

Very Short Answer Type Questions

[1 Mark]

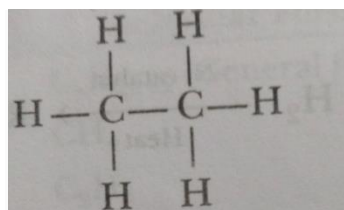
Q. 1. Draw the electron dot structure of the gas molecule which is liberated when zinc metal is treated with aqueous NaOH solution.

Ans. Hydrogen gas,



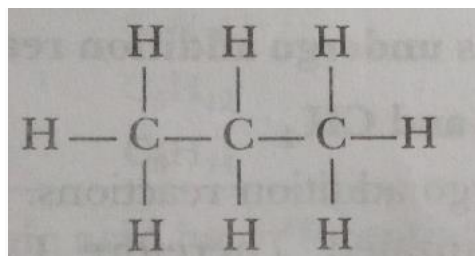
Q.2. Write the number of covalent bonds in the molecule of ethane.

Ans. There are seven covalent bonds:



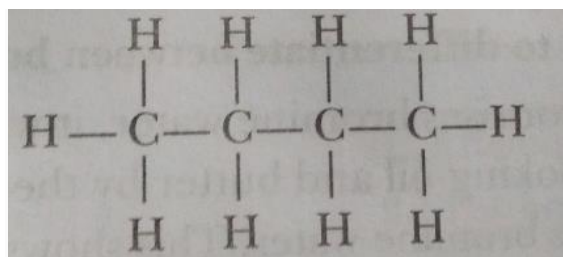
Q. 3. Write the number of covalent bonds in the molecule of propane, C₃ H₈.

Ans. There are ten covalent bonds:



Q. 4. Write the number of covalent bonds in the molecule of butane, C₄H₁₀.

Ans. There are thirteen covalent bonds:



Q.5. Which element exhibits the property of catenation to maximum extent and why?

Ans. Carbon exhibits the property of catenation due to strong C – C bond.

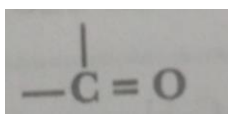
Q 6. What is the molecular formula of the alcohol which can be derived from propane?

Ans. Propane: $\text{CH}_3 - \text{CH}_2 - \text{CH}_3$ or C_3H_8
Alcohol obtained from propane is $\text{C}_3\text{H}_7\text{OH}$.

Q. 7. Give the names of the functional groups:

(i) -OH

(ii)



Ans. (i) Alcoholic group

(ii) Ketonic group.

Q. 8. Which functional group always occur at the terminal position of a carbon chain?

Ans. Aldehydic group R-CHO and carboxyl group R-COOH ($\text{R} =$ alkyl group).

Q. 9. Name the function group which always occurs in the middle of a carbon chain.

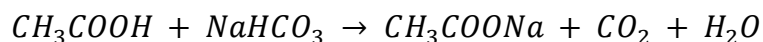
Ans. Ketonic group always occurs in the middle of a carbon chain.

Q. 10. In an organic compound, which parts largely determine its physical and chemical properties?

Ans. The alkyl part (carbon chain) of an organic compound determines its physical properties whereas the functional group determines its chemical properties.

Q. 11. An organic compound 'X' of molecular formula $\text{C}_2\text{H}_4\text{O}_2$ gives brisk effervescence with sodium bicarbonate. Give the name and formula of X.

Ans. 'X' is ethanoic acid (an organic acid). $'X' \rightarrow \text{CH}_3\text{COOH}$



Organic acid decomposes sodium bicarbonate and gives brisk effervescence of carbon dioxide gas.

Q. 12. Why is pure ethanoic acid called glacial ethanoic acid (or glacial acetic acid)?

Ans. The melting point of pure ethanoic acid is 290 K and hence it often freezes in cold climate to form a colourless, ice-like liquid. This has given it the name glacial acetic acid.

Q. 13. What is vinegar?

Ans. A 5-8% solution of acetic acid in water is called vinegar and is used widely as a preservative in pickles

Q. 14. How does carbon attain a stable electronic configuration?

Ans. Carbon attains stable electronic configuration by sharing its four electrons with other atoms.

Q. 15. What is isomerism?

Ans. It is a phenomenon in which compounds have the same molecular formula but different structural formula.

Q. 16. Which of the following formulae represents a saturated hydrocarbon?

C_nH_{2n+2} , C_nH_{2n+1} , C_nH_{2n} , C_nH_{2n-2}

Ans. C_nH_{2n+2} represent a saturated hydrocarbon.

Q. 17. Which of the following are alkenes?

CH_4 , C_2H_6 , C_2H_4 , C_3H_6 and C_3H_8 .

Ans. C_2H_4 and C_3H_6 are alkenes.

Q. 19. What happens when methane is burnt in air?

Ans. Methane burns in air to give carbon dioxide and water.

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \text{Heat energy.}$

Q. 19. A test tube contains a brown coloured liquid. The colour of the liquid in test tube remains unchanged when methane is passed through it, but disappears when ethene is passed. Which element is present in the liquid?

Ans. The element present in the liquid is bromine.

Q. 20. What is the next homologue of C_3H_7OH called?

Ans. The next homologue of C_3H_7OH is called butanol (C_4H_9OH).

Q. 21. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n} .

Ans. The 2nd member is propene, C_3H_6 .

Q. 22. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n+2} .

Ans. The second member is ethane, C_2H_6 .

Q. 23. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n-2} .

Ans. The 2nd member is propyne, C_3H_4 .

Q.24. Which two of the following organic compounds belong to the same homologous series? C_2H_6 , C_2H_6O , $C_2H_6O_2$, CH_4O

Ans. CH_4O and C_2H_6O belong to the same homologous series.

Q. 25. Write the name and molecular formula of the first member of the homologous series of alkynes.

Ans. The first member is ethyne, C_2H_2 .

Q.26. Write the name and molecular formula of the fourth member of alkane series.

Ans. The fourth member of the alkane series is butane C_4H_{10} .

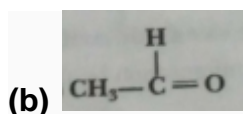
Q. 27. Write the next homologue of each of the following:

(i) C_2H_4 (ii) C_4H_6

Ans. (i) C_3H_6 (ii) C_5H_8

Q. 28. Name the following compounds:

(a) CH_3-CH_2-OH



Ans. (a) Ethanol (b) Ethanal

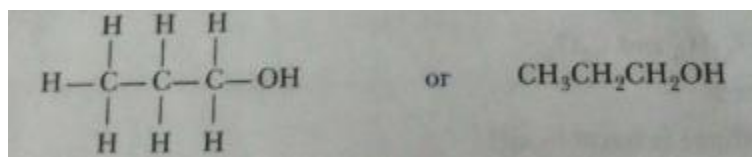
Q. 29. Select saturated hydrocarbons from the following:

C₃H₆; C₅H₁₀; C₄H₁₀; C₆H₁₄; C₂H₄

Ans. C₄H₁₀ and C₆H₁₄ are saturated hydrocarbons.

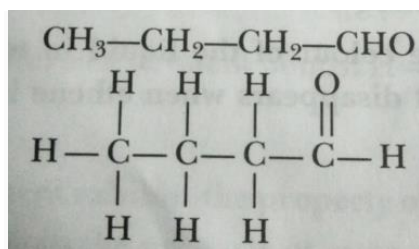
Q.30. Write the name and structure of an alcohol with three carbon atoms in its molecule.

Ans. The compound is propanol.



Q.31. Write the name and structure of an aldehyde with four carbon atoms in its molecule.

Ans. Butanal;



Q. 32. Name the process by which unsaturated fats are changed to saturated fats.

Ans. Hydrogenation

Short Answer Type Questions – I

[2 marks]

Q. 1. What is a covalent bond? What type of bond exists in (i) CCl_4 , (ii) CaCl_2 ?

Ans. The chemical bonds formed between two atoms by the sharing of electrons between them is known as a covalent bond. The sharing of electrons between the two atoms takes place in such a way that both the atoms acquire stable electronic configuration of their nearest noble gas.

(i) CCl_4 – Covalent bond, (ii) CaCl_2 – Ionic bond

Q. 2. Catenation is the ability of an atom to form bonds with other atoms of the same element. It is exhibited by both carbon and silicon. Compare the ability of catenation of the two elements. Give reasons.

Ans. Carbon exhibits catenation much more than silicon or any other element due to its smaller size which makes the C-C bonds strong while the Si-Si bonds are comparatively weaker due to its large size.

Q. 3. Select the hydrocarbons which are members of the same homologous series. Give the name of each series.

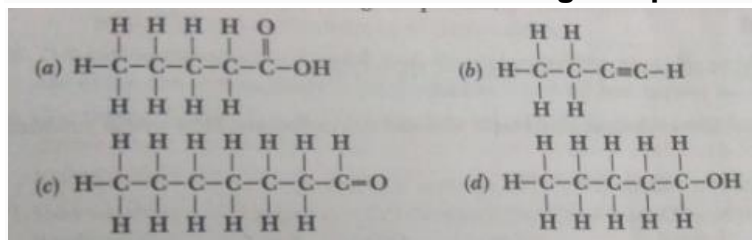
C_3H_8 , C_4H_{10} , C_5H_{10} , C_6H_{10} , C_7H_{12} and C_8H_{16} .

Ans. C_3H_8 , C_4H_{10} → Alkanes

C_5H_{10} , C_8H_{16} → Alkanes

C_6H_{10} , C_7H_{12} → Alkanes

Q. 4. Write the names of the following compounds.



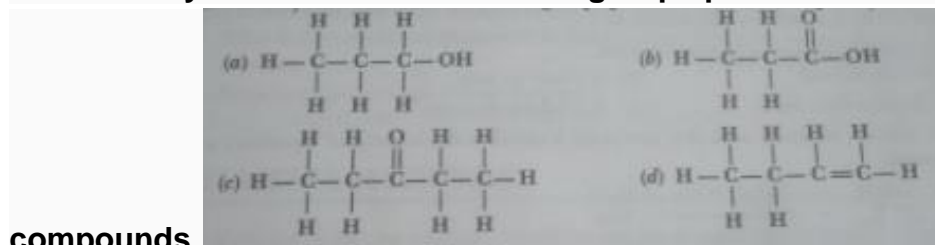
Ans. (a) Pentanoic acid (b) Butyne

(c) Heptanal (d) Pentanol

Q. 5. Why are unsaturated hydrocarbons more reactive than saturated hydrocarbons?

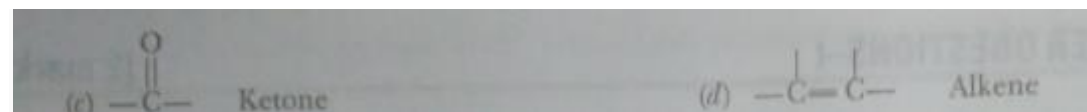
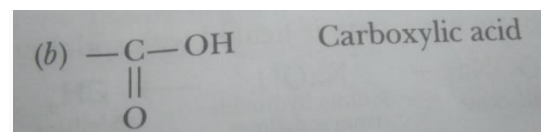
Ans. Unsaturated hydrocarbons are more reactive due to the presence of C=C and C≡C bonds which are weaker than the single bond in saturated hydrocarbons. These double and triple bonds are the reactive sites in the unsaturated hydrocarbons which easily give addition reactions.

Q. 6. Identify and name the functional groups present in the following



compounds.

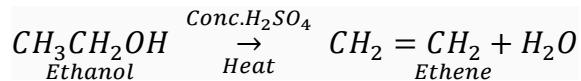
Ans. (a) -OH Hydroxy/Alcohol



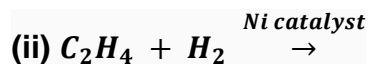
Q. 7. Write the name and molecular formula of an organic compound having its name suffixed with '-ol' and having two carbon atoms in the molecule. With the help of a balanced equation indicate what happens when it is heated with excess of conc. H₂SO₄.

Ans. The organic compound is ethanol. Its molecular formula is C₂H₆O and structural formula is

C₂H₅OH or CH₃CH₂OH.



Q. 8. Complete the reaction(s) given below and classify them as Combustion/ Oxidation/ Addition/ Substitution reaction.



Ans. (i) CH₃CH₂COOH, Oxidation (ii) C₂H₆, Addition.

Q. 9. Carbon, Group (14) element in the Periodic Table, is known to form compounds with many elements.

Write an example of a compound formed with

(a) Chlorine (Group 17 of Periodic Table)

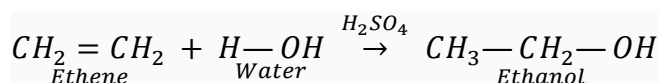
(b) Oxygen (Group 16 of Periodic Table)

Ans. (a) Carbon tetrachloride (CCL₄)

(b) Carbon dioxide (CO₂)

Q. 10. How is ethanol obtained for commercial use?

Ans. When ethene is heated with concentrated sulphuric acid at 73° C (348 K), and treated with water, ethanol is produced .



Q. 11. Name the gas evolved when ethanoic acid reacts with sodium carbonate. How would you identify this gas?

Ans. The evolved is carbon dioxide (CO₂). The reaction is as follows:



When this gas is passed through lime water, it turns milky. The milky colour of lime water confirms that the gas is carbon dioxide (CO₂).

Q. 12. Write four uses of ethyl alcohol.

Ans. (i) It is used in the manufacture of paints, medicines, dyes, soaps, etc.

(ii) It is used in the preparation of organic compounds like ether, chloroform and iodoform.

(iii) It is used as a fuel in internal combustion engines.

(iv) It is used in low temperature thermometers.

Q. 13. Mention the physical properties of acid.

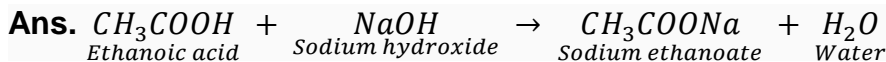
Ans. (i) It is colourless liquid.

(ii) It is sour in taste.

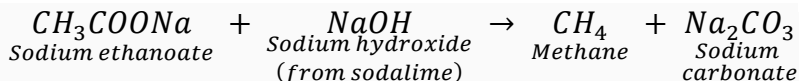
(iii) It has a characteristic smell.

(iv) It is soluble in water.

Q. 14. How will you convert ethanoic acid into methane? Explain with the help of equations of the reactions involved.



Then, sodium ethanoate is heated with sodalime to get methane.



Q. 15. What is meant by denatured alcohol? What is the need to denature alcohol?

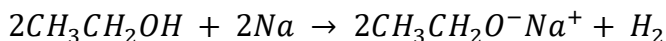
Ans. Denatured alcohol is ethyl alcohol which has been made unfit for drinking purposes by adding poisonous substances like methanol, pyridine, copper sulphate, etc. Ethanol is an important chemical. It is supplied at concessional rates to industries. It is therefore, made unfit for drinking purposes to prevent its misuse.

Q. 16. Intake of small quantity of methanol can be lethal. Comment.

Ans. Methanol is oxidised to methanal in the liver. Methanal reacts rapidly with the components of cells. It causes the protoplasm to coagulate. It also affects the optic nerve, causes blindness.

Q. 17. A gas is evolved when ethanol reacts with sodium. Name the gas evolved and also write the balanced chemical equation of the reaction involved.

Ans. Gas evolved is hydrogen.



Q.18. Why are detergents better cleansing agents than soaps?

Ans. Detergents work as cleansing agent in hard and soft water both because the charged ends of detergents do not form insoluble precipitates with calcium and magnesium ions in hard water.

Q. 19. Why are soaps not suitable for washing clothes with hard water?

Ans. Soaps are not suitable for washing clothes with hard water because of two reasons:

(i) Soap reacts with the calcium and magnesium ions present in hard water to form insoluble precipitate called scum. This results in the wastage of soap.

(ii) The sticky scum sticks to the clothes being washed and interferes with the cleaning ability of soap. This makes the cleaning of clothes difficult.

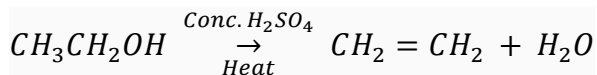
Q. 20. Two carbon compounds A and B have the molecular formula C₃H₈ and C₃H₆ respectively. Which one of the two is most likely to show addition reaction? Justify your answer.

Ans. Compound A (C₃H₈) is saturated and compound B (C₃H₆) is unsaturated hydrocarbon (with a double bond). As we know that addition reactions are a characteristic property of unsaturated hydrocarbons, thus the compounds B (C₃H₆) is most likely to show addition reaction.

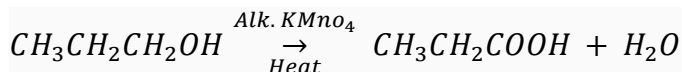
Q. 21. How would you bring about the following conversions? Name the process and write the reaction involved.

(a) Ethanol to ethene. (b) Propanol to propanoic acid.

Ans. (a) By the dehydration of ethanol in the presence of concentrated H₂SO₄.

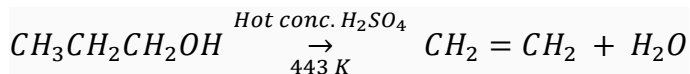


(b) By the oxidation of propanol using oxidising agent such as alkaline KMnO₄.



Q. 22. Ethene is formed when ethanol at 443 K is heated with excess of concentrated sulphuric acid. What is the role of sulphuric acid in this reaction? Write the balanced chemical equation of this reaction.

Ans. Sulphuric acid acts as a dehydrating agent.



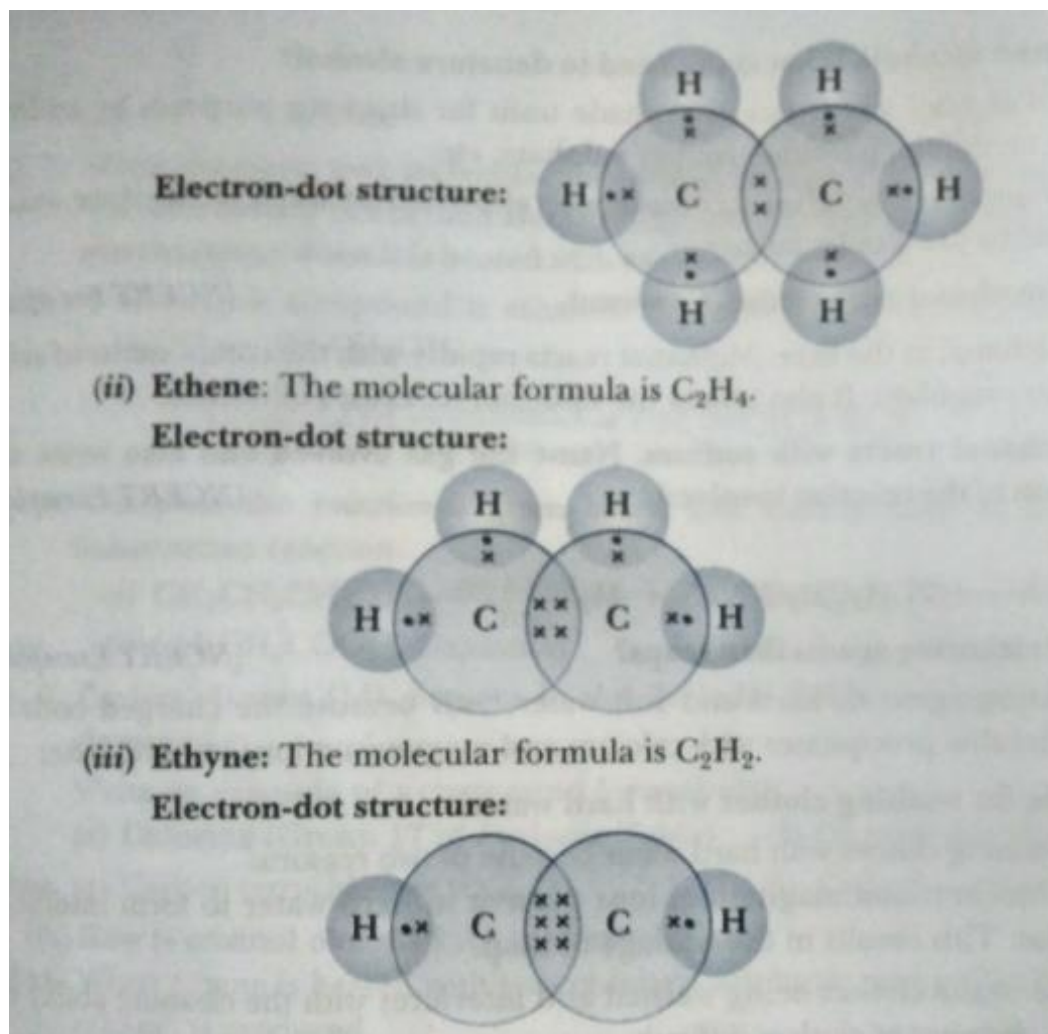
Short Answer Type Questions – II

[3 marks]

Q. 1. Write the molecular formula of the following compounds and draw their electron-dot structures:

(i) Ethane (ii) Ethene (ii) Ethyne

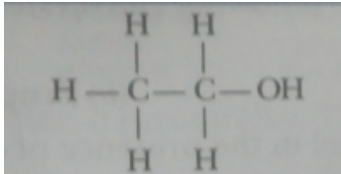
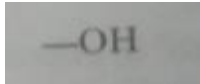
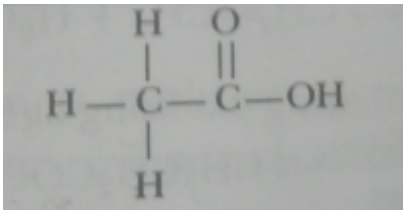
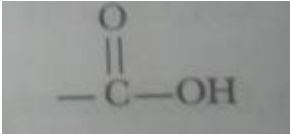
Ans. (i) Ethane: The molecular formula is C_2H_6 .



Q.2. What is meant by functional group in carbon compounds? Write in tabular form the structural formula and the functional group present in the following compounds:

(i) Ethanol (i) Ethanoic acid

Ans. An atom or a group of atoms which determine the chemical properties of an organic compound is called a functional group.

Name of compound	Structural Formula	Functional
Ethanol		
Ethanoic acids		

Q. 3. Draw the electron-dot structure for ethyne. A mixture of ethyne and oxygen is burnt for welding. In your opinion, why cannot we use a mixture of ethyne and air for this purpose?

Ans. For structure of ethyne, Refer to Q. 1, Short Answer Questions-11.

Ethyne burns in air with a sooty flame because of incomplete combustion caused by the limited supply of air. But when burnt at 3000°C in oxygen it gives a clean flame because of complete combustion. This oxy-acetylene flame is used for welding.

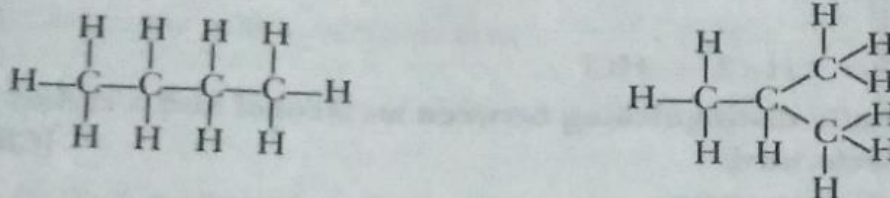
Such a high temperature cannot be achieved without mixing oxygen.

Therefore, a mixture of ethyne and air is not used for welding.

Q.4. What is meant by isomers? Draw the structures of two isomers of butane, C₄H₁₀. Explain why we cannot have isomers of first three members of alkane series.

Ans. Isomers are compounds having the same molecular formula but different structures.

The two isomers of butane, C_4H_{10} are:



Since branching is not possible, isomers are not possible for the first three members of alkane series.

Q. 5. What is meant by homologous series of carbon compounds? Classify the following carbon compounds into two homologous series and name them.



Ans. A group of organic compounds having the same functional group and similar structures in which the successive members differ by CH_2 group is called homologous series.

Alkynes: C_3H_4 , C_4H_6 , C_5H_8

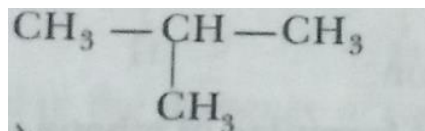
Alkenes: C_3H_6 , C_4H_8 , C_5H_{10}

Q. 6. Give an example each of (i) open chain (ii) branched chain and (iii) ring compounds.

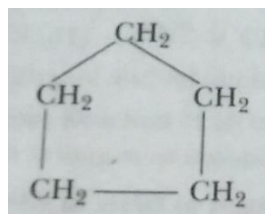
Ans. (i) Open chain compound (n-pentane):



(ii) Branched chain compound (isobutane):



(ii) Ring (cyclopentane):



Q. 7. (a) How does the supply of air affect combustion of saturated hydrocarbons?

(b) What is indicated by:

(i) sooty flame

(ii) blue flame of a bunsen burner?

(c) Why are holes provided at the bottom of a bunsen burner?

Ans. (a) If air supply is not sufficient, saturated hydrocarbons give yellow sooty flame.

(b) (i) Yellow sooty flame-Burning of unsaturated hydrocarbons such as ethene and ethyne/incomplete combustion (any one),

(ii) Blue flame-Burning of saturated hydrocarbons/complete combustion

(c) Holes let the supply of air to be adjusted for complete combustion.

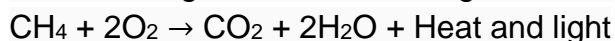
Q. 8. Explain the given reactions with examples:

(a) Combustion reaction

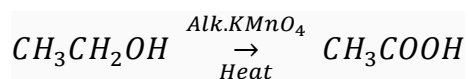
(b) Oxidation reaction

(c) Substitution reaction

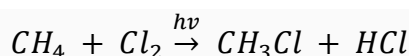
Ans. (a) Combustion reaction: Carbon compounds burns in oxygen to produce carbon dioxide along with release of large amount of heat and light.



(b) Oxidation reaction: Ethanol is oxidised to ethanoic acid in the presence of alkaline KMnO_4 (oxidising agent) on heating.



(c) Substitution reaction: In the presence of sunlight, chlorine replace the hydrogen atom of hydrocarbons.



Q. 9. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed.

Ans. (i) Test with NaHCO_3 solution in water.

On adding carboxylic acid to baking soda, carbon dioxide is liberated with brisk effervescence.

On adding a solution of baking soda to alcohol, no brisk effervescence occurs.

(ii) Test with blue litmus solution.

Carboxylic acid turns blue litmus red.

There is no change in colour when a blue litmus solution is added to alcohol.

Q. 10. Write physical properties of ethanol.

Ans. Physical properties of ethanol are:

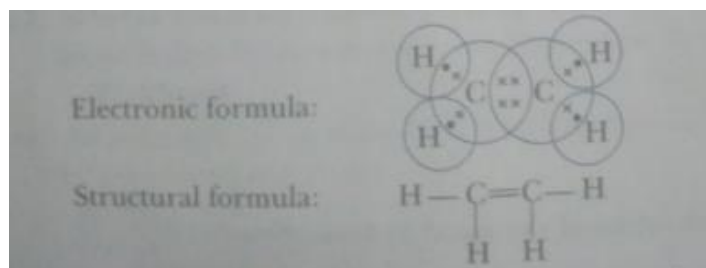
- (i) Ethanol is a colourless liquid having a pleasant smell and a burning taste.
- (ii) Ethanol is a liquid at room temperature.
- (iii) Ethanol is lighter than air.
- (iv) Ethanol is miscible with water.
- (v) Ethanol is a covalent compound.
- (vi) Ethanol has no effect on litmus solution.

Q. 11. Write molecular, electronic and structural formulae of ethene.

Ans. Molecular formula: C_2H_4

Electronic formula:

Structural formula:



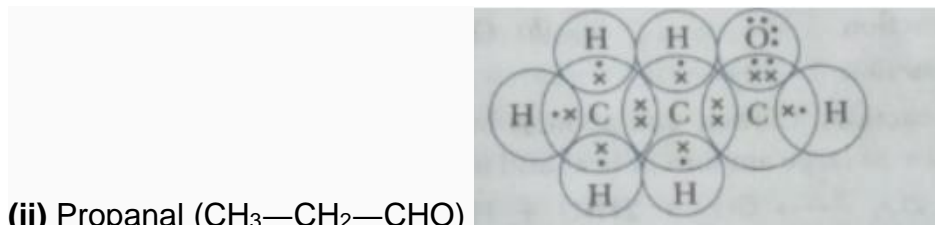
Q. 12. (i) What is a homologous series of organic compounds? State any two characteristics of homologous series.

(ii) Draw the electron dot structure for propanal.

Ans. (i) A series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called homologous series.

Characteristics of homologous series:

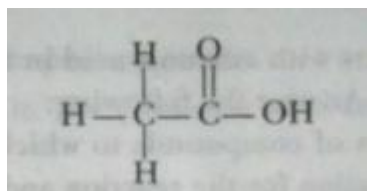
- (a)** The molecular formulae of any two successive members of a homologous series differ by $-CH_2$.
- (b)** There is a regular gradation in physical properties of members of a homologous series.



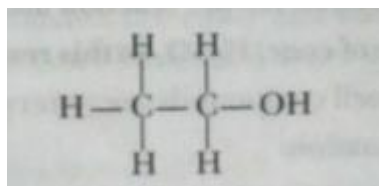
(ii) Propanal ($\text{CH}_3\text{—CH}_2\text{—CHO}$)

Q. 13. A compound X is formed by the reaction of a carboxylic acid $\text{C}_2\text{H}_4\text{O}_2$ and an alcohol in presence of a few drops of H_2SO_4 . The alcohol on oxidation with alkaline KMnO_4 followed by acidification gives the same carboxylic acid as used in this reaction. Give the names and structures of (a) carboxylic acid, (b) alcohol and (c) the compound X. Also write the reaction.

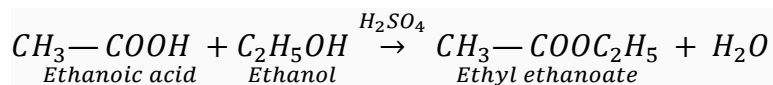
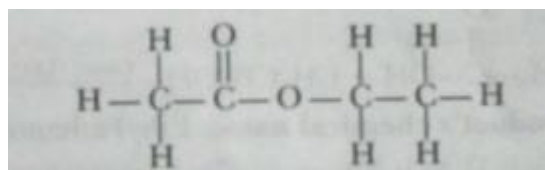
Ans. (a) Carboxylic acid is ethanoic acid



(b) Alcohol is ethanol

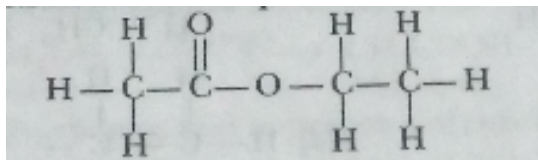


(c) X is ethyl ethanoate



Q. 14. An ester has the molecular formula $\text{C}_4\text{H}_8\text{O}_2$. Write its structural formula. What happens when this ester is heated in the presence of sodium hydroxide solution? Write the balanced chemical equation for the reaction and name the products. What is a saponification reaction?

Ans. Structural formula:



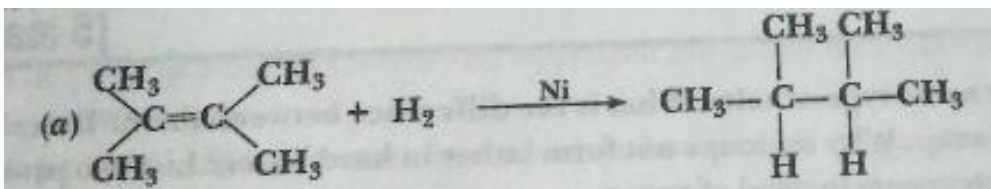
When this ester is heated in the presence of sodium hydroxide solution, it changes into an alcohol and a carboxylic acid.



Products: Ethanol and ethanoic acid

Saponification: Reaction of an ester with an acid or base to give an alcohol and a carboxylic acid. This reaction is known as saponification because it is used in the preparation of soap.

Q. 15. What is the role of metal or reagents written on arrows in the given chemical reactions?



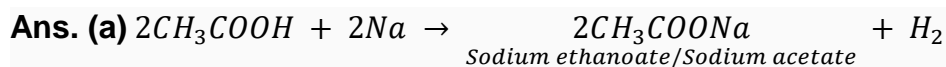
Ans. (a) Ni acts as a catalyst.

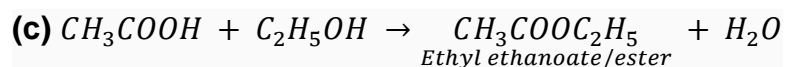
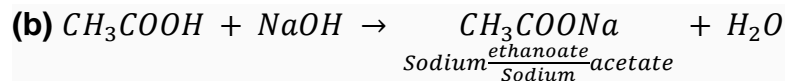
(b) Concentrated H_2SO_4 acts as a catalyst and a dehydrating agent.

(c) Alkaline $KMnO_4$ acts as an oxidising agent.

Q. 16. Write chemical equation of the reaction of ethanoic acid with the following: (a) Sodium; (b) Sodium hydroxide; (c) Ethanol.

Write the name of one main product of each reaction.





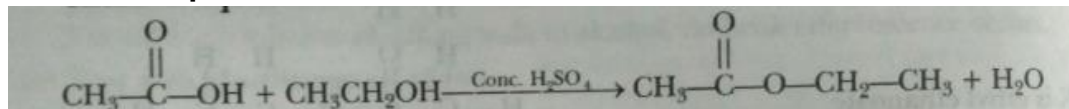
Q. 17. When ethanol reacts with ethanoic acid in the presence of conc. H₂SO₄, a substance with fruity smell is produced. Answer the following:

(i) State the class of compounds to which the fruity smelling compounds belong. Write the chemical equation for the reaction and write the chemical name of the product formed.

(ii) State the role of conc. H₂SO₄ in this reaction.

Ans. (i) The fruity smell compounds are esters.

Chemical equation:

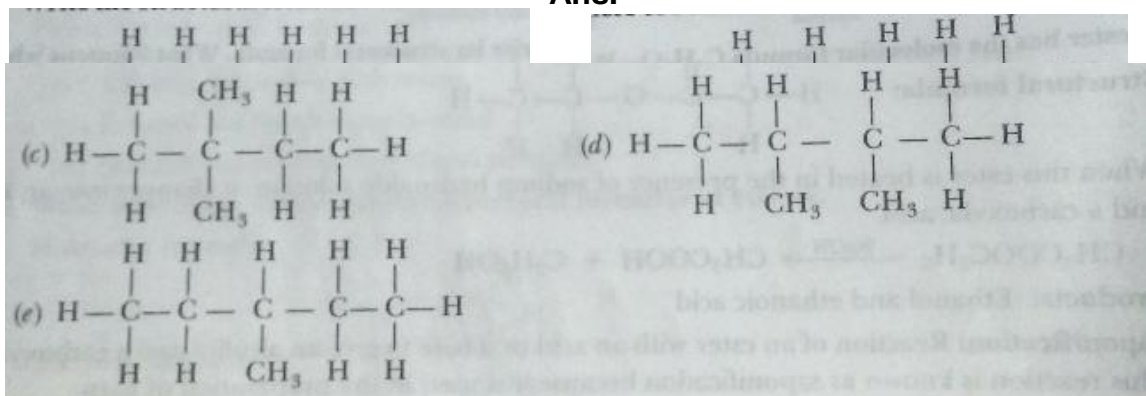


Product's chemical name: Ethyl ethanoate.

(ii) Conc. H₂SO₄ acts as a dehydrating agent.

Q. 18. Write the structural formulae of all the isomers of hexane.

Ans.



Long Answer Type Questions

[5 Marks]

Q. 1. Both soap and detergent are some type of salts. What is the difference between them? Describe in brief the cleansing action of soap. Why do soaps not form lather in hard water? List two problems that arise due to the use of detergents instead of soaps.

Ans. Soaps are sodium or potassium salts of long-chain carboxylic acids. Detergents are generally ammonium or sulphonate salts of long chain carboxylic acids.

For cleansing action of soaps, Soaps do not form lather in hard water because hard water contains calcium and magnesium salts. Soap molecules react with calcium and magnesium salts to form an insoluble precipitate called scum.

Two problems which arise because of the use of detergents are:

(i) Detergents are non-biodegradable; hence, detergents accumulate in the environment and cause problems.

(ii) Certain phosphate additives are added to detergents which form a thick green scum over the river water and harm the animal life in the river.

Q.2. What happens when

(i) ethanol burns in air.

(i) ethanol reacts with sodium metal.

(iii) ethanol is oxidised with chromic anhydride in glacial ethanoic acid.

(iv) ethanol is heated with alkaline potassium permanganate.

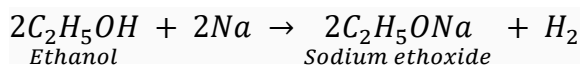
(v) ethanol is heated with ethanoic acid in the presence of a few drops of concentrated sulphuric acid?

Ans. (i) Ethanol is highly inflammable liquid. It catches fire easily and starts burning.

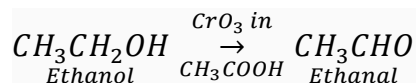
Ethanol burns readily in air with a blue flame to form carbon dioxide and water vapour:



(ii) Ethanol reacts with sodium to produce sodium ethoxide and hydrogen gas:

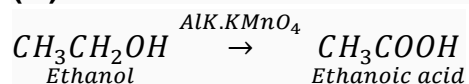


(iii) When ethanol is treated with chromic anhydride, then its partial oxidation takes place and ethanal is formed

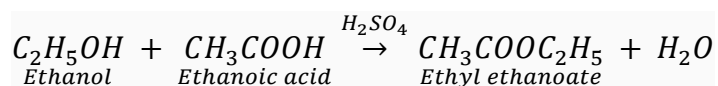


Chromic anhydride oxidises ethanol to ethanal.

(iv) Alkaline KMnO_4 oxidises ethanol to ethanoic acid.



(v) Ethanol reacts with ethanoic acid in presence of concentrated sulphuric acid to form a sweet-smelling ester, ethyl ethanoate.



Q. 3. (a) What are hydrocarbons? Give examples.

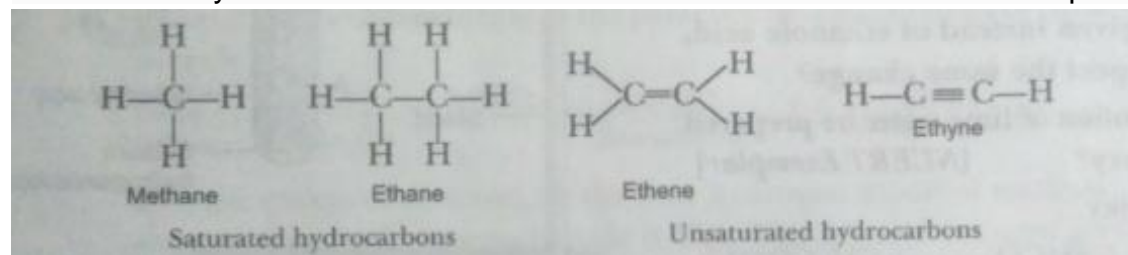
(b) Give the structural differences between saturated and unsaturated hydrocarbons with two examples each.

(c) What is a functional group? Give examples of four different functional groups.

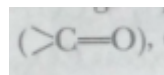
Ans. (a) Compounds of carbon and hydrogen are called hydrocarbons. For example, methane, ethane, etc.

(b) Saturated hydrocarbons contain carbon-carbon single bonds.

Unsaturated hydrocarbons contain at least one carbon-carbon double or triple bond.



(c) An atom/group of atoms joined in a specific manner which is responsible for the characteristic chemical properties of the organic compounds is called a functional group. Examples are hydroxyl group ($-\text{OH}$), aldehyde group ($-\text{CHO}$), ketonic group ($-\text{COOH}$), etc.



Q. 4. Explain why carbon forms compounds mainly by covalent bond. Explain in brief two main reasons for carbon forming a large number of compounds. Why does carbon form strong bonds with most other elements?

Ans. Carbon has 4 electrons in its outermost shell, and needs to gain or lose 4 electrons to attain noble gas configuration. Losing or gaining 4 electrons is not possible due to energy considerations, hence it shares electrons to form covalent bonds.

Two reasons for large number of carbon compounds:

(i) Catenation: The unique ability of carbon to form bonds with other atoms of carbon giving rise to long chains of different types of compounds.

(ii) Tetravalency: Since carbon has a valency of 4, it is capable of bonding with four other atoms of Carbon or atoms of elements like oxygen, hydrogen, nitrogen, sulphur, chlorine, etc.

carbon forms strong bonds with most other elements because of its small size which enables the nucleus to hold on to the shared pairs of electrons strongly.

Q. 5. A compound C (molecular formula, C₂H₄O₂) reacts with Na-metal to form a compound R and evolves a gas which burns with a pop sound. Compound C on treatment with an alcohol A in presence of an acid forms a sweet smelling compound S (molecular formula C₃H₆O₂). On addition of NaOH to C, it also gives R and water. S on treatment with NaOH solution gives back R and A.

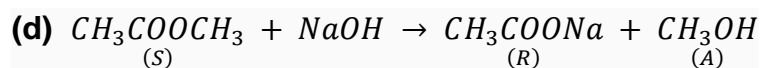
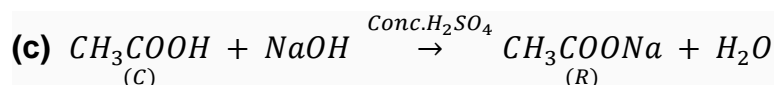
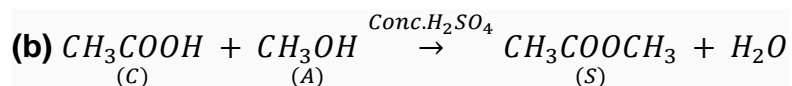
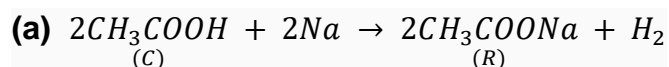
Identify C, R, A, S and write down the reactions involved.

Ans. C- Ethanoic acid

R- Sodium salt of ethanoic acid (sodium acetate) and gas evolved is hydrogen

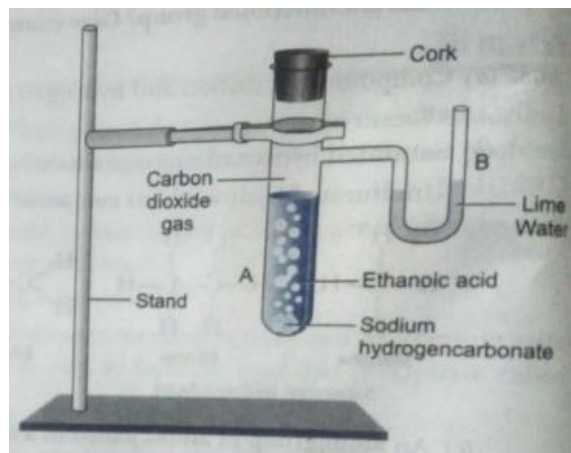
A- Methanol

S- Ester (Methyl acetate)

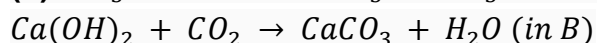


Q. 6. Look at the figure and answer the following questions:

- (a) What change would you observe in the calcium hydroxide solution taken in tube B?
- (b) Write the reaction involved in A and B respectively.
- (c) If ethanol is given instead of ethanoic acid, would you expect the same change?
- (d) How can a solution of lime water be prepared in the laboratory?



Ans. (a) It will turn milky.



With excess CO_2 , milkiness disappears.

(c) As C_2H_5OH and $NaHCO_3$ do not react, a similar change is not expected



(d) The lime water is prepared by dissolving calcium oxide in water and decanting the supernatant liquid.

Q. 7. A salt X is formed and a gas is evolved when ethanoic acid reacts with sodium hydrogen- carbonate. Name the salt X and the gas evolved. Describe an activity and draw the diagram of the apparatus to prove that the evolved gas is the one which you have named. Also, write chemical equation of the reaction involved

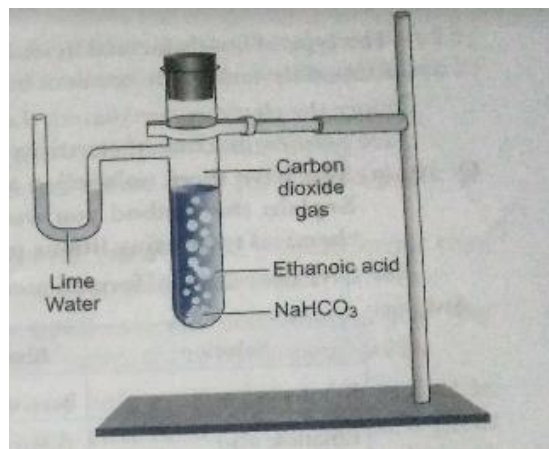
Ans. X is sodium ethanoate

Gas evolved is carbon dioxide

Activity:

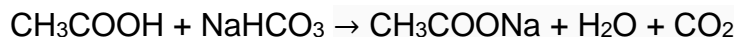
(i) Set up the apparatus as shown in the figure.

(ii) Take a spatula-full of sodium hydrogencarbonate in a test tube and add 2 mL of dilute ethanoic acid.



(iii) We observe that brisk effervescence of a gas is produced in the test tube.

(iv) Now pass the gas produced through freshly prepared lime water it is observed that lime water turns milky. Only carbon dioxide gas can turn lime water milky. So this activity proves that when ethanoic acid reacts with sodium hydrogencarbonate, then carbon dioxide is evolved.



Q.8. (i) Give a chemical test to distinguish between saturated and unsaturated hydrocarbons.

(ii) Name the products formed when ethane burns in air. Write the balanced chemical equation for the reaction showing the types of energies liberated.

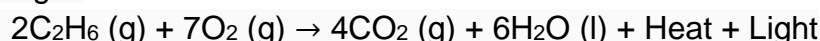
(iii) Why is reaction between methane and chlorine in the presence of sunlight considered a substitution reaction?

Ans. (i) Br₂-water test: Br₂-water is a brown coloured liquid.

Unsaturated hydrocarbons give addition reaction with Br₂, so the colour of Br₂- water gets decolourised.

Saturated hydrocarbons do not react with Br₂-water, so the colour of Br₂-water does not get decolourised

(ii) On burning ethane in air, the products obtained are carbon dioxide and water, along with heat and light.



(iii) Methane reacts with chlorine in the presence of sunlight to form chloromethane and hydrogen chloride.



With the excess of chlorine, all the four hydrogen atoms of methane are replaced by chlorine atoms to form carbon tetrachloride (CCl₄). This reaction is considered as substitution reaction because hydrogen of methane is substituted by chlorine.

Q.9. Elements forming ionic compounds attain noble gas electronic configuration by either gaining or losing electrons from their valence shells. Explain giving reason why carbon cannot attain such a configuration in this manner to form its compounds. Name the type of bonds formed in ionic compounds and in the compounds formed by carbon. Also explain with reason why carbon compounds are generally poor conductors of electricity.

Ans. Carbon has 4 electrons in its outermost shell. It cannot lose 4 electrons to form C^{4+} cation because very high energy is required to remove 4 electrons leaving behind a carbon cation with 6 protons in its nucleus holding onto just 2 electrons. It also cannot gain 4 electrons to form C^{4-} anion because it is difficult for 6 protons to hold onto 10 electrons.

The type of bonds formed in ionic compounds are ionic or electrovalent bonds and in compounds formed by carbon are covalent bonds.

Since the electrons are shared, there are no charged particles in carbon compounds and hence they are poor conductors of electricity.

Q. 10. (a) You have three unlabelled test tubes containing ethanol, ethanoic acid and soap solution. Explain the method you would use to identify the compounds in different test tubes by chemical tests using litmus paper and sodium metal.

(b) Give the reason of formation of scum when soaps are used with hard water.

Ans. (a)

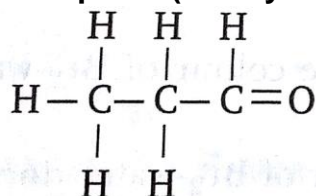
Solution	Blue Litmus Paper	Red Litmus Paper	Sodium Metal
Ethanol	No change	No change	Hydrogen gas
Ethanoic acid	Turns red	No changes	Hydrogen gas
Soap	No changes	Turns blue	Hydrogen gas

(b) Hard water contains calcium ions or magnesium ions or both. These ions on reacting with soap solution forms insoluble substance called scum.

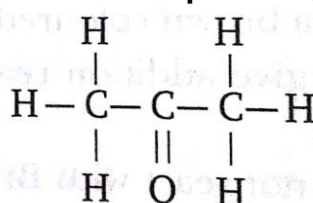
HOTS (Higher Order Thinking Skills)

Q.1. 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.

Ans. Propanal (aldehyde);



Propanone (ketone);



These two compounds are called isomers i.e., compounds having same molecular formula but different structural formula.

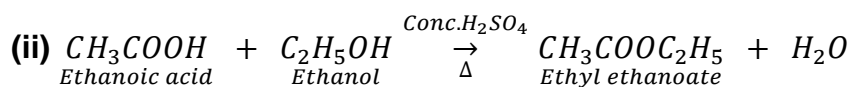
Q.2. An organic acid 'X' is a liquid which often freezes during winter time in cold countries, has the molecular formula $C_2H_4O_2$. On warming it with ethanol is the presence of a few drops of conc. H_2SO_4 , a compound 'Y' with a sweet smell is formed.

(i) Identify 'X' and 'y'.

(ii) Write chemical equation for the reaction involved.

Ans. (i) X = Ethanoic acid (CH_3COOH)

Y = Ethyl ethanoate ($CH_3COOC_2H_5$)



Q.3. Give reason for the following observations:

(a) Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame.

(b) Use of synthetic detergents causes pollution of water.

Ans. (a) We need to adjust air holes of gas burner so that sufficient oxygen-rich mixture is burnt to give a clean blue flame for complete combustion.

(b) Synthetic detergents are generally non-biodegradable, that is, they are not decomposed by microorganisms like bacteria. Hence, use of synthetic detergents causes water pollution in lakes and rivers.

Q. 4. (a) Why do covalent compounds have low melting points and boiling points?

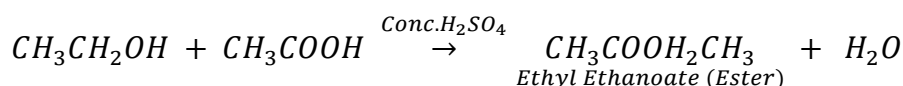
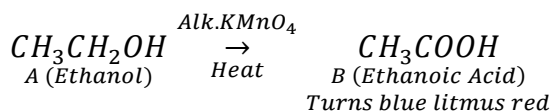
(b) How are carboxylic acids different from mineral acids from ionisation point of view?

Ans. (a) The molecules in covalent compounds are held by weak van der Waal's forces, hence they have low melting points and boiling points as compared to ionic compounds.

(b) Carboxylic acids (like CH_3COOH) ionise to a very small extent in solution and give very small amount of H^+ ions. Thus, they are weak acids as compared to the mineral acids.

Q.5. An organic compound 'A' is a constituent of wine and beer and is also used as fuel in spirit lamp. Compound 'A' on heating with alkaline potassium permanganate gives another compound 'B' which turns blue litmus to red. Compound 'A' and 'B' combine in the presence of conc. H_2SO_4 , to give a sweet-smelling compound 'C'. Identify compounds 'A', 'B' and 'C'. Also write the equations involved in the reaction.

Ans. As compound 'A' is a constituent of wine and beer and is used in spirit lamp it is ethanol.

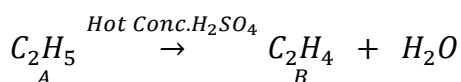


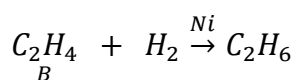
Q.6. An element of group 14 has two common allotropes, A and B. A is very hard and is bad conductor of electricity while B is soft to touch and good conductor of electricity. Identify the element and its allotropes. Explain reasons for their different properties.

Ans. The element is carbon and the two allotropes are diamond and graphite. Diamond has three-dimensional rigid structure and does not have any free electrons. Hence, it is hard and bad conductor of electricity. Graphite forms hexagonal sheet-like structure and one valency (one electron) with carbon is free. Hence, graphite is soft and a good conductor of electricity.

Q.7. An organic compound A on heating with concentrated H_2SO_4 forms a compound B which on addition of one mole of hydrogen in presence of Ni forms a compound C. One mole of compound C on combustion forms two moles of CO_2 and 3 moles of H_2O . Identify the compounds A, B and C and write the chemical equations of the reactions involved.

Ans. Since compound C gives 2 moles of CO_2 and 3 moles of H_2O , it shows that it has the molecular formula C_2H_6 (Ethane). C is obtained by the addition of one mole of hydrogen to compound B so the molecular formula of B should be C_2H_4 (Ethene). Compound B is obtained by heating compound A with concentrated H_2SO_4 which shows it to be an alcohol. So compound A could be $\text{C}_2\text{H}_5\text{OH}$ (Ethanol).

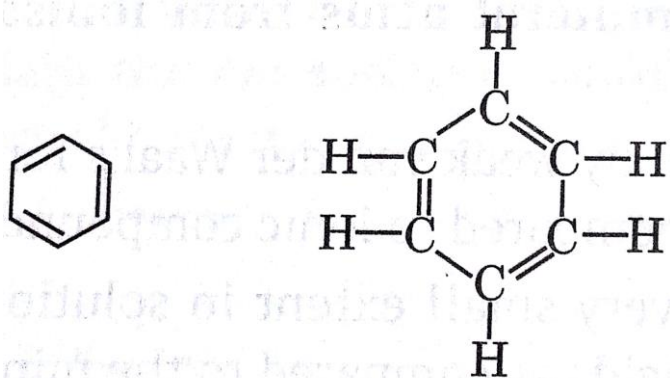




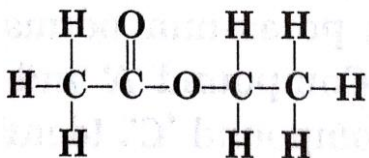
Q.8. A cyclic compound 'X' has molecular formula C₆H₆. It is an unsaturated compound and burns with sooty flame. Identify 'X' and write its structural formula.

Ans. X = Benzene/C₆H₆

Structure



Q.9. The structure formula of an ester is:



Write the molecular formula of alcohol and acid from which it would have been formed.

Ans. Alcohol → CH₃CH₂OH/C₂H₅OH

Carboxylic acid → CH₃COOH

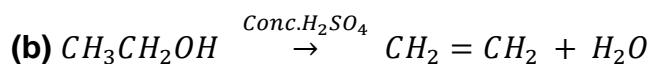
Q.10 An organic compounds A of molecular formula C₂H₆O On heating with excess of Conc. H₂SO₄ gives compound B of molecular formula C₂H₄. Compound B on reduction gives compounds C of molecular formula C₂H₆.

(a) Name A, B and C.

(b) Write chemical equation for the conversion of A to B.

(c) What is the role of Conc. H₂SO₄ in the above equation?

Ans. (a) A – Ethanol B – Ethene C – Ethane



(c) Conc. H₂SO₄ acts as a dehydrating agent.

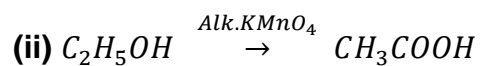
Q.11 An organic compounds 'A' of molecular formula C_2H_6O on oxidation with dilute alkaline $KMnO_4$ solution gives an acid 'B' with the same number of carbon atoms. Compound 'A' is often used for sterilisation of skin by doctors.

(i) Name the compounds 'A' and 'B'.

(ii) Write the chemical equation involved in the formation of 'B' from 'A'.

Ans. (i) Compound A – Ethanol (ethyl alcohol)

Compound B – Ethanoic acid (acetic acid)



Value Based Questions

Q. 1. Mrs. Anita Pandey observed that her cooking utensils are becoming black in colour and the flame of her gas stove is yellowish in colour. She complains about it in the gas company and got the gas stove repaired.

Answer the following questions based on the above situation:

- (i) What can be the reason for this sooty flame?**
- (ii) How is this problem harmful for our environment?**
- (ii) What steps should be taken to stop this process?**
- (v) What values are promoted by Mrs. Pandey?**

Ans. (i) The inlets for air in stove get blocked which leads to yellow flame.

(ii) This problem is harmful for our environment as incomplete combustion results in the formation of oxides which are major pollutants of our environment.

(iii) For preventing this situation, gas or stove burners should be cleaned time to time.

(iv) Prudence, careful observation, decision making.

Q. 2. Ethanol, commonly called as alcohol is an excellent solvent, is used in medicines and is an important chemical compound involved in synthesis of many chemical compounds.

However, in spite of its benefits to man its impact on social behaviour has always been questioned. Media has often shown abnormal behaviour of people while drunk. It is considered as a curse in the lives of those who are addicted to alcohol. 'Alcoholic, people are not only lowering their metabolism and affecting Central Nervous System, they are also a threat to the lives of others. Anger and rude behaviour are some of its ill effects.

Answer the following questions based on the above information:

- (i) Comment on the statement-'should production of alcohol be banned?' Give three valid reasons to justify.**
- (ii) As a student what initiative would you take in the common concern of Save Life, Do Not Drink'? Give two suggestions.**

Ans. (i) In favour of negative response:

(a) It is used as a solvent in the manufacture of varnishes, etc.

(b) It is used in so many ways for medicines.

(c) It is used as a disinfectant.

In favour of positive response:

(a) Cause of death of many people.

(b) Many adolescents get affected out of it and become addicts, which affects their physical as well as mental health.

(c) Is being misused even where it is of important use (for example, painting shops, industries)

(ii) Initiatives:

(a) Drive to spread awareness.

(b) Skit/street plays/drama.

(c) Organising exhibitions.

(d) Organising debate.

Q. 3. A chemical bond is an attractive force that holds the atoms together in a molecule or a compound. The element carbon is known to have the unique ability to form bonds with other similar atoms or atoms of other elements. This property of carbon has resulted in its having very large number of compounds. The carbon-carbon bond is also known to be very strong and hence stable.

Answer the following questions based on above information:

(i) Name the chemical bond formed between carbon-carbon atoms. How is this bond formed?

(ii) Which two values are reflected in the nature of carbon resulting in its ability to form maximum number of compounds?

(iii) How can these values be helpful in strengthening relationship in a family, organisation or even people of a nation?

Ans. (i) Covalent bond is formed between carbon-carbon atoms by the sharing of electrons.

(ii) Sharing (ability to share); nature to share and bonding with others.

(iii) Sharing of one's possessions, jobs, resources, moments with others enable an individual, an organisation or even a society to live happily and comfortably.