

## 14. CARBON AND ITS COMPOUNDS

### Questions and Answers

#### 1. Name the simplest hydrocarbon.

A. Methane (CH<sub>4</sub>) is the simplest hydrocarbon.

#### 2. What are the general molecular formulae of alkanes, alkenes and alkynes.

A.

Sl No	Type of Hydrocarbon	General molecular formula
1	Alkane	C <sub>n</sub> H <sub>2n+2</sub>
2	Alkene	C <sub>n</sub> H <sub>2n</sub>
3	Alkyne	C <sub>n</sub> H <sub>2n-2</sub>

#### 3. Name the carboxylic acid used as a preservative.

A. Generally vinegar (acetic acid) is used as preservative. Some times benzoic acid, citric acid, formic acid are also used.

#### 4. Name the product other than water formed on burning of ethanol in air.

A. The product other than water formed on burning of ethanol in air is carbon dioxide.  
 $C_2H_5OH + 3O_2 \rightarrow 3H_2O + 2CO_2 + \text{Heat}$

#### 5. 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) An aldehyde derived from ethane is ethanal. The formula of ethanal is CH<sub>3</sub>CHO.

(ii) A ketone derived from butane is butanone. The formula of butanone is C<sub>2</sub>H<sub>5</sub>COCH<sub>3</sub>.

(iii) A chloride derived from propane is Propyl chloride or chloro propane. The formula of chloro propane is C<sub>3</sub>H<sub>7</sub>Cl.

(iv) An alcohol derived from pentane is pentanol. The formula of pentanol is CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>OH.

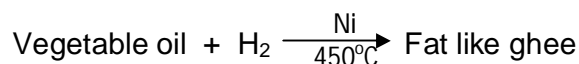
#### 6. A mixture of oxygen and ethyne is burnt for welding; can you tell why a mixture of ethyne and air is not used?

A. Ethyne with oxygen produces enough heat that can be used in welding to melt hard metals. Nitrogen, an inactive gas present in air. So If ethyne is burnt in air, it under goes in incomplete reaction. Then sufficient heat is not produced. So a mixture of ethyne and air is not used in welding.

#### 7. Explain with the help of a chemical equation, how an addition reaction is used in vegetable ghee industry.

A. **Addition Reaction:** A reaction which one molecule combines with another to form only one new large molecule is called addition reaction.

In a vegetable ghee industry, the unsaturated vegetable oils were reacted with hydrogen in the presence of Nickel catalyst at 450°C temperature. They produce saturated fats like ghee. This is an example of Addition reaction.

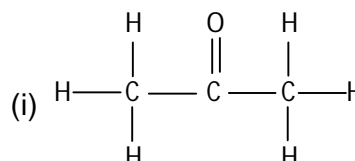


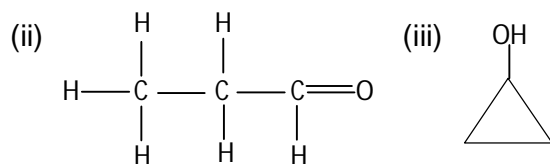
#### 8. a. What are the various possible structural formulae of a compound having molecular formula C<sub>3</sub>H<sub>6</sub>O ?

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) Given molecular formula is C<sub>3</sub>H<sub>6</sub>O.





(b) The IUPAC names of above compounds are

- (i) Propanone (or) acetone
- (ii) Propanal (or) Propanaldehyde
- (iii) cyclo propanol

(c) They have same molecular formula.

**9. Name the simplest ketone and write its molecular formula.**

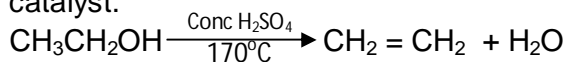
A. The simplest ketone is Propanone. Its molecular formula is  $\text{CH}_3\text{COCH}_3$ . This is also called as acetone.

**10. What do we call the Self linking property of carbon?**

A. The Self linking property of carbon is called catenation.

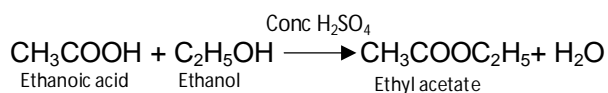
**11. Name the compound formed by heating ethanol at 443 K with excess of conc.  $\text{H}_2\text{SO}_4$ .**

A. The compound formed by heating ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ) at 443 K with excess of conc.  $\text{H}_2\text{SO}_4$  is ethene or ethylene ( $\text{C}_2\text{H}_4$ ). In this reaction sulphuric acid acts as a catalyst.



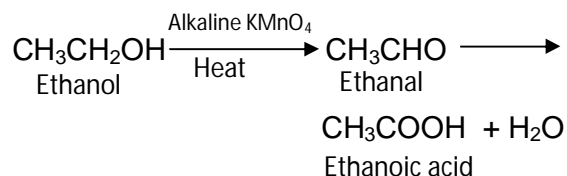
**12. Give an example for esterification reaction.**

A. The reaction between carboxylic acid and an alcohol in the presence of conc.  $\text{H}_2\text{SO}_4$  to form a sweet odoured substance with functional group  $-\text{COOR}$  is called esterification.



**13. Name the product obtained when ethanol is oxidized by either chromic anhydride or alkaline potassium permanganate.**

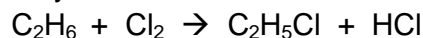
A. Ethanol is oxidized to form acetaldehyde and finally acetic acid. Chromic anhydride or alkaline potassium permanganate is used as catalyst in this reaction.



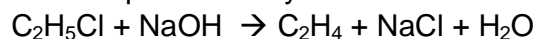
**14. Write the chemical equation representing the reaction of preparation of ethanol from ethane.**

A. Preparation of ethanol from ethane:

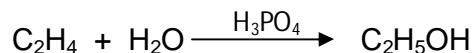
(i) Ethane reacts with chlorine to form ethyl chloride.



(ii) On reaction with aqueous NaOH, ethyl chloride produce ethylene.



(iii) Ethylene can react with water/ steam in the presence of Phosphoric acid (catalyst) to produce ethanol.



**15. Write the IUPAC name of the next homologous of  $\text{CH}_3\text{OHCH}_2\text{CH}_3$ .**

A. The given compound is propanol ( $\text{CH}_3\text{OHCH}_2\text{CH}_3$ ).

The next homologous compound is butanol. The formula of butanol is  $\text{CH}_3\text{OHCH}_2\text{CH}_2\text{CH}_3$ .

**16. Define homologous series of carbon compounds; Mention any two characteristics of homologous series..**

A. The series of carbon compounds in which two successive compounds differ by  $-\text{CH}_2$  unit is called homologous series.

**Ex:** 1.  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$ ,  $\text{C}_3\text{H}_8$ , .....

The characteristics of homologous series:

(i) They have one general formula.

**Ex:** The general formula of alkanes is  $\text{C}_n\text{H}_{2n+2}$

(ii) Successive compounds in this series differ by  $-\text{CH}_2$  unit.

(iii) They possess similar chemical properties due to the same functional group.

(iv) They show a regular gradation in their physical properties.

### 17. Give the names of functional groups

(i) -CHO (ii) -C=O.

A. The names of given functional groups are:

- (i) -CHO is Aldehyde functional group
- (ii) -C=O is ketone functional group

### 18. Why does carbon form compounds mainly by covalent bonding?

A. The atomic number of carbon is Z=6. Its electronic configuration is  $1s^2 2s^2 2p^2$ . The number of valence electrons is 4. It is not possible either to remove 4 electrons or to add 4 electrons to carbon because carbon is a small atom and electrons are strongly bound to the nucleus. So carbon can only form covalent compounds by sharing of electrons.

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

A. The property of an element that exist in two or more physical forms is called Allotropy. The different forms of elements are called allotropes of that element. They are having more or less similar chemical properties.

Allotropy is shown by elements only.

**Ex:1** some allotropes of carbon are diamond, graphite, buck minster fullerene

**Ex:2** some allotropes of sulphur are Rhombic, monoclinic and plastic sulphur.

### 20. Explain how sodium ethoxide is obtained from ethanol? Give chemical equations.

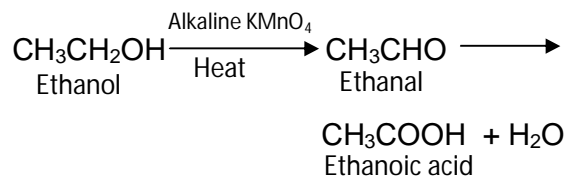
A. Ethanol reacts with metallic sodium to liberate  $H_2$  gas and form sodium ethoxide.

$$2CH_3CH_2OH + 2Na \rightarrow 2CH_3CH_2ONa + H_2$$

Ethanol                  sodium                  Sodium ethoxide

### 21. Describe with chemical equation how ethanoic acid may be obtained from ethanol.

A. Ethanol is oxidized to form acetaldehyde and finally acetic acid. Chromatic anhydride or alkaline potassium permanganate is used as catalyst in this reaction.

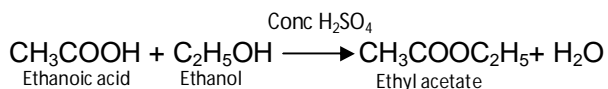


### 22. Explain the cleansing action of soap.

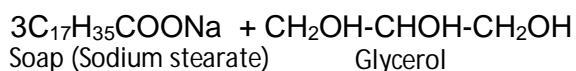
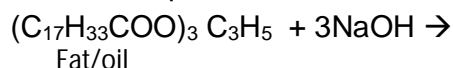
A. Soaps form micelles in water. The dirt from clothes get attached to the centre of micelle. They stay in solution of soap as colloid and are easily rinsed away. Thus the soap cleans the dirt.

### 23. Distinguish between esterification and saponification reactions of organic compounds.

A. **Esterification:** The reaction between carboxylic acid and alcohol in the presence of conc.  $H_2SO_4$ , to form a sweet odoured substance, ester with functional group -COOR is called esterification.



**Saponification :** The hydrolysis process of fats or oils with alkalis to obtain soap is called saponification.



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

A. Structure of Graphite:

(i) Each carbon atom in a layer of graphite is joined to three another carbon atoms. These bonds are strong. They form hexagonal rings.

(ii) The layers of graphite are quite far such that there exist weak interaction between carbon atoms of various layers.

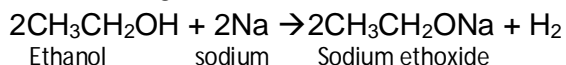
(iii) Due to this structure, graphite is used as lubricant. And also it is a good electric conductor.

25. Name the acid present in vinegar.

A. Acetic acid ( $\text{CH}_3\text{COOH}$ ) is present in Vinegar.

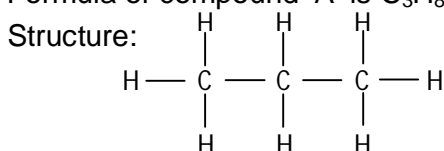
26. What happens when a small piece of sodium is dropped into ethanol?

A. Ethanol reacts with metallic sodium to liberate  $\text{H}_2$  gas and form sodium ethoxide.

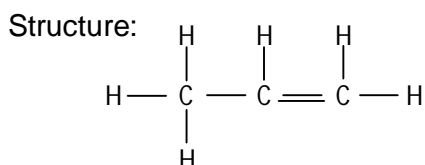


27. Two carbon compounds A and B have molecular formula  $\text{C}_3\text{H}_8$  and  $\text{C}_3\text{H}_6$  respectively. Which one of the two is most likely to show addition? Justify your answer.

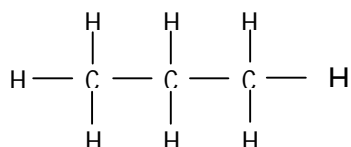
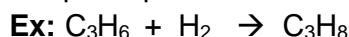
A. (i) Formula of compound 'A' is  $\text{C}_3\text{H}_8$ .



(ii) Formula of compound 'B' is  $\text{C}_3\text{H}_6$ .



'A' is saturated hydrocarbon and 'B' is unsaturated hydrocarbon. So compound 'B' participates in addition reactions.



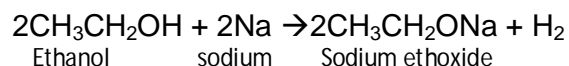
28. Suggest a test to find the hardness of water and explain the procedure.

A. Take two test tubes. Fill one with distilled water and the other with pump water. Add 2ml of soap solution to both the test tubes. Shake the test tubes vigorously for 30 seconds. And leave them for 30 seconds in the stand. Observe the foam formed. The level of foam in distilled water is more than to that of pump water. Thus we declare that pump water is hard water.

29. Suggest a chemical test to distinguish between ethanol and ethanoic acid and explain the procedure.

A. (i) Ethanol does not react with blue litmus paper. But ethanoic acid reacts with blue litmus paper and turned it into red.

(ii) Ethanol reacts with metallic sodium to liberate  $\text{H}_2$  gas and form sodium ethoxide.



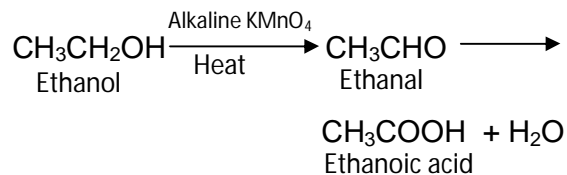
But ethanoic acid does not liberate  $\text{H}_2$  gas in with sodium metal.

30. An organic compound 'X' with a molecular formula  $\text{C}_2\text{H}_6\text{O}$  undergoes oxidation with alkaline  $\text{KMnO}_4$  and forms the compound 'Y', that has molecular formula  $\text{C}_2\text{H}_4\text{O}_2$ .

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.

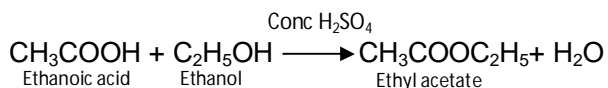


(i) 'X' is ethanol ( $\text{CH}_3\text{CH}_2\text{OH}$ )

'Y' is ethanoic acid ( $\text{CH}_3\text{COOH}$ )

Ethanoic acid is used as preservative.

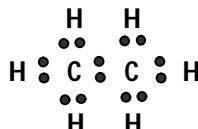
(ii) If 'X' (ethanol) is made to react with 'Y' (ethanoic acid) produced a sweet odoured substance called ester (ethyl acetate).



33. Draw the electronic dot structure of ethane molecule.

A. Ethane formula is  $\text{C}_2\text{H}_6$ .

The electronic dot structure of ethane is



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

- A. (i) Esters are sweet smelling substances.  
(ii) These are used in making perfumes.  
(iii) Esters are used in saponification to produce soaps.  
(iv) Hence I appreciate the role of esters in daily life.

**35. How do you condemn the use of alcohol as a social practice.**

- A. (i) The common name of ethanol is alcohol.  
(ii) Consumption of small quantity of ethanol causes drunkenness.  
(iii) Large quantity of ethanol consumption effect the nervous system.  
(iv) Ethanol consumption leads to slow down the metabolic processes.  
(v) Driving vehicles when taken alcohol causes accidents.

So, I condemn the use of alcohol as a social practice.

**36. An organic compound with molecular formula  $C_2H_4O_2$  produces brisk effervescence on addition of sodium carbonate / bicarbonate. Answer the following:**

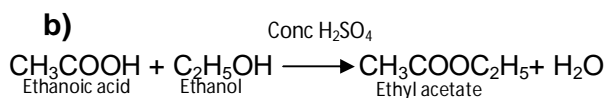
- a. Identify the organic compound.  
b. Write the chemical equation for the above reaction  
c. Name the gas evolved.  
d. How will you test the gas evolved?  
e. List two important uses of the above compound.
- A. a) The compound having molecular formula  $C_2H_4O_2$  is ethanoic acid.  
b)  $C_2H_4O_2 + Na_2CO_3 \rightarrow CH_3COONa + CO_2 + H_2O$   
 $CH_3COOH + Na_2CO_3 \rightarrow CH_3COONa + CO_2 + H_2O$   
c) The gas is evolved is  $CO_2$ .  
d) If we send the gas into lime water, it will convert into milky white substance.  
 $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$   
e) (i) The compound is used as preservative in pickles.  
(ii) It is used in saponification to prepare soaps.

**37. 1ml glacial acetic acid and 1ml of ethanol are mixed together in a test tube. Few drops of concentrate sulphuric acid is added in the mixture are warmed in a water bath for 5 min.**

**Answer the following:**

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

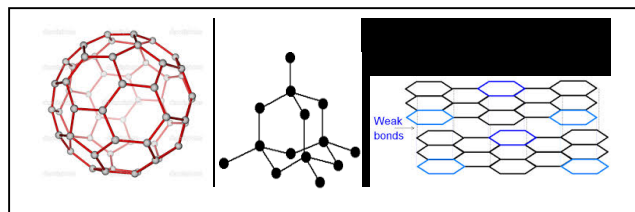
A. a) The resultant compound is ethyl acetate.



- c) This type of reactions are called esterification reactions.  
d) The compound gives sweet odour. It is used in perfumes and flavouring agents.

### \*ADDITIONAL QUESTIONS\*

38. What is catenation?  
39. Draw the structure of Diamond.  
40. Name the allotropes of carbon.  
41. Write about graphene.  
42. Explain the substitution reactions of alkenes. Give two examples.  
43. What is a miscelle?  
44. Name the following functional groups.  
(i)  $-COOH$       (ii)  $-C=O$   
(iii)  $-CO-NH_2$       (iv)  $-NH_2$   
45. Define combustion. Give one example.



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