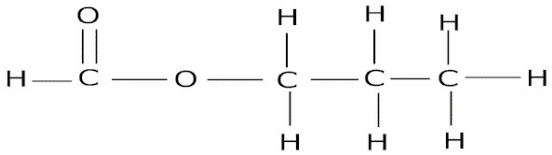
CBSE Test Paper-04

Chapter 04 Carbon and its Compound

1. Which one of the following is not in liquid state at $10^{o}\,C$? **(1)**

   a. H_2O
   b. Glacial acetic acid
   c. C_2H_5OH
   d. Acetone

2. The structural formula of an ester from which an acid and an alcohol is formed is as follows. Name the acid and the alcohol. **(1)**



   a. Formic acid, Ethanol
   b. Ethanoic acid, Ethanol
   c. Propanoic acid, Methanol
   d. Formic acid, Propanol

3. **Statement A:** Ethane decolorizes bromine water whereas ethyne does not.
   Statement B: Mixture of water and alcohol is used in radiators of vehicles in cold countries. **(1)**

   a. Statement B is true; Statement A is false.
   b. Both - Statement A and Statement B - are true.
   c. Statement A is true; Statement B is false.
   d. Both - Statement A and Statement B - are false.

4. The functional group present in ethanol is**: (1)**

   a. Carboxyl group
   b. Ester group
   c. Alcoholic group

d. Aldehydic group

5. Which among the following is a cleaner fuel? **(1)**

   a. $C_6H_{12}O_{22}$
   b. CH_3OH
   c. C_3H_7OH
   d. C_2H_5OH

6. Name the functional groups present in the following compounds. **(1)**

   i. $CH_3COCH_2CH_2CH_2CH_3$
   ii. $CH_3CH_2CH_2COOH$
   iii. $CH_3CH_2CH_2CH_2CHO$
   iv. CH_3CH_2OH

7. Complete the following reaction, **(1)**
   $CH_2 = CH_2 + Cl_2 \rightarrow$

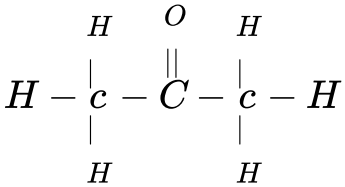
8. What are the various ways in which an atom can achieve the noble gas configurations? **(1)**

9. Which ions are responsible for making water hard? **(1)**

10. An aldehyde as well as a ketone can be represented by the same molecular formula, say C_3H_6O. Write their structures and name them. State the relation between the two in the language of science. **(3)**

11. Diamond is a poor conductor of electricity while graphite is a good conductor. Give reason. **(3)**

12. Name the following compounds. **(3)**

   i. 

ii. $$H-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{c}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{c}}-\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{c}}-\overset{\overset{H}{|}}{C}=O$$

iii. $$H-\overset{\overset{H}{|}}{\underset{\underset{||}{}}{C}}=OH$$

13. Name the product formed when an organic acid and alcohol react in the presence of acid catalyst. Write the equation and give two uses of the product formed. **(3)**

14. What are alcohols? What is its general formula? Give the names and molecular formula of first three members of the homologous series of alcohols. **(5)**

15. Identify the compounds A to E in the following reaction sequence. **(5)**

i. $CH_3CH_2OH \xrightarrow{KMnO_4+KOH} A$

ii. $CH_3CH_2OH + A \xrightarrow{Conc.\ H_2SO_4} B$

iii. B + NaOH $\rightarrow$ $C + CH_3\overset{\triangle}{C}H_2OH$

iv. A + $NaHCO_3$ $\rightarrow$ C + D + H_2O

v. CH_3CH_2OH+ E $\rightarrow$ CH_3CH_2ONa + H_2

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Answers

1. b. Glacial acetic acid

   Explanation: Freezing point of pure ethanoic acid is 16.6 °C (61.9 °F). Freezing point of pure water is 0 °C. Freezing point of pure ethyl alcohol (C_2H_5OH) is -114.1 °C. Freezing point of pure acetone is -95 °C. When ethanoic acid (acetic acid) is cooled below 10 °C, it freezes to form a colourless, ice-like solid. The solid looks like glacier and hence pure ethanoic acid is called glacial ethanoic acid (or glacial acetic acid).

2. d. Formic acid, Propanol

   Explanation: $HCOOCH_2CH_2CH_3 + H_2O$ --> $HCOOH + CH_3\,CH_2CH_2OH$

   The ester is $HCOOCH_2CH_2CH_3$. The product HCOOH is formic acid or methanoic acid (carboxylic acid) and $CH_3\,CH_2CH_2OH$ is propanol (alcohol).

3. a. Statement B is true; Statement A is false.

   Explanation: Bromine water test is a test for unsaturated hydrocarbons. Ethane undergoes addition reaction and decolorizes bromine water. Similarly, ethyne also decolorizes bromine water.

   Mixture of water and alcohol is used in radiators of vehicles in cold countries. Alcohol is used for antifreeze mixture. Antifreeze is an additive which lowers the freezing point of a water-based liquid.

4. c. Alcoholic group

   Explanation: The functional group present in ethanol (C_2H_5OH) is the **alcoholic group** (-OH group). The hydroxyl group attached to a carbon atom is known as **alcohol group**.

5. d. $C_2H_5\,OH$

   Explanation: Ethanol ($C_2H_5\,OH$) is a cleaner fuel. It is used as a fuel in cars along with petrol. It is also used as a fuel in spirit lamps.

6. i. The functional group present in given compound is Ketone, $-\overset{\overset{O}{||}}{C}-$
   ii. The functional group present in given compound is Carboxylic acid, -COOH
   iii. The functional group present in given compound is Aldehyde, -CHO
   iv. The functional group present in given compound is Alcohol, -OH

7. $CH_2 = CH_2 + Cl_2 \rightarrow CH_2Cl - CH_2Cl$

8. An atom can achieve the noble gas configurations by transfer of electrons to/from the other atom(s) or by sharing of electrons with other atom(s).

9. Calcium ions (Ca^{2+}) and magnesium ions (Mg^{2+}) are responsible for making the water hard.

10. An aldehyde as well as a ketone both are different functional groups and can be represented by the same molecular formula, say C_3H_6O.

    Their structures are as follows:

    $CH_3CH_2 - \overset{\overset{O}{||}}{C} = H$

    IUPAC name Propanal

    $CH_3 - \overset{\overset{O}{||}}{C} = CH_3$

    IUPAC name Propanone

    Such compounds with identical molecular formula but different structures are called structural isomers. Where number of atoms of each type remain same only the arrangement changes.

11. In diamond, all the four valence electrons of carbon are involved in the formation of covalent bonds. Thus, no free electrons are available to conduct electricity. Whereas, in graphite, three electrons in the valence shell of carbon are involved in the formation of covalent bond. The fourth electron is free to move. So,it conducts electricity.

12. i. Propanone (CH_3COCH_3)

ii. Butanal (C_3H_7CHO)

iii. Methanoic acid (HCOOH)

13. When an organic acid and alcohol reacts ester is formed by the process is known as esterification reaction for e.g. formation of ethyl ethanoate which is a ester of ethanoic acid and ethanol. Reaction is given as:

$$\underset{Ethanoic\ acid}{CH_3COOH} + \underset{Ethanol}{CH_2CH_3OH} \xrightarrow{Conc.\ H_2\ SO_4} \underset{Ethyl\ ethanoate}{CH_3COOCH_2CH_3} + H_2O$$

Ester is used in preparing perfumes and flavouring agents.

14. The organic compounds containing the hydroxyl or alcoholic group (–OH) as the functional group are called alcohols. These are obtained by replacing one hydrogen atom of an alkane by –OH group. For example,

$$\underset{Alkane}{H-\overset{H}{\overset{|}{\underset{H}{\underset{|}{C}}}}-OH} \xrightarrow[H\ by\ OH]{\text{Replace } one} \underset{Alcohol}{H-\overset{H}{\overset{|}{\underset{h}{\underset{|}{C}}}}-OH}$$

They are represented by the general formula C_nH_{2n+1}-OH or ROH, where R stands for alkyl group (C_nH_{2n+1} -)

First three members of the series are:

Formula	Common name	IUPAC name
CH_3OH	Methyl alcohol	Methanol
CH_3CH_2OH	Ethyl alcohol	Ethanol
$CH_3CH_2CH_2OH$	Propyl alcohol	Propanol

15. i. A : CH_3COOH (Acetic acid) . It is obtained by oxidation of ethanol.

ii. B : $CH_3-\overset{O}{\overset{\|}{C}}-OC_2H_5$ (Ethyl ethanoate) . the reaction is esterification reaction.

iii. C : CH_3COONa (Sodium ethanoate). The reaction is saponification reaction.

iv. D : CO_2 (Carbon dioxide) .

v. E : Na (Sodium)