permits and leaving heavy taxes on liquor products.

**12. An Organic compound with molecular formula  $\text{C}_2\text{H}_4\text{O}_2$  produces brick effervescence on addition of sodium carbonate bicarbonate. Answer the following.**

- a. Identify the organic compound.**
- b. Write the chemical equation for the above reaction.**
- c. Name the gas evolved.**
- d. How will you test the gas evolved?**
- e. List 2 important uses of the above compound.**

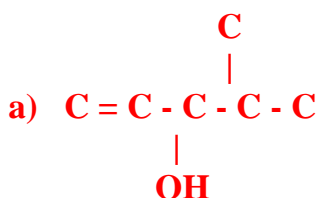
- A.
- Acetic acid [ $\text{CH}_3\text{COOH}$ ]
  - $2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COONa} + \text{H}_2 + \text{CO}_2$   
 $\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$
  - Carbon di Oxide ( $\text{CO}_2$ )
  - When the evolved gas is passed into lime water, lime water turns to milky white basing on the observation, we conclude that the evolved gas is carbon dioxide.
  - Ethanoic acid is used as
    - Preservation for pickles
    - Solvent in industry
    - Preparation of dyes, drugs
    - Curing meat, fish.

**13. 1 ml of glacial acetic acid & 1ml of ethanol are mixed together in a test tube. Few drops of Conc.  $\text{H}_2\text{SO}_4$  is added in the mixture are warmed in a water bath for 5 min. Answer the following:**

- Name the resultant compound formed.
- Represent the above change by a chemical equation.
- What term is given to such a reactions.
- What are the special characteristics of the compound formed?

- A.
- Ethyl acetate ( $\text{CH}_3\text{COOC}_2\text{H}_5$ ) an ester
  - $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \xrightarrow[-\text{H}_2\text{O}]{\text{H}_2\text{SO}_4} \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$
  - Etherification reaction
  - The formed compound when poured into water, we observed a sweet fruit odor.

**14. Name the compound, based on IUPAC Nomenclature.**



b) C – OH

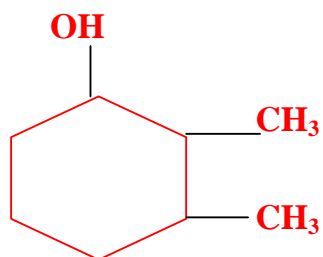
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C – OH

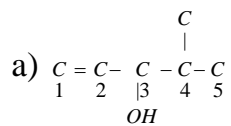
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C – OH

c)



A.



3- hydroxyl, 4 – methyl pent-1-ene

b)

C – OH

|

C – OH

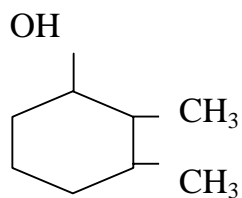
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C – OH

1,2,3 – trihydroxy propane

c)

2,3 dimethylcyclohexane -1-ol



## Multiple Choice Questions

1. Which of the four test tubes containing the following chemicals shows the brisk effervescence when dilute acetic acid was added to them? [ ]
- i) KOH                      ii) NaHCO<sub>3</sub>  
iii) K<sub>2</sub>CO<sub>3</sub>                iv) NaCl
- a) i & ii                      b) ii & iii  
c) i & iv                      d) ii & iii
2. Which of the following solution of acetic acid in water can be used as preservative? [ ]
- a) 5-10%                      b) 10-15%  
c) 15-20%                      d) 100%
3. The suffix used for naming an aldehyde is? [ ]
- a) - ol                      b) - al                      c) - one                      d) - ene
4. Acetic acid, when dissolved in water, it dissociates into ions reversibly, because it is a: [ ]
- a) Weak acid                      b) Strong acid  
c) Weak base                      d) Strong base
5. Which one of the following hydrocarbon can show isomerism? [ ]
- a) C<sub>2</sub>H<sub>4</sub>                      b) C<sub>2</sub>H<sub>6</sub>                      c) C<sub>3</sub>H<sub>8</sub>                      d) C<sub>4</sub>H<sub>10</sub>
6. Combustion of hydrocarbon is generally accompanied by the evolution of: [ ]
- a) Heat                                      b) Light  
c) Both heat and light                      d) Electric current.



7. 2 ml of ethanoic acid was taken in each of the three test tubes A, B and C and 2 ml, 4ml and 8ml water was added to them, respectively. A clear solution is obtained in: [ ]

- a) Test tube A only                      b) Test tubes A & B only.  
c) Test tubes B and C only            d) All the test tubes.

8. If 2 ml of acetic acid was added slowly in drops to 5ml of water, then we will notice [ ]

- a) The acid forms a separate layer on the top of water.  
b) Water forms a separate layer on the top of the acid.  
c) Formation of a clear and homogenous solution.  
d) Formation of a pink and clear solution.

9. A few drops of ethanoic acid were added to solid sodium carbonate. The possible results of the reactions are: [ ]

- a) A hissing sound evolved            b) Brown fumes evolved.  
c) Brisk effervescence occurred      d) A pungent smelling gas evolved

10. When acetic acid reacts with ethyl alcohol, we add conc.  $H_2SO_4$ , it acts as \_\_\_\_\_ and the process is called \_\_\_\_ [ ]

- a) Oxidizing agent, Saponification    b) Dehydrating agent, Esterification  
c) Reducing agent, Esterification      d) Acid & Esterification

11. Hybridisation deals with? [ ]

- a) Electrons                      b) Orbitals                      c) Both                      d) None of them

Key: 1.b; 2. a; 3. b; 4. a; 5. d; 6. c; 7. d; 8. c; 9. c; 10. b. 11. B.

## Fill in the Blanks

1. Carbon compounds containing double and triple bonds are called \_\_\_\_\_.
2. A compound which is basic constituent of many cough syrups is \_\_\_\_\_.
3. Very dilute solution of ethanoic acid is \_\_\_\_\_.
4. A sweet odour substance formed by the reaction of an alcohol and a carboxylic acid is \_\_\_\_\_.
5. When sodium metal is dropped in ethanol, \_\_\_\_\_ gas will be released.
6. The functional group present in methanol is \_\_\_\_\_.
7. IUPAC name of alkene containing 3 carbon atoms is \_\_\_\_\_.
8. The first member of homologous series among alkynes is \_\_\_\_\_.
9. The product that is formed by dehydration of ethanol in conc. sulphuric acid is \_\_\_\_\_.
10. Number of single covalent bonds in ammonia are \_\_\_\_\_.
11. Type of reactions shown by alkenes is \_\_\_\_\_.
12. Bond angle in  $\text{CH}_4$  is \_\_\_\_\_.
13. 10% ethanol in gasoline is known as \_\_\_\_\_.
14. In periodic table (Modern periodic table), to which group, does the carbon belongs to \_\_\_\_\_.
15. As per heat energy is considered, combustion reaction is \_\_\_\_\_ in nature.

### Key:

- |                              |                             |                 |
|------------------------------|-----------------------------|-----------------|
| 1) Unsaturated hydrocarbons; | 2) Ethanol;                 | 3) vinegar;     |
| 4) Ester;                    | 5) Hydrogen;                | 6) Alcohol;     |
| 7) 1- propene;               | 8) Acetylene /Ethyne;       | 9) Ethene;      |
| 10) Three (3);               | 11) Substitution reactions; | 12) 109°28';    |
| 13) Gasohol;                 | 14) IVA;                    | 15) Exothermic; |

Match the Following

- |                     |     |         |
|---------------------|-----|---------|
| 1. Alcohols         | [ ] | a) CHO  |
| 2. Aldehydes        | [ ] | b) COOR |
| 3. Kctone           | [ ] | c) OH   |
| 4. Carboxylic acids | [ ] | d) CO   |
| 5. Esters           | [ ] | e) COOH |

**Key:** 1.c; 2. a; 3. d; 4. e; 5. B.

**II.**

- |                                     |     |                  |
|-------------------------------------|-----|------------------|
| 1. CH <sub>4</sub>                  | [ ] | a) Ethanoic acid |
| 2. C <sub>2</sub> H <sub>5</sub> OH | [ ] | b) Ethyne        |
| 3. CH <sub>3</sub> COOH             | [ ] | c) Ethane        |
| 4. C <sub>2</sub> H <sub>4</sub>    | [ ] | d) Methane       |
| 5. C <sub>2</sub> H <sub>2</sub>    | [ ] | e) Ethanol       |

**Key:** 1.d; 2. e; 3. a; 4. c; 5. B.

**III**

- |                           |     |                |
|---------------------------|-----|----------------|
| 1. Welding Industry       | [ ] | a) Graphite    |
| 2. Syrups                 | [ ] | b) acetylene   |
| 3. Preservative of pickle | [ ] | c) Graphene    |
| 4. Lead pencil            | [ ] | d) Acetic acid |
| 5. Electric conductor     | [ ] | e) Ethanol     |

**Key:** 1.b; 2. e; 3. d; 4. a; 5. C.