Grade X - Science

Lesson 4. Carbon Compounds

Objective Type Questions

(1 Mark each)

I. Multiple choice questions

1. Which of the following is not observed in a homologous series? Give reason for yours choice.

   a. Change in chemical properties.

   b. Difference in $-CH_2$ and 14u mass

   c. Gradation in physical properties

   d. Same functional group

2. Ethane, with the molecular formula C_2H_4 has

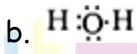
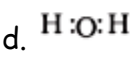
   a. 6 covalent bonds **b. 7 covalent bonds**

   c. 8 covalent bonds d. 9 covalent bonds

3. Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms, e.g., hydrogen. After the formation of four bonds, carbon attains the electronic configuration of

   a. Helium **b. Neon** c. Argon d. Kryton

4. The correct electron dot structure of a water molecule is

   a.  b.  c.  d. 

Ans. c

5. Which among the following are unsaturated hydrocarbons?

   (i) $H_3C - CH_2 - CH_2 - CH_3$

   (ii) $H_3C - C \equiv C - CH_3$

   (iii) $H_3C - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3$

   (iv) $H_3C - \underset{\displaystyle CH_3}{\underset{|}{C}} = CH_2$

a. (i) and (iii) b. (ii) and (iii) **c.(ii) and (iv)** d. (iii) and (iv)

6. Oils on treating with hydrogen in the presence of palladium or nickel catalyst form fats. This is an example of

   a. Addition reaction

   b. Substitution reaction

   c. Displacement reaction

   d. Oxidation reaction

7. In which of the following compounds,—OH is the functional group?

   a. Butanone **b.Butanol** c. Butanoic acid d. Butanal

II. Multiple choice questions

1. When sodium hydrogen carbonate is added to ethanoic acid a gas evolves. Consider the following statement about the gas evolved.

   (A) It turns lime water milky.

   (B) It is evolved with a brisk effervescence.

   (C) It has a smell of burning sulphur.

   (D) It is also a by-product of respiration.

   The correct statements are:

   a. (A) and (B) only.

   b. (B) and (D) only.

   c. (A),(C) and (D)

   d. (A), (B) and (D)

2. While studying the saponification reaction, what do you observe when you mix an equal amount of colourless vegetable oil and 20% aqueous solution of NaOH in a beaker?

   a. The colour of the mixture has become dark brown

   b. A brisk effervescence is taking place in the beaker

   c. The outer surface of the beaker has become hot

   d. The outer surface of the beaker has become cold

3. When you add a few drop of acetic acid to a test-tube containing sodium bicarbonate power, which one of the following is your observation?

a. No reaction takes place.
b. A colourless gas with pungent smell is released with brisk effervescence.
c. A brown coloured gas is released with brisk effervescence.
d. Formation of bubbles of a colourless and odourless gas.

4. In the soap micelles

a. the ionic end of soap is on the surface of the cluster while the carbon chain is in the interior of the cluster.
b. ionic end of soap is in the interior of the cluster and the carbon chain is out of the cluster.
c. both ionic end carbon chain are in the interior of the cluster.
d. both ionic end and carbon chain are on the exterior of the cluster.

5. Ethanol reacts with sodium and forms two products. These are

a. sodium ethanoate and hydrogen
b. sodium ethanoate and oxygen
c. sodium ethoxide and hydrogen
d. sodium ethoxide and oxygen

III. Multiple choice questions

1. — CHO represents the functional group

a. esters b. carboxylic acid c. alcohol **d. aldehydes**

2. A functional group mainly determines the

a. physical properties **b. chemical properties**
c. both d. none of these

3. Solubility of alcohol in water is due to

a. low density of alcohol b. volatile nature of alcohol
c. ionisation **d. hydrogen bonding**

4. Artificial flavour for orange is obtained from

a. amyl acetate b. isoamyl valerate
c. methyl butyrate **d. octyl acetate**

5. Drinking alcohol is very harmful and it ruins the health. "Drinking alcohol" stands for

a. drinking methyl alcohol **b. drinking ethyl alcohol**
c. drinking propyl alcohol d. drinking isopropyl alcohol

6. The ionic part of synthetic detergent is

a. $-OSO_3^- Na^+$ b. $-COO^- Na^+$

c. $-COO^- H^+$ d. $-COO^- CH_3^+$

7. The difference in the formula and molecular masses of CH_3OH and C_2H_5OH is

a. CH_3 and 16u

b. CH_2 and 14u

c. CH_4 and 18u

d. CH_3 and 16u

8. Which of the following statements about graphite and diamond is true?

a. They have the same crystal structure.

b. They have the same degree of hardness.

c. They have the same electrical conductivity.

d. They can undergo the same chemical reactions.

9. Which of the following ethanol?

a. CH_3CHO b.CH_3COOH **c. CH_3CH_2OH** d. CH_3COOCH_3

10. Which of the following contains covalent bond?

a. $Mgcl_2$ b. CaF_2 c.Al_2O_3 **d. HCl**

11. The number of covalent bonds in C_4H_{10} is

a. 10 b. 8 **c. 13** d. 12

12. Which amongst the following will conduct electricity?

a. $C_6H_{12}O_6$ b. KCl(s) c.C_2H_5OH **d. NaCl (aq)**

13. The self linkage property (catenation) is maximum in

a. carbon b. silicon c. sulphur d. phosphorus.

14. Ethane and ethene can be distinguished by

a. $Br_2(l)$ **b. Br_2 (aq) water** c. Cl_2 d. I_2

15. Carbon exists in the atmosphere in the form of

a. carbon monoxide only

b. carbon monoxide in traces and carbon dioxide

c. carbon dioxide only

d. coal

16. Which of the following statement are usually correct for carbon compounds?

(i) They are good conductors of electricity

(ii) They are poor conductors of electricity

(iii) They have strong forces of attraction between their molecules

(iv) They do not have strong forces of attraction between their molecules.

a. (i) and (iii) b. (ii) and (iii) c. (i) and (iv) **d. (ii) and (iv)**

17. A molecule of ammonia (NH_3) has

a. only single bonds b. only double bonds

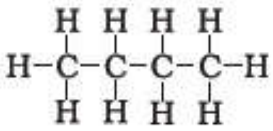
c. only triple bonds d. two double bonds and one single bond

18. Buckminsterfullerence is an allotropic form of

a. Phosphorus b. sulphur **c. carbon** d. tin

19. Which of the following are correct structural isomers of butane?

i.



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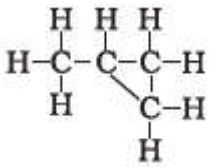

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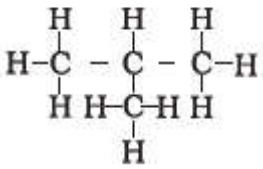

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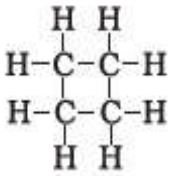


a. (i) and (iii) b. (ii) and (iv) c. (i) and (ii) d. (iii) and (iv)

20. $CH_3CH_2OH \xrightarrow{\text{Alkaline } KMnO_4 + \text{heat}} CH_3COOH$

In the above given reaction alkaline $KMnO_4$ acts as

a. reducing agent **b. oxidising agent**

c. catalyst d. dehydrating agent

21. Oils on treating with hydrogen in the presence of palladium or nickel catalyst form fats.

This is an example of

a. Addition reaction b. Substitution reaction

c. Displacement reaction c. Oxidation reaction

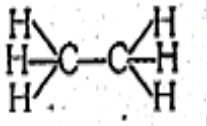
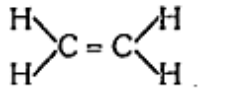
22. Which of the following is the correct representation of electron dot structure of nitrogen?

a) :N : N: b) :N :: N: c. :N : N: d. :N ⁞⁞ N:

Ans.(d)

23. Structural formula of ethyne is

a. $H-C\equiv C-CH_3$ b. $H-C\equiv C-H$

c.  d. 

Ans. (b)

24. Chlorine reacts with saturated hydrocarbon at room temperature in the _____

a. absence of sunlight **b. presence of sunlight**

c. presence of water c. presence of hydrochloric acid

25. Pentane has the molecular formula C_5H_{12}. It has

a. 5 covalent bonds b. 12 covalent bonds

c. 16 covalent bonds d. 17 covalent bonds

26. Ethanol reacts with sodium and forms two products. These are

a. sodium ethanoate and hydrogen b. sodium ethanoate and oxygen

c. sodium ethoxide and hydrogen d. sodium ethoxide and oxygen

27. Vinegar is solution of

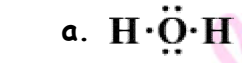
a. 50 % - 60 % acetic in alcohol b. 5 % - 8 % acetic acid in alcohol

c. 5 % - 8 % acetic acid in water d. 50 % - 60 % acetic acid in water

28. Carbon forms four covalent bonds by sharing its four valence electrons with four univalent atoms. E.g. hydrogen. After the formation of four bonds. Carbon attains the electronic configuration of

a. helim b. argon **c. Neon** d. Krypton

29. The correct electron dot structure of a water molecule is

a.  b. c. d.

Ans. c

30. Which of the following does not belong to the same homologous series?

a. CH_4 b. C_2H_6 c. **C_4H_8** d.C_3H_8

31. The heteroatoms present in $CH_3 - CH_2 - O - CH_2Cl$ are

(i) oxygen (ii). carbon (iii) hydrogen (iv) chlorine

a. (i) and (iii) b. (ii) and (iii) c. (iii) and (iv) **d. (i) and (iv)**

32. Which of the following represents saponification reaction?

a. $CH_3COOH + NaOH \xrightarrow{CaO} CH_4 + Na_2CO_3$

b. $CH_3COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3COOC_2H_5 + H_2O$

c. $2CH_3COOH + 2Na \rightarrow CH_3COONa + H_2$

d. $CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$

Ans. d

I. Assertion & Reason

Directions : In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is NOT the correct explanation of A.

(C) A is true but R is false.

(D) A is false and R is true.

1. **Assertion (A)** : In a homologous series of alcohols, the formula for the second member is C_2H_5OH and the third member is C_3H_7OH.

Reason (R) : The difference between the molecular masses of the two consecutive members of a homologous series is 144.

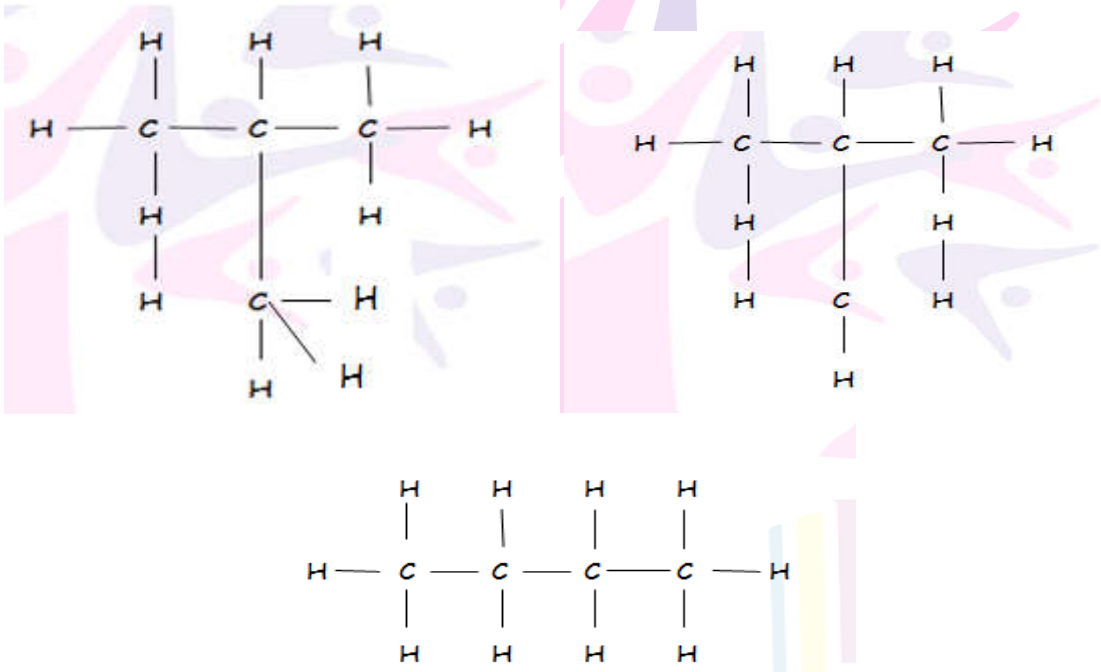
Ans. Option (C) is Correct.

2. **Assertion (A)** : Following are the members of a homologous series : CH_3OH, CH_3CH_2OH, $CH_3CH_2CH_2OH$

Reason (R) : series of compounds with same functional group but differing by $-CH_2$ unit is called a homologous series.

Ans. Option (A) is Correct.

3. **Assertion** : Following are the structural isomers of butane.



Reason : Structural isomers have the same molecular formula but they differ in their structures.

Ans. Option (A) is Correct.

4. **Assertion (A)** : Iso-butane is the isomer of C_4H_{10}

Reason (R) : Iso-butane has four C and ten H atom.

Ans. option (B) is Correct.

5. **Assertion (R)** : CH_3Cl is obtained from CH_4 by substitution reaction by the action of Cl_2 in the presence of sunlight.

Reason (R) : It is obtained by addition reaction.

Ans. Option (C) is Correct.

II. Assertion & Reason

Directions : In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is NOT the correct explanation of A.

(C) A is true but R is false.

(D) A is false and R is true.

1. **Assertion (A)** : Acetic acid has six single bond and one double bond.

Reason (R) : It is unsaturated organic compound.

Ans. Option (A) is Correct.

2. **Assertion (A)** : Soap has good cleaning action.

Reason (R) : Soap has short chain of hydrocarbon which acts as hydropobic and long ionic part which acts as hydrophilic.

Ans. Option (C) is Correct.

3. **Assertion** : Esterfication is a process in which a sweet smelling substance is produced

Reason : When esters react with sodium hydroxide, an alcohol and sodium salt of carboxylic acid are obtained.

Ans. Option (B) is Correct.

4. **Assertion (A)** : In esterification, carboxylix acid and alcohol reacts in the presence of acid to give eter.

Reason (R) : Esterfiation is the reverse of saponification

Ans. option (B) is Correct.

III. Assertion & Reason

Direction : In the following question, the assertion and Reason have been put forward. Read the statement carefully and choose the correct alternative from the following.

(a) Both the assertion and the Reason are correct and the Reason is the correct explanation of the Assertion.

(b) The Assertion and the Reason are correct but the Reason is not the correct explanation of the Assertion.

(c) Assertion is true but the Reason is false.

(d) The statement of the Assertion is false but the Reason is true.

1. **Assertion** : Methane is simplest saturated hydrocarbon which is a major component of natural gas.

   Reason : Methane belongs to alkene.

Ans.(c) Assertion is true but the Reason is false.

2. **Assertion** : Ethanol is present in alcoholic drinks.

   Reason : Ethanol gas formula CH_3OH.

Ans (C) Assertion is true but the Reason is false.

3. **Assertion** : Ethanoic acid reacts with ethyl alcohol in presence of conc H_2SO_4 to form ethy ethanoate.

   Reason : Esters are used in ice creames and cold drinks.

Ans. (b) The Assertion and the Reason are correct but the the Reason is not the correct explanation of the Assertion.

4. **Assertion** : Vegetable oils are unsaturated, react with hydrogen in presence of nickel to form vegetable ghee.

   Reason : This reaction is saponification.

Ans. (c) Assertion is true but the Reason is false.

5. **Assertion** : Soaps are 100% bio-degradable but work well with hard water:

   Reason : Some detergents are not bio-degradable but work well with hard water.

Ans. (d) The statement of the Assertion is false but the Reason is true.

I. Very Short Answer Type Questions

(1 Mark each)

1. Name a cyclic unsaturated carbon compound.

Ans. Cyclopentene/cyclohexene-formula or structure(or any other)

2. Write the molecular formula of the 2nd and the 3rd member of the homolohous series whose first member is methane.

Ans. Ethane(C_2H_6)

Propane (C_3H_8)

3. Name the functional group present in propanone.

Ans. Ketone.

4. How are covalent bonds formed.

Ans. Covalent bonds are formed by the sharing of electrons pair/pairs between the atoms.

5. Write the molecular formula of first two members of homologous series having functional group –Br.

Ans. CH_3Br, C_2H_5Br

6. Write the molecular formula of the 2nd and 3nd member of the homologous series where the first member is ethayne.

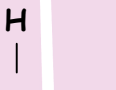
Ans. C_3H_4, C_4H_6

7. 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

8. Name the following compounds:

(i) $CH_3—CH_2—OH$, **(ii)** 

Ans. (i) Ethanol, (ii) Ethanal.

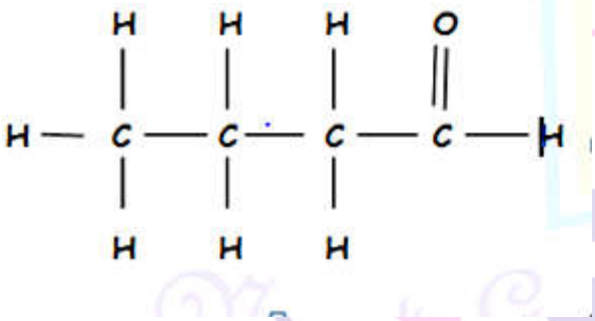
9. Which element exhibits the property of catenation to maximum extent and why?

Ans. Carbon, due to strong C __C bond.

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

Ans. Butanal, $CH_3 - CH_2 - CH_2 - CHO$

Or



11. Name the process of converting vegetable oil to vegetable ghee.

OR

Name the process by which unsaturated fats gets changed to saturated fats.

Ans. Hydrogenation.

12. **100% Pure ethyl alcohol is called _____**

Ans. Absolute alcohol.

13. Carboxylic acid containing one carbon atom is called_____

Ans. Formic acid.

14. Methane reacts with 1 mole of chlorine in presence of sunlight to give _____

the reaction is called _____ reaction.

Ans. Chloromethane, substitution.

15. The number of isomers of C_6H_{14} are _____

Ans . 5

True or False Statements:-

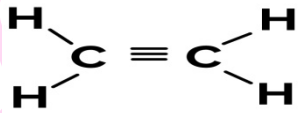
16. Buckminster fullerene is an isomer of of carbon containing clusters of carbon atom joined together to forms spherical molecules.

Ans. False.

17. The general formula of saturated hydrocarbon is C_nH_{2n+2}

Ans. True.

18. The structural formula of ethyne is



Ans. False

19. The IUPAC name of ethylene is ethane.

Ans. False.

20. When the oxygen supply is insufficient, the fuel burn incompletely producing mainly a blue flame

Ans. False.

21. The addition of hydrogen to an unsaturated hydrocarbon to produce saturated hydrocarbon is know as hydrogenation.

Ans. True.

Direction: Match Columns I with Column II.

Column I	Column II
(i) $CH_4 + Cl_2 \xrightarrow{\text{Sunlight}}$	A. Unsaturated hydrocarbon
(ii) $H_2C = CH_2$	B. Used in wood polish.
(iii) CH_3OH	C. $CH_3Cl + HCl$
(iv) Ester	D. Used in the ice cream cold drinks and artificial flavours.

Ans. (i) C (ii) (A) (iii) (D) (iv) (B)

22. How much carbon is present on earth and CO_2 in atmosphere?

Ans. 0.02% , 0.03%

23. What is valency of carbon?

Ans. 4

24. Why does carbon forms strong bonds?

Ans. It is due to small size.

25. What will be the product formed when carbon is burnt in presence of air?

Ans. Carbon dioxide

26. What is allotropy?

Ans. It is a property due to which an element can exist in more than one for which differ in physical properties but have similar chemical properties, e.g., carbon, sulphur, phosphorus, oxygen show allotropy.

27. Name three allotropes of carbon.

Ans. Diamond, graphic and Buckminster fullerenes

28. Which is the purest allotrope of carbon?

Ans. Buskminster fullerences.

29. Why is graphite soft slippery?

Ans. Due to weak van der walls' forces of attraction between hexagonal layers.

30. Why is diamond hard?

Ans. It is due to strong covalent bonds.

31. Why is diamond hard?

Ans. It is due to strong covalent bonds.

32. Carbon has four electrons in its valences shell. How does carbon attain stable electronic configuration.

Ans. It is because carbon can share form electrons to complete its octet.

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40. Why is diamond Iustrous?

Ans. It is due to high refractive index.

41. Carbon has four electrons in its valence shell. How does carbon attain stable electronic configuration.

Ans. By sharing four electrons with other atoms.

42. Draw electron dot structures of water molecule.

Ans.

43. Whyn is carbon tetravalent?

Ans. It is because carbon can share form electrons to complete its octet.

44. Which element exhibits the property if catenation to maximum extent and why?

Ans. Carbon shows catenation to maximum extent because it forms strong covalent bonds.

45. Which gas is present in biogas and CNG?

Ans. Methane

46. Give name of one cyclic hydrocarbon.

Ans. Cyclohexane

47. What are organic compounds?

Ans. Those compounds which consist of carbon essentially and hydrogen mostly along with ether elements like oxygen, sulphur, nitrogen, halogens, etc., are called organic comounds.

48. What is vital Force Theory?

Ans. It was proposed that 'vital force' is necessary for formation of these organic compounds. They can only be obtained from living organisms.

49. Name the first organic compound prepared in Laboratory.

Ans. In 1828, wohlar prepared first organic compound urea by heating ammonium cyanate by isomerisation reaction

$NH_4CNO \xrightarrow{heat} NH_2CONH_2$

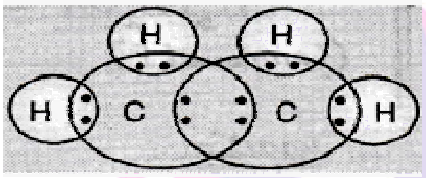
Ammonium eyante Urea

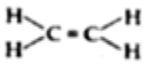
50. Why carbon considered to be the most important element?

Ans. Carbon is considered to be the most important element because it forms largest number of compounds which are useful in our daily life.

51. Write the electron dot structure ethane molecule (C_2H_4).

Ans.





52. Name the following compounds:

(a) $CH_3 - CH_2 - OH$, (b) $CH_3 - \overset{\overset{H}{|}}{C} = O$

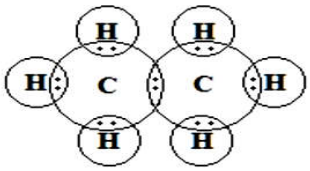
Ans. (a) Ethanol (b) Ethanol

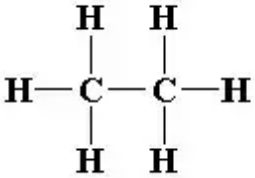
53. Write the general formula of hydrocarbon alkene. Write the name of simplest alkene.

Ans. C_nH_{2n}, Ethene

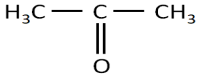
54. Write the electron dot structure of ethane molecule (C_2H_6).

Ans.



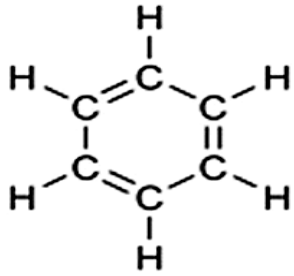


55. Name the first member of ketone.

Ans.  , Propanone

56. Write the molecular formula of benzene and state the number of double bonds in its structure.

Ans. C_6H_6



57. Write the molecular formula of the 2nd and the 3rd member of the homologous series whose first member is methane.

Ans. C_2H_6 and C_3H_8 are molecular formula of 2nd nd 3rd member of alkanes.

58. Write the general formula of first twi members of homologous series with functional group __OH.

Ans. Methanol (CH_3OH) and Ethanol (CH_3CH_2Cl).

59. Write the molecular formula of first two members of hologous series having group ___Cl.

Ans. CH_3cl and C_2H_5cl.

60. Write the molecular formula of the first two members of the homologous series having function group __COOH.

Ans. HCOOH _ Methanoic acid

CH_3COOH __ Ethanoic acid

61. Write the name and formula of the 2nd member of the series of carbon compounds whose general formula is C_nH_{2n}.

Ans. C_3H_6, $H_2C = CH \quad CH_3$

Propene is second member of series whose general formula is C_nH_{2n}.

II. Very Short Answer Type Questions (1 Mark each)

1. What is the chemical formula of acetic acid?

Ans. CH_3COOH

2. Medicine like tincture iodine or cough syrup uses ethanol for their preparation. Why ?

Ans. Ethanol is a solvent used to make tincture iodine or cough syrup because the cell membrane of microorganisms is made up of lipids and ethanol is the solvent, which can dissolve the lipid easily and kill the micro-organisms that may be pathogenic.

3. What is the role of conc. H_2SO_4 while conversion of ethanol to ethane?

Ans. Concentrated sulphuric acid acts as dehydrating agent, i.e., removes water molecule from ethanol and also catalyse the reaction and convert ethanol to ethane.

4. Show conversion of ethanol to ethanoic acid in the presence of $KMnO_4$.

Ans. $CH_3CH_2OH \xrightarrow{KMnO_4\,[O]} CH_3COOH$

5. Explain saponification?

Ans. The reaction of an ester to react with an acid or base to give back the alcohol and carboxylic acid is called saponification.

I. Short Answer Type Questions - I

(2 Mark each)

1. The table shows the electronic structure of four elements.

Element	Electronic Structure
P	2,6
Q	2,8,1
R	2,8,7
S	2,8,8

(a) Identify which element(s) will form covalent bonds with carbon.

(b) "Carbon reacts with an element in the above table to form several compounds". Give suitable reason.

Ans. (a) P and R

(b) Carbon has a valency four or Tetravalency and Catenation.

2. A carbon compounds 'A' having melting point 156 K and boiling point 351 K, with molecular formula C_2H_6O is soluble in water in all proportions.

(a) Identify 'A' and draw its electron dot structure.

(b) Give the molecular formula of any two homologous of 'A'.

Ans. (a) Ethanol; C_2H_5OH

(b) CH_3OH and C_3H_7OH are homologous of ethanol. CH_4O and C_3H_8O

3. Give a test that can be used to confirm the presence of carbon in a compound. With a valency of 4, how is carbon able to attain able gas configuration in its compounds?

Ans. - Burn compound in air/ oxygen; Gas evolved turns lime water milky.

- By sharing its four valence electrons with other elements.

4. Unsaturated hydrocarbons contain multiple bond between two carbon atoms and these compounds show addition reactions. Out of saturated and unsaturated carbon compounds. Which compounds are more reactive? Write a test to distinguish from ethane.

Ans. Unsaturated compounds are more reactive.

Test: Bayer's reagent test / Bromine water test given by ethane and not by ethane / Ethane gives clear flame while ethane gives a yellow flame with lots of black smoke.

5. Write the name and formula of the 2nd member of the series of carbon compounds whose general formula is $C_nH_{2n+1}OH$.

Ans. Ethanol, C_2H_5OH or CH_3CH_2OH

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

Ans. Propene, C_3H_6

7. Select saturated hydrocarbons from the following: C_3H_6, C_5H_{10}, C_4C_{10}, C_6H_{14}, C_2H_4.

Ans. C_6H_{14} and C_4H_{10} are saturated hydrocarbons.

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

Ans. Butane. C_4H_{10}

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

Propyne, C_3H_4.

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

Ans. Ethane, C_2H_6

11. Name the functional group present in each of the following organic compounds:

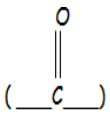
(i) C_2H_5Cl (ii) C_2H_5OH

Ans. (i) (— Cl) Halogen (Chloro)

(ii) (— OH) Alcohol

12. Name the functional group present in each of the following organic compounds:

(i) CH_3COCH_3 (ii) C_2H_5COOH

Ans. (i) Ketone 

(ii) Carboxylic acid (— COOH)

13. Name the functional group present in each of the following compounds:

(i) HCOOH (ii) C_2H_5CHO

Ans.

(i) — COOH (Carboxylic acid)

(ii) — CHO (Aldehyde)

14. Write the molecular formula of the fourth and fifth members of the homologous series of carbon compounds represented by the general formula $C_nH_{2n+1}OH$.

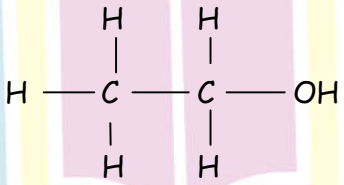
Ans. $CH_3CH_2CH_2CH_2OH$ is fourth member.

$CH_3CH_2CH_2CH_2CH_2OH$ is fifth member.

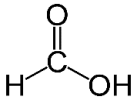
15. Write name and formula of the second member of the carbon compounds having functional group OH.

Ans. $CH_3 — CH_2 — OH$,

Ethanol



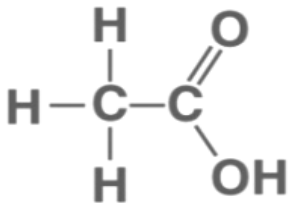
16. Write the name and formula of the first member of the carbon compounds having functional group-COOH.

Ans. HCOOH 

Methanoic acid

17. Draw the structure for ethanoic acid molecule. CH_3COOH.

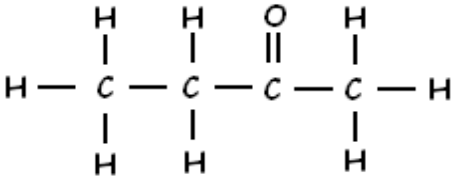
Ans.



Ethanoic acid

18. Draw the structure of butanone molecule, $CH_3COC_2H_5$

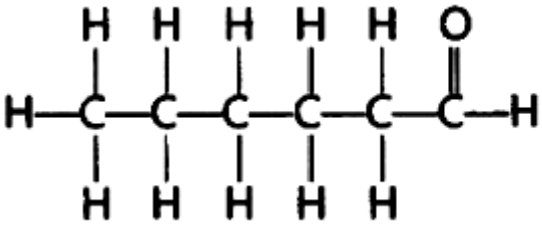
Ans.



Butanone

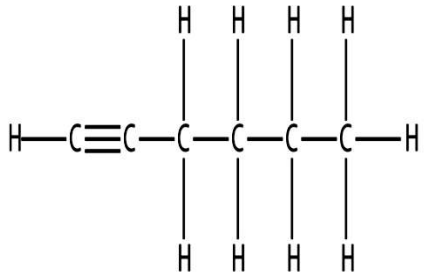
19. Draw the structure of the hexanal molecule, $C_5H_{11}CHO$.

Ans.



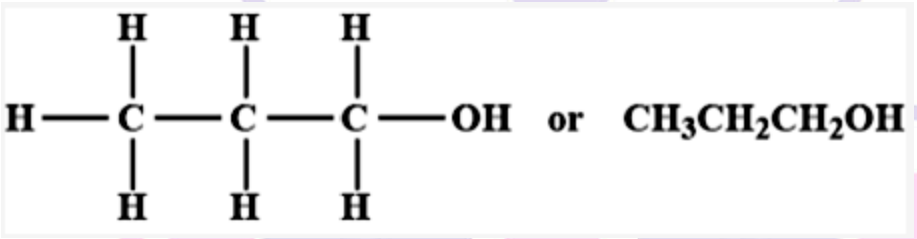
Hexanal ($C_5H_{11}CHO$)

20. Name the following compounds:



Ans. 1-Hexyne is IUPAC name of the compound.

21. Write the name and structure of an alcohol with three carbon atoms units molecule



1 – Propanol

22. Write molecular formulae of alcohol which can be derived from butane.

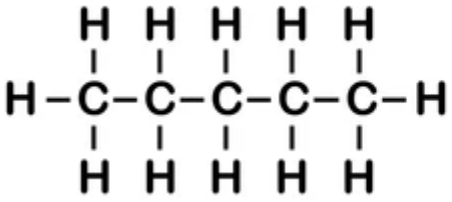
Ans. C_4H_9OH or $CH_3CH_2CH_2CH_2OH$

23. What is glacial acetic acid?

Ans. Pure acetic acid (100%) is called glacial acetic acid.

24. How many covalent bonds are present in pentane C_5H_{12}.

Ans. There are 16 covalent bonds present in C_5H_{12}



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

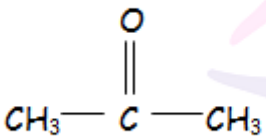
Ans. C_2H_2, Ethyne

26. Write the next homologue of each of the following.

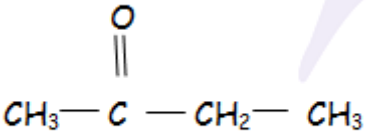
(i) C_2H_4 (ii) C_4H_6

Ans. C_3H_4 and C_4H_6

27. Write the formula of the members of homologous series with functional group $>C=O$



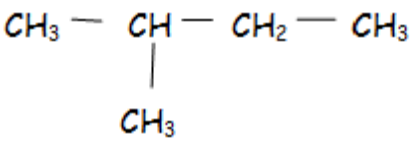
Ans. and



28. Draw the structure of two isomers of pentane, C_5H_{12}.

Ans. $CH_3-CH_2-CH_2-CH_2-CH_3$

Pentane



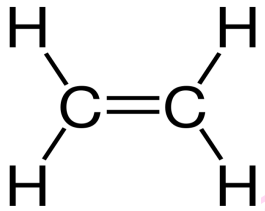
2-methybutane

29. Which hetero atoms are present in halo alkane?

Ans. Cl , Br, F, I

30. Draw the structures of the first member of alkenes and series to show the bonding between the two carbon atoms.

Ans. First member of alkenes is C_2H_4 (ethane) and alkyne is C_2H_2ethyne). Their structures are shown below:



Ethene

Ethyne

31. Write molecular formula of alkyne containing 10 atoms of hydrogen.

Ans. C_6H_{10}

II. Short Answer Type Questions - I **(3 Mark each)**

1. List two chemical properties on the basis of which ethanol and ethanoic acid may be differentiated and explain how.

Ans. Ethanoic acid reacts with NaOH to give sodium salt and water but C_2H_5OH does not show this reaction.

Ethanoic acid reacts with $NaHCO_3$ (Sodium Bicarbonate) or Na_2CO_3 (Sodium Carbonate) and given sodium salt of ethanoic acid, water and carbon dioxide.

2. On dropping a small piece of sodium in a test-tube containing carbon compound 'X' with molecular formula C_2H_6O, a brisk effervescence is observed splinter at the mouth of the mouth of the test-tube the gas evolved burns with a pop sound. Identify 'X' and 'Y'. Also write the chemical equation for the reaction. Write the chemical equation for the reaction formed, when you heat 'X' with excess conc. Sulphuric acid.

Ans. X - C_2H_5OH; Y - H_2 gas

$2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2\uparrow$

Ethene; C_2H_4

3. Why the mixture of ethyne and air is not used for welding though air is easily available. Instead, a mixture of ethane and oxygen is used for welding.

Ans. Air contains a mixture of nitrogen and oxygen. Nitrogen which is more in quantity does not support combustion.

While when ethyne is burnt is oxygen, large quantity of heat and is evolved. The heat evolved can be used for welding.

(b) CH_3OH and C_3H_7OH are homologous of ethanol CH_4O and C_3H_8O

3. Give a test that can be used to confirm the presence of carbon in a compound. With a valency of 4, how is carbon able to attain moble gas configuration in its compounds?

Ans. Burn compounds in air/ oxygen; Gas evolved turns lime water milky

By sharing its four valence electrons with other elements.

4. Unsaturated hydrocarbons contain multiple bonds between two carbon atoms and these compounds show addition reactions. Out of saturated and unsaturated carbon compounds, which compounds are more reactive? Write a test to distinguish ethane from ethane.

Ans. Unsaturated compounds are more reactive.

Test: Bayer's reagent test / Bromine water test given by ethane and not by ethane / Ethane gives clear flame while ethane gives a yellow flame with lot of black smoke.

5. Butter and cooking oil can be distinguished using alkaline $KMnO_4$ Cooking oil is unsaturated compound and thus decolourised the pink colour of $KMnO_4$ while butter is a saturated compound so it does not.

Ans. Bromine water test in which only cooking oil discharges brown colour due to cooking oil being unsaturated compound.

6. What detergents chemically? List two demerits of using detergents for cleaning.

Ans. Detergents are sodium or potassium salts of sulphonic acid of benzene or alkene.

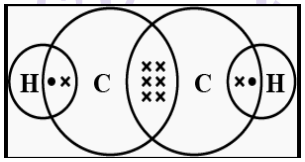
Demerits:

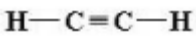
(i) They are expensive.

(ii) They are non-biodegradable, therefore cause water pollution.

7. 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.





Ehyne and air will not produce enough heat due to incomplete combustion needed for welding purpose. Ethyne and oxygen will produce lot of heat due to complete combustion which can be used for welding purposes.

8. Write the name and molecular formula of an organic compound having its name suffixed with 'ol' and having two carbon atoms in its molecule. Write balanced chemical equation to indicate what happens when this compounds is heated with excess conc. H_2SO_4 and the name of the main product formed. Also state the role of conc. H_2SO_4 in the reaction.

Ans. Ethanol, C_2H_5OH

$$CH_3CH_2OH \xrightarrow[443K]{\text{Conc } H_2SO_4} CH_2 = CH_2 + H_2$$

Ethanol Ethane

Conc. H_2SO_4 acts as dehydrating agent.

I. Short Answer Type Questions – II

(3 marks each)

1. What is a homologous series of carbon compounds? Give an example and list its there characteristics.

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

Example: Alkane / Alkane / Alkyne / Alcohol or any other one carrot example.

Characteristics:

(i) They have same general formula.

(ii) They have same functional group.

(iii) The difference in the molecular mass of two successive members in 14 u.

(iv) The difference in the molecular formula of two successive member is of CH_2 unit.

(v) They have similar chemical properties.

2. Which compounds are called (a) alkenes, (b) alkynes? C_4H_{10} belongs to which of these? Draw two structural isomers of this compounds.

Ans.(a) Alkenes

Saturated hydrocarbon with C-C single bond

(b) Alkenes

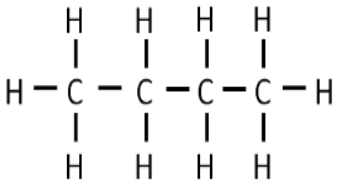
Unsaturated Hydrocarbon with double bond in C=C

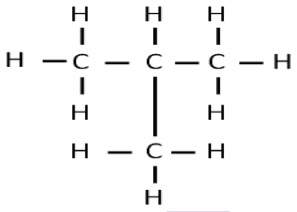
(c) Alhynes

Unsaturated Hydrocarbon with triple bond in C ≡ C

C_4H_{10} belongs to Alkane

2 structural isomers.





3. What happens when hydrogen is added to a vegetable oil in the presence of nickel? Name the reaction and write one difference between the physical property of the vegetable oil and the product obtained in this reaction. Write the role of nickel in this reaction.

Ans. (i) Vegetable oil is converted into saturated fat.

(ii) The reaction is Hydrogenation.

(iii) Unsaturated vegetable oil is liquid and saturated fat is solid at room temperature

(iv) Nickel acts as a catalyst.

4. Explain the following:

(a) CH_3COOH is week acid.

(b) Propene undergoes addition reaction.

(c) The gas stoves have inlets for air.

Ans. (a) Due to the incomplete ionisation of acetic (CH_3COOH) acid.

(b) $CH_3 - CH = CH_2$ (Propene) undergoes addition reaction because of double bond.

(c) To supply sufficient oxygen for complete combustion.

5. What are covalent compounds? How are they different from ionic compounds? List any two properties of covalent compounds.

Ans. The compounds that are formed due to sharing of electrons between two atoms/cpmpounds having covalent bonds.

Ionic compounds are formed due to transfer of electrons from one atoms to another/compounds having ionic bond/compounds having attraction between oppositely charged ions.

(i) They are poor conductors of electricity.

(ii) They have low melting and boiling point.

6. **Give reason why carbon can neither form C^{4+} cations nor C^{4-} anions, but forms covalent compounds. Also, state the reason to explain why covalent compounds are bad conductions of electricity and have low melting and boiling points?**

Ans. Carbon cannot C^{4+} cation because removal of 4 electrons from a carbon atom would require a large amount of energy.

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

Hence, carbon atoms share electrons forming covalent compounds.

Covalent compounds do not form ions/ charged particles and therefore do not conduct electricity. Inter molecular forces of attraction are weak, hence they have low melting and boiling points.

7. **Two carbon compounds X and Y have the molecular formula C_4H_8 and C_5H_{12} respectively. Which one of these is most likely. Also, give the chemical equation to explain the process of addition reaction in this case.**

Ans. C_4H_8, it is an unsaturated hydrocarbon due to the presence of a double bond.

$$C_4H_8 + H_2 \xrightarrow{Ni/Pd} C_4H_{10}$$

8. **What is an oxidising agent? What happens when an oxidising agent is added to propanol? Explain with the help of a chemical equation.**

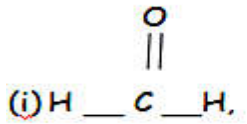
Ans.(i) It is a substance which can give oxygen to other substances.

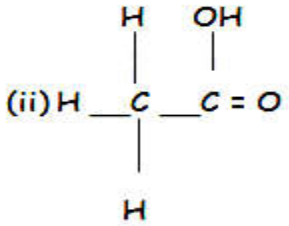
$$CH_3-CH_2-CH_2-OH \xrightarrow[\text{OR Acidified } K_2CrO_7 + \text{Heat}]{\text{Alkaline } KMnO_4 + \text{Heat}} CH_3-CH_2-\underset{\underset{O}{\|}}{C}-OH$$

Propanol — Propanoic acid

(iii) Propanol is oxidised to propanoic acid.

9. (a) Define the term functional group. Identify the functional group present in the following:





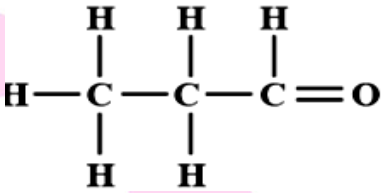
(b) What happens when 5X alkalie $KMnO_4$ solution is added drop by drop to warm ethanol taken in a test-tube ? state the role of alkaline $KMnO_4$ solution in this reaction.

Ans. (a) Functional group: Heteroatom or group of atoms attached to the carbon chain, which give specific properties to the compounds, is called a functional group.

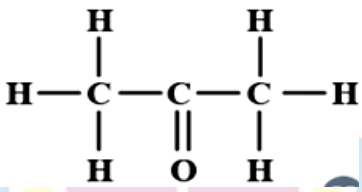
(b) Acetic/Ethanoic acid is formed. It is an oxidising agent.

10. An aldehyde as well a ketone can be represented by the same molecular formula, say C_3H_6O. Write their structures and name them. State the scientific relation between the two.

Ans (i) Propanal (aldehyde);



(ii) Propanone (Ketone);



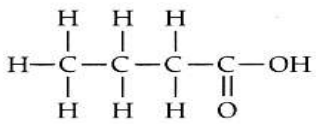
(iii) Isomers (same molecular formula but different structural formula/different functional group)

11. Daw the structures of the following compounds and identify are functional group present in them:

(a) Butanoic acid (b) Bromopropane (c) Butyne

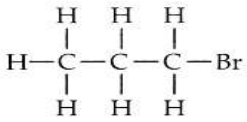
Ans.

(i)



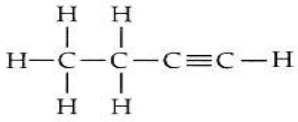
Carboxyl group — COOH

(ii)



Halogen atom — Br

(iii)



Triple Bond C≡C

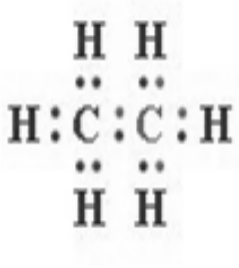
12. Write the molecular formula of the following compound and draw electron dot structures:

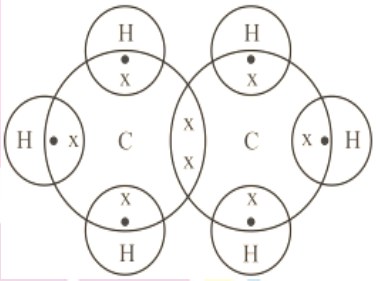
(a) Ethane

(b) Ethene

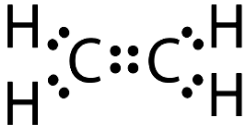
(c) Ethyne

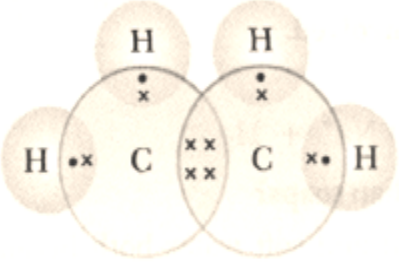
Ans. (i) Ethane: C_2H_6





(ii) Ethene : C_2H_4





(iii) Ethyne: C_2H_2

II. Short Answer Type Questions – II

(3 marks each)

1. 3 mL of ethanol is taken in a test tube and warmed gently in a water bath. A 5% solution of alkaline potassium permanganate is added first drop by drop to this solution, then in excess.

(a) How is 5% solution of $KMnO_4$ prepared?

(b) State the role of alkaline potassium permanganate in this reaction. What happens on adding it in excess?

(c) Give proper reaction to explain.

Ans.(a) By dissolving 5g of $KMnO_4$ in 100 mL of water by dissolving 5 g $KMnO_4$ in water to make a final volume of 100 mL.

(b) As an oxidizing agent purple colour persists.

(c) $CH_3CH_2OH \xrightarrow[\text{heat}]{\text{Alkaline } KMnO_4} CH_3COOH$

Detailed Answer:

Ans. (a) Preparation of 5 g of $KMnO_4$: By dissolving 5 g potassium permanganate in 100 mL of water.

(b) Alkaline $KMnO_4$ acts as oxidizing agent as it adds oxygen to alcohol and convert it into an acid.

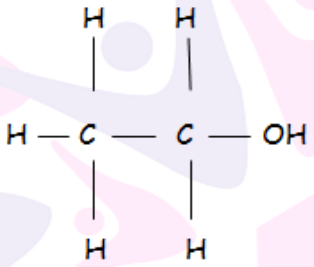
Initially, when we add potassium permanganate all potassium permanganate is used up in the reaction after completion of the reaction, there is no more ethanol in the solution. Adding more potassium permanganate after this endpoint makes the solution red.

(c) $CH_3 - CH_2OH \xrightarrow[\text{Or acidified } K_2Cr_2O_7 + \text{Heat}]{\text{Alkaline} KMnO_4 + \text{Heat}} CH_3COOH$

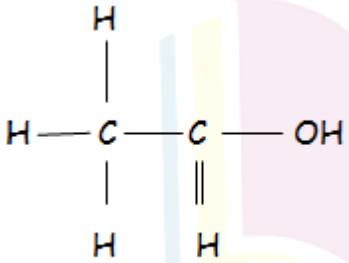
2. (a) Draw the structures for (i) ethanol, (ii) ethanoic acid.

(b) Why is the conversion of ethanol to ethanoic acid considered an oxidation reaction? Write the oxidizing agent used in the reaction involved.

Ans. (i) Ethanol : C_2H_5OH/CH_3CH_2OH



(ii) Ethanoic acid : CH_3COOH



(iii) As oxygen is added to ethanol

Oxydizing agent : Alkaline $KMNO_4$

Acidified $K_2Cr_2O_7$

3. What happens when (write chemical equation in each case)

(a) ethanol is burnt in air?

(b) ethanol is heated with excess conc. H_2SO_4 at 443 K ?

(c) a piece of sodium is dropped into ethanol?

Ans. (a) $C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$

(b) $CH_3CH_2OH \longrightarrow C_2H_4 + H_2O$

(c) $2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$

4. Distinguish between etherification and saponification reactions with the help of the chemical equations for each. State one use of each

(i) esters, and **(ii) saponification process.**

Ans. In esterfication a carboxylic acid and alcohol react to form ester in presence of acid. It is reverse of saponification.

$$RCOOH + R'OH \xrightarrow{H^+} \underset{\text{Ester}}{RCOOR'} + H_2O$$

In saponification, an ester reacts with a strong base or an acid to give sap and alcohol.

$$RCOO' + NaOH \longrightarrow \underset{\text{Soap}}{RCOONa} + KOH$$

(i) Uses of esters:

As esters have fragrant odorus, they are used as a constituent or perfumes, essential oils, food flavourings etc.

(ii) Uses of saponification process:

In the manufacturing of soap used as cleaning agent.

5. Write the chemical equation to explain what happens when ethanol is heated with alkaline solution when ethanol is heated with alkaline solution of potassium permanganate. Mention two physical properties and two uses of ethanol.

Ans. Alkaline $KMnO_4$ is dark pink in colour. So When it is added to ethanol and heated, the pink colour of the solution disappears, when excess of $KMnO_4$ is added, the pink colour does not disappear, indicating that all ethanol has been converted to ethanoic acid.

Physical properties of ethanol:

(a) It is a colourless liquid with pleasant smell and burning taste.

(b) It is a volatile liquid with low boiling point.

Uses of ethanol:

(a) It is used in the manufacture of medicines varnished, paints, dyes, soap, etc.

(b) It is a good solvent many organic compounds which are insoluble in water are soluble in ethanol.

6. Complete the following chemical equations;

(i) $CH_3COOC_2H_5 + NaOH \longrightarrow$

(ii) $CH_3COOH + NaOH \longrightarrow$

(iii) $C_2H_5OH + CH_3COOH \xrightarrow{\text{Conc } H_2SO_4}$

Ans. (i) $CH_3COOC_2H_5 + NaOH \longrightarrow CH_3COONa + C_2H_5OH$

(ii) $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$

(iii) $C_2H_5OH + CH_3COOH \xrightarrow{\text{Conc } H_2SO_4} CH_3COOC_2H_6 + H_2O$

7. Which the help of a diagram, explain cleaning action of soap.

Ans. Soap molecules from micelles where one end, i.e., hydrocarbon is towards the oil droplet while the ionic end faces outside.

The micelle stay in solution as an emulsion. The soap solution thus helps in dissolving the dirt in water and we can wash the clothes clean.

8. Complete the following chemical equations:

(i) $CH_3COOH + Na_2CO_3 \longrightarrow$

(ii) $CH_4 + O_2 \longrightarrow$

(iii) $C_2H_5OH + Na \longrightarrow$

Ans.

(i) $2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$

(ii) $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

(iii) $2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$

9. Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write balanced chemical equation in each case. Write the name of the reactants and the products other than ethanoic acid and sodium ethanoate in each case.

Ans.

$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$

Sodium carbonate — Water — Carbon dioxide

$CH_3COOH + NaHCO_3 \longrightarrow CH_2COONa + H_2O + CO_2$

Sodium Hydrogen carbonate — Water — Carbon dioxide

$CH_3COOH + NaOH \longrightarrow CH_2COONa + H_2O$

Sodium Hydrogen — Water

$2CH_3COOH + 2Na \longrightarrow 2CH_3COONa + H_2$

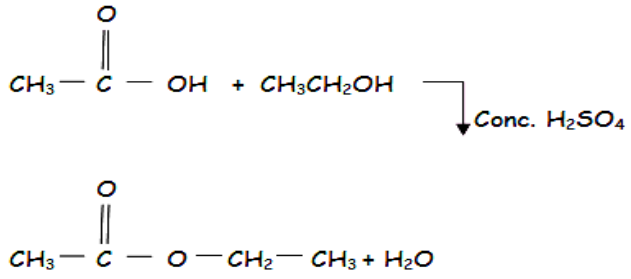
Sodium — Hydrogen gas

10. When ethanol reacts with ethanoic acid in the presence of conc. H_2SO_4, 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. H_2SO_4.

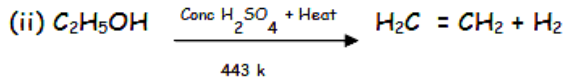
Ans. (i) Esters.



(ii) Conc. H_2SO_4 acts as a dehydrating agent. (Helps in the removal of water formed in the reaction.)

11. Name the compound formed when ethanol is heated in excess of conc. Sulphuric acid at 443 k. Also write the chemical equation of the reaction stating the role of conc. Sulphuric acid in it. What would happen if hydrogen is added to the product of this reaction in the presence of catalysts such as palladium or nickel?

Ans. (i) Ethene

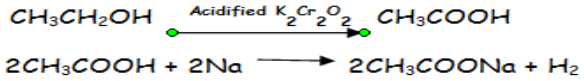


(iii) Conc. H_2SO_4 acts as a dehydrating agent/removes water from the reactant.

(iv) Ethane/C_2H_6 will be formed.

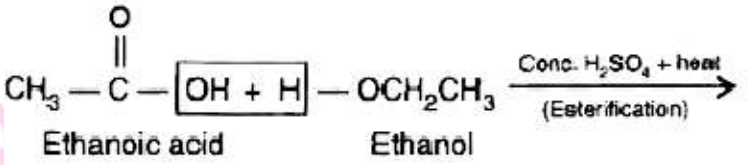
12. An Organic compound 'P' is a constituent of wine. 'P' on reacting with acidified $K_2Cr_2O_7$ forms another compounds 'Q'. When a piece of odium is added to 'Q' a gas 'R' evolves which burns with a pop sound. Identify P,Q and R and write the chemical equations of the reactions involved.

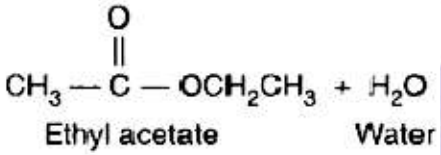
Ans. P-Ethanol, Q-Ethanoic, R-Hydrogen



13. When we take 1 mL ethanol and 1 mL ethanoic acid along with a few drop of concentrated sulphuric acid in a test-tube, a sweet smelling substance is formed. Name the compound and give the balanced chemical equal for the reaction. What do we call the reverse reaction to give back alcohol and carboxylic acid which is used in the preparation of soap?

Ans.





Reverse reaction = Saponification

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

Ans. (i) Test 1 (Litmus Test): Take to strips of blue litmus paper. Place a drop each of the alcohol and carboxylic acid on these strips separately. The blue litmus paper turns red in the case of carboxylic acid and remains unaffected in the case of alcohol.

(ii) Test 2 (sodium hydrogen carbonate test/sodium carbonate test): A pinch of sodium hydrogen carbonate or sodium carbonate is added to both test tubes, separately.

If brisk effervescence with the evolution of a colourless gas is observed, it indicated the presence of carboxylic acid.

If no change is observed then it confirms the presence of the alcohol.

(iii) Test 2 (Ester test or any other suitable test)

Detailed Answer:

(ii) We can distinguish between an alcohol and a carboxylic acid on the basis of their reaction with sodium carbonate and sodium hydrogen carbonate. Carboxylic acids reacts with sodium carbonate and sodium hydrogen carbonate to evolve CO_2 gas that turns lime water milky.

(iii) Alcohol reacts with sodium metal to produce hydrogen gas with rapid effervescence. On the other hand, carboxylic acid does not show this type of chemical reaction with sodium metal.

15. C_3H_6, C_4H_8 and C_5H_{10} belong to the same homologous series.

(i) Define homologous series.

(ii) Why the melting and boiling points of C_5H_{10} is higher than C_4H_8?

(iii) Arrange these hydrocarbon in order of increasing boiling points.

Ans. (i) The series of organic compounds which have similar chemical homologous series.

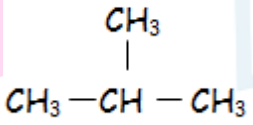
(ii) It is because C_5H_{10} has higher molecular weight, more vander Wall's force of attraction and higher boiling points and melting points.

(iii) $C_3H_6 < C_4H_8 < C_5H_{10}$ is increasing order of boiling point.

16. What is meant by isomers? Draw the structures of two isomers of butane, C_4H_{10}.

Explain why we cannot have isomers of first three members of alkane series.

Ans. Isomers are those compounds which have same molecular formula but different structural formula

$CH_3CH_2CH_2CH_3$ and  are two isomers of C_4H_{10}. Isomers are not possible for first three members because branching is not possible.

17. Define homologous series of organic compounds. List its two characteristics. Write the name and formula of the first member of the series of alkanenes.

Ans. The series of organic compounds having same functional group and similar chemical properties is called homologous series.

Each member differs from successive member by $-CH_2$ group. The difference in molecular weight between two successive members is 14 μ.

Characteristics:

(i) It has same general formula from which, all members can be derived.

(ii) They have similar chemical properties.

C_2H_4, $CH_2 = CH_2$, Ethene is first members of alkene series.

18. What are covalent compounds? Why are they different from ionic compounds? List their three characteristic properties.

Ans. Those compounds which are formed by sharing of electrons are called covalent compounds. They differ from ionic compounds because they do not have ionic compounds are formed by transfer of electrons.

Properties

(i) They have low melting and boiling points.

(ii) The do not conduct electricity in molten state or in aqueous solution.

(iii) They are mostly insoluble in water but soluble in organic solvents.

19. Atoms of element contains five electrons in its valence shell. This element is major component of air. It exists as a diatomic molecule.

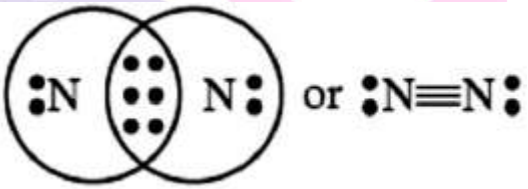
(i) Identify the element.

(ii) Show the bond formed between two atoms of this element.

(iii) Write the nature of the bond between the tow atoms.

Ans. (i) Nitrogen.

(ii)



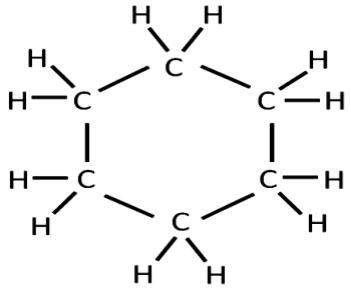
(iii) Covalent bond.

20. (a) Why are most carbon compounds poor conductors of electricity?

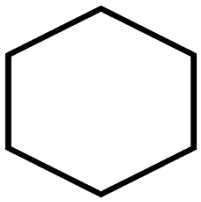
(b) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

Ans. (a) Carbon compounds are covalent in nature and do not dissociate form ions because of which they are poor conductor of electricity.

(b) Cyclohexane is the the saturated compound in which the carbon atoms are arranged in a ring.



Structural formula



Cylohexane

21. Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen can take place. Starting the essential conditions required for an addition reaction to occur. Write the chemical equation giving the name of the reactant and the product of such a reaction.

Ans. Name and general formula of the chains of hydrocarbons undergoing addition reaction with hydrogen:

Alkene — C_nH_{2n}

Alkyne — C_nH_{2n-2}

Essential conditions required for an addition reaction to occur:

(a) Multiple bonds (double or triple) must be present between carbon atoms in the chain of hydrocarbon.

(b) Addition of hydrogen should be carried out in the presence of catalyst such as nickel or platinum.

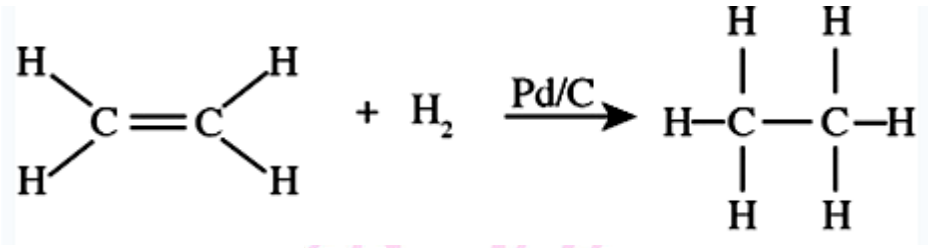
Chemical Equations:

$$\underset{\text{Ethene}}{CH_2 = CH_2} + \xrightarrow[\text{Heat}]{\text{Ni or Pt}} \underset{\text{Ethane}}{CH_3 - CH_3}$$

$$\underset{\text{Ethyne}}{CH \equiv CH} + 2H_2 \xrightarrow[\text{Heat}]{\text{Ni or Pt}} \underset{\text{Ethene}}{CH_3 - CH_3}$$

22. Write the name and general formula of chain of hydrocarbons in which an addition reaction. State the essential condition for an addition equation giving the name of the reactant and the product of the reaction.

Ans. C_nH_{2n} and C_nH_{2n-2} are general formula of alkynes and alkynes in which addition reaction with hydrogen is possible. Hydrogen is added to unsaturated hydrocarbon (having double or triple bond) in presence of heated nickel as catalyst.

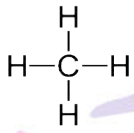


Ethene Ethane

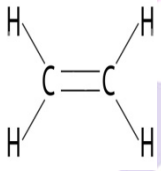
23. (a) Differentiate between alkanes and alkenes. Name and draw the strcture of one members of each.

(b) Alkanes generically burn with clean flame. Why?

Ans. (a) Alkanes are saturated hydrocarbons and contain single bonds only.

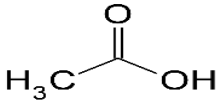
e.g.,  , Methane

Alkenes are unsaturated hydrocarbons having double or triple.

e.g.,  , Ethene

(b) Alkanes have higher percentage of hydrogen and less percentage of carbon, therefore burn with clear flame.

24. A carboxylic acid $C_2H_4O_2$ reacts with an alcohol in the presence of H_2SO_4 to form a compound 'X'. The alcohol on oxidation with alkaline $KMnO_4$ followed by acidification gives the same carboxylic acid, $C_2H_4O_2$. Write the name and structure of (a) Carbonxylic acid, (b) alcohol and (c) the compounds 'X'.

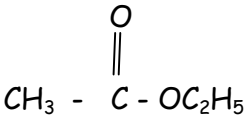
Ans. (a) A Carboxylic acid is ethanoic acid 

(b)compound X is ethanol CH_3-CH_2-OH

$CH_3CH_2OH + 2[O] \xrightarrow[KMnO_4]{\text{Alkaline}} CH_3COOH + H_2O$

Ethanol — Ethanoic acid

(c) 'X' is $CH_3COOC_2H_5$ (ethyl ethanoate)



$CH_3CH_2OH + O_2 \longrightarrow 2CO_2 + 3H_2O$ + Heat energy

25. Complete the following equations:

(i) $CH_4 + O_2 \longrightarrow$

(ii) $C_2H_5OH \xrightarrow{\text{Hot Conc. } H_2SO_4}$

(iii) $CH_3COOH + NaOH \longrightarrow$

Ans. (i) $CH_4 + 2O_2 \rightarrow CO_2\,(g) + 2H_2O\,(l)$

(ii) $C_2H_5OH \xrightarrow{\text{Hot Conc. } H_2SO_4} CH_2 = CH_2 + H_2O$

(iii) $CH_3COOH\,(aq) + NaOH\,(aq) \rightarrow CH_3COONa\,(aq) + H_2O\,(l)$

26. Complete the following chemical equations:

(i) $CH_3COOC_2H_5 + NaOH \longrightarrow$

(ii) $CH_3COOH + NaOH \longrightarrow$

(iii) $C_2H_5OH + CH_3COOH \xrightarrow{\text{Hot Conc. } H_2SO_4}$

Ans. (i) $CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$

(ii) $NaOH + CH_3COOH \rightarrow CH_3COONa + H_2O$.

(iii) $C_2H_5OH + CH_3COOH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$

27. Write a chemical equation in each case to represent the following types of chemical reactions of organic compounds:

(i) Oxidation reactions

(ii) Addition reactions

(iii) Substitution reactions.

Ans. (i) Oxidation reactions:

$CH_3CH_2OH + 2[O] \xrightarrow[KMnO_4]{\text{Alkaline}} CH_3COOH + H_2O$

(ii) Addition reaction:

$$CH_2 = CH_2 + H_2 \xrightarrow[571]{Ni} CH_3\_\_CH_3$$

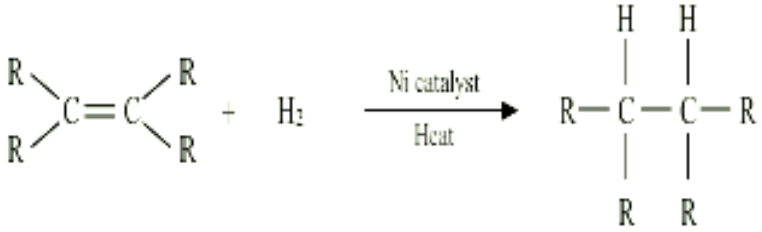
(iii) Substitution reaction:

$$CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} CH_3Cl + HCl$$

Methane — Methyl chloride

28. Two carbon compounds A and B have the molecular formula C_3H_8 and C_3H_6 respectively. Which one of the two is most likely to show addition reaction? Justify your answer. Explain with the help of a chemical equation, how an addition reaction is useful in vegetable ghee industry.

Ans. C_3H_6 Will show addition reaction. C_3H_6 is an unsaturated compound with a double bond. Vegtable oils have long unsaturated carbon chains which on addition of hydrogen in the presence of catalyst Nickel, change into saturated carbon chains. This is called hydrogenation of oils.



29. Under what conditions an oxidation reaction can be called as combustion reaction?

Illustrate your answer with examples.

Ans. When complete oxidation of fuel takes places with release of high amount of heat and light, it is called combustion reaction. It is highly exothermic and generally accompanied by heat and light.

Burning of coal

$$C + O_2 \longrightarrow CO_2 + \text{heat} + \text{light}$$

Burning of the rocket fuel (liquid H_2)

$$2H_2O + O_2 \longrightarrow 2H_2O + \text{heat} + \text{light}$$

Burning of acetylene used in welding torches.

$$2C_2H_2 + 5O_2 \longrightarrow 4CO_2 + 2H_2O + \text{heat} + \text{light}$$

30. Write the structural formula of ethanol and list its two physical properties. What happens when it is heated with excess of conc. H_2SO_4 at 443 k? state the role of conc. H_2SO_4 in this reaction.

Ans. CH_3 ___ CH_2OH is structural formula physical properties:

(i) It is liquid with specific smell.

(ii) It is soluble is water.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[443\ K]{\text{Conc } H_2SO_4} \underset{\text{Ethene}}{CH_2=CH_2} + H_2O$$

Conc. H_2SO_4 acts dehydrating agent.

31. What happens when:

(a) ethanol is burnt in air,

(b) ethanol is heated with excess conc. H_2SO_4 at 443 K.

(c) a piece of sodium is dropped into ethanol?

Ans.

(a) CO_2 and H_2O are formed. Heat and light is produced.

$$C_2H_2OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O + \text{Heat and light}$$

(b) Ethene is formed

$$CH_3CH_2OH \xrightarrow[443\ k]{\text{conc } H_2SO_4} CH_2=CH_2 + H_2O$$

(b) Hydrogen gas and sodium ethoxide is formed.

$$2C_2H_5OH + 2Na \longrightarrow 2C_2H_2ONa + H_2$$

32. Write the respective chemical equations to show what happens when

(i) methane is burned in presence of oxygen?

(ii) ethanol is heated with concentrated sulphuric acid 443 k?

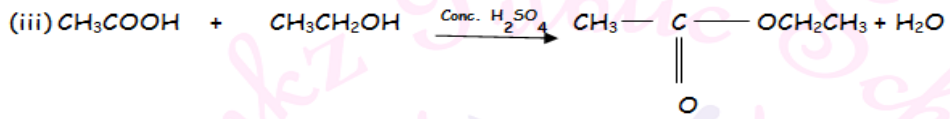
(iii) ethanol reacts with ethanoic acid in the presence of an acid acting as a catalyst?

Ans. (i) $CH_4 + 2O_2 \longrightarrow 2H_2O + CO_2$

Water and carbon dioxide formed.

(ii) $CH_3CH_2OH \xrightarrow{\text{Hot conc. } H_2SO_4} CH_2 = CH_2 + H_2O$

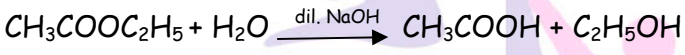
The concentrated sulphuric acid can be regarded as a dehydrating agent which removes water from ethanol.



33. Write the equation for reaction when acetic acid and ethyl alcohol are warmed together in the presence of conc. H_2SO_4. Name the reaction. Also write the reaction by which acetic and ethyl alcohol can be obtained back from the product formed. Name this reaction also.

Ans. 

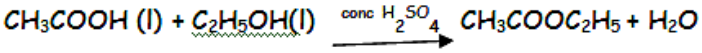
This reaction is called esterification.

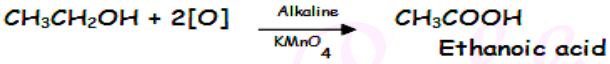


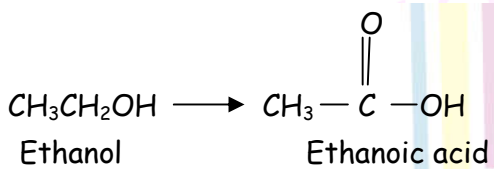
The reaction is called saponification reaction or alkaline hydrolysis of ester.

34. A compound 'X' is formed by the reaction of carboxylic acid $C_2H_2O_4$ and an alcohol in the presence of Conc. H_2SO_4. This alcohol on treating with alkaline $KMnO_4$ gives the same carboxylic acid used in the reaction. Give the name and structure of carboxylic acid, alcohol, write the reaction involving formation of 'X'.

Ans.







35. Write the chemical equations to show what happens when

(i) Sodium hydroxide is added to ethanoic acid?

(ii) solid sodium hydrogen carbonate is added to ethanoic acid?

(iii) solid sodium hydrogen carbonate is added to ethanoic acid?

Ans.

(i) $NaOH$ + CH_3COOH ⟶ CH_3COONa + H_2O

Sodium hydroxide — Acetic acid — Sodium acetate — Water

(ii) CH_3COOH + $NaHCO_3$ ⟶ CH_3COONa + H_2O + CO_2

Ethanoic acid — Sodium Hydrogencarbonate — Sodium ethanoate — Water — Carbon dioxide

(iii) $2Na$ + $2CH_3CH_2OH$ ⟶ $2CH_3CH_2O^-Na^+$ + H_2

Sodium — Ethanol — Sodium ethoxide — Hydrogen

36. Describe the harful effect of drinking Alcohol.

Ans. (i) If ethanol is mixed with CH_3OH (methanol) and consumed, it may cause series poisoning and loss of eyesight.

(ii) It cause addiction (habit forming) and mixes with blood. It damages liver if taken regularly In large amount.

(iii) The person loses sense of discrimination under its influence.

(iv) Higher amount of consumption of ethanol leads to loss of body control and consciousness. It may even cause death.

Therefore, we should not drink alcohol under any circumstances because it leads to wastage of time, weath and spoils heath.

37. Write the IUPAC name of the following compounds.

(a) $CH_3CH_2CH_2CH_2OH$

(b) CH_3CH_2CHO

(c) CH_3COCH_3

(d) $CH_3CH_2CH_2CH_2COOH$

(e) $CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3$

(f) CH_3COOCH_3

Ans. (a) Butanol (b) Propane (c) Propanone (d) Pentanoic acid

(e) 2-Propanol (f) Methyl ethanoate

I. Long Answer Type Questions

(5 mark each)

1. The formula of four organic compounds are gives below:

A	B	C	D
C_2H_4	CH_3COOH	C_2H_5OH	C_2H_6

(a) Which one of these compounds A, B, C or D is a saturated hydrocarbon?

(b) Identify the organic acid and give its structural formula.

(c) Which of the above compounds when heated at 443k in the presence of concentrated H_2SO_4 forms ethane as the major product? What is the role played by concentrated H_2SO_4 in thus reaction? Also, write the chemical equation involved.

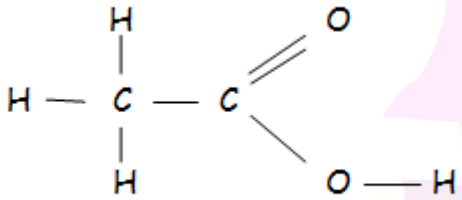
(d) Give a chemical equation when B and C react with each other in presence of concentrated H_2SO_4. Name the major product formed and mention one of its important use.

Ans.

(a) D is a saturated hydrocarbon

(b) B is an organic acid.

Structural formula:



(c) C is an alcohol.

Conc. H_2SO_4 acts as a dehydrating agent and removes a water molecule from ethanol.

$$C_2H_5OH \xrightarrow{\text{Hot conc } H_2SO_4} C_2H_4 + H_2O$$

$$C_2H_5OH + CH_3COOH \underset{}{\overset{Conc.H_2SO_4}{\rightleftharpoons}} CH_3-\overset{\overset{O}{\|}}{C}-O-C_2H_5$$

Ethanol — Ethanoic acid — Ethyl ethanoate (ester)

2. Write the chemical formula and name of the compound which is the active ingredient of all alcoholic drinks. List its two uses. Write chemical equation and name of the product formed when this compound reacts with: (i) sodium metal (ii) hot concentrated sulphuric acid.

Ans. C_2H_5OH, Ethanol/Ethyl alcohol

Good solvent, used in medicines.

(i) $2C_2H_5OH + 2\,Na \longrightarrow 2C_2H_5ONa + H_2$

Sodium ethoxide

(ii) $C_2H_5OH \xrightarrow[40\,K]{\text{Hot Conc } H_2SO_4} CH_2 = CH_2 + H_2O$

Ethene

Detailed Answer:

Ethanol with chemical formula : CH_3CH_2OH is an active ingredient of all alcoholic deinks.

Two use are:

(a) It is used in the manufacture of paints and varnishes.

(b) It is used in medical swabs and hand sanitizers.

Chemical reactions of ethanol:

(i) With sodium of ethanol:

$2CH_3CH_2OH + 2Na \longrightarrow CH_2 = CH_2 + H_2O$

Ethanol Sodium Sodium ethoxide

(ii) With out concentrated sulphuric acid:

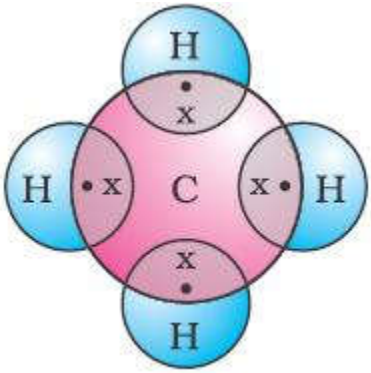
$CH_3CH_2OH \xrightarrow[H_2SO_4]{\text{Hot conc.}} CH_2 = CH_2 + H_2O$

Ethanol Ethene

3. What is methane ? Draw its electron dot structure. Name the type of bonds formed in this compound. Why are such compounds: (i) poor conductors of electricity and (ii) have low melting and boiling points? What happens when this compound burns in oxygen?

Ans.

- CH_4/Simplest hydrocarbon



- Covalent bonds

(i) No ions or charged particles are formed

(ii) Due to weak covalent bonds

- Carbon dioxide and water are produced/

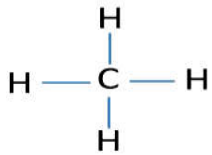
$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O + \text{heat and light}$$

4. Why are certain compounds called hydrocarbon? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first members of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical for the reaction to occur.

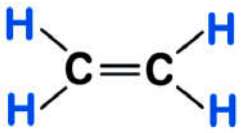
Ans. Certain compounds are called hydrocarbons because those compound are make up of carbon and hydrogen atoms.

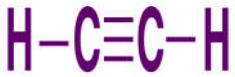
Alkanes	Alkenes	Alkynes
General formula = C_nH_{2n+2}	General formula = C_nH_{2n}	General formula = C_nH_{2n+2}

The structure of the first member of each series are:



CH_4(methane):

C_2H_4(ethane): 

C_2H_2(ethyne): 

The name of the reaction that converts alkenes into alkanes is hydrogenation.

$$\underset{\text{Ethene}}{CH_2 = CH_2} + H_2 \xrightarrow[\text{Catalyst}]{Ni} \underset{\text{Ethane}}{\mathbf{CH_3 - CH_3}}$$

The conditions which are necessary for this reaction are the presence of a catalyst Ni and the temperature should be 423K.

5. (a) Give a chemical test to distinguish between saturated and unsaturated hydrocarbon.

(b) Name the products formed when ethane burns in air. Write the balance chemical equation for the reaction showing the type of energies liberated.

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

Ans. (a) Pass the vapours of the given samples of saturated and unsaturated hydrocarbons into bromine water taken in two separate test-tubes. The one which discharges the colour of bromine water is that of unsaturated hydrocarbon and the other represent saturated hydrocarbon.

(b) One burning ethane in air, the products obtaining are carbon dioxide and water, along with heat and light.

$$2C_2H_6(g) + 7O_2(g) \longrightarrow 4CO_2(g) + 6H_2O(I) + \text{Heat} + \text{Light}$$

(c) It is considered a substitution reaction because the hydrogen atoms of methane (CH_4) are replaced by chlorine atoms one by one.

6. Describe the addition reaction of carbon compounds with its application. State the function of catalyst in this reaction. How this reaction is different from a substitution reaction?

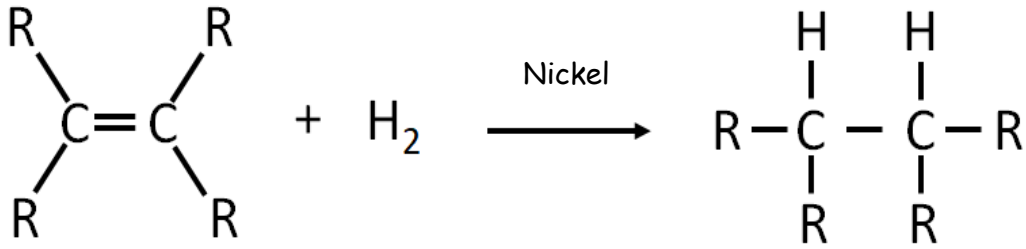
Ans. When any molecule like H_2 adds to unsaturated hydrocarbon of Ni as catalyst, it is called addition reaction.

$$CH_2 = CH_2 + H_2 \xrightarrow{Ni} C_2H_6$$

Use: Hydrogenation of vegetable oil in the presence of Ni as catalyst.

Catalyst: Increase the rate of reaction

Hydrogenation reaction: It is the process in which unsaturated compound reacts with hydrogen in presence of nickel as a catalyst to form saturated compound.



(Vegetable Oil) (Vegetable Ghee)

7. (a) Carry out following convertions:

(i) Ethanol to ethane

(ii) Ethanol to Ethanoic acid

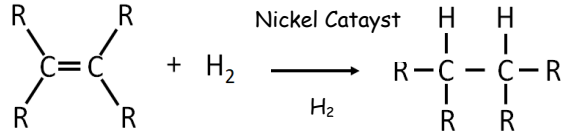
(b) Difference between addition reaction and substitution reaction. Give one example of each.

Ans. (a)

(i) CH_3CH_2OH (Ethanol) $\xrightarrow[H_2SO_4]{\text{hot Conc}}$ $CH_2 = CH_2 + H_2O$ (Ethane)

(ii) $CH_3CH_2OH \xrightarrow[\text{Or acidified } K_2Cr_2O_7 + \text{Heat}]{\text{Alkaline } KMnO_4 + \text{Heat}} CH_3COOH$

(b)

Addition reaction	Substitution reaction
Unsaturated hydrocarbon add hydrogen in the presence of catalysts to give saturated hydrocarbons Example. 	One type of atom or a group of atoms takes the place of another in a compound. Example. $CH_4 + Cl_2 \longrightarrow CH_3Cl + HCl$

Detailed Answer:

(b) Difference between addition reaction and substitution reaction. Give one example of each.

Ans. (a) (i) $CH_3CH_2OH \xrightarrow[H_2SO_4]{\text{hot Conc}} CH_2 = CH_2 + H_2O$

Ethanol — Ethane

(ii) $CH_3CH_2OH \xrightarrow[\text{Or acidified } K_2Cr_2O_7 + \text{Heat}]{\text{Alkaline } KMnO_4 + \text{Heat}} CH_3COOH$

(b) Difference between addition reaction and substitution reaction:

Addition reaction	Substitution reaction
A type of reaction in which two or more molecules combine with each other to form a single substance.	A type of reaction in which one type of atom or a group of atom replaces another atom in a compound.
It is a characteristic property of unsaturated hydrocarbons.	It is a characteristic property of saturated hydrocarbons.
E.g., Hydrogenation of oil.	E.g., Halogenation of alkane.

8. A compound 'X' on heating with excess conc. Sulphuric acid at 443 gives an unsaturated compound 'Y', 'X' also reacts with sodium metal to evolves a colourless gas 'Z'/ identify 'X', 'Y' and 'Z'. Write the equation of the chemical reaction for formation of 'Y' and also write the role of sulphuric acid in the reaction.

Ans. Compound X is ethanol, Y is ethane and Z is hydrogen gas.

$CH_3CH_2OH \xrightarrow[\text{Heat(443k)}]{\text{Conc}H_2SO_4} CH_2 = CH_2 + H_2O$

Here, sulphuric acid acts as dehydrating agent. When ethanol (X) reacts with sodium metal, a colourless gas is evolved known as hydrogen.

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

9. Soaps and detergents are two types of a salts. State the difference between the two. Write the mechanism of the cleaning action of soaps. Why o soaps not form lather (foam) with heard water? Mention any tow problems that arise due to the use to detergents instead of soaps

Ans. (i) Soaps are the sodium or potassium salts of long chain carboxylic acids while detergents are the ammonium or sulphonate salts of long chain carboxylic acids.

(ii) The dirt is oily in nature and when soap is added to water, its molecules form structures called micelles in which carbon chain of the molecules dissolves in the oil while the ionic end dissolves in water and faces outside. The micelles thus help in dissolving the dirt in water.

Ca^{+} and Mg^{2+} present in hard water form insoluble substance (scum) with soap.

Two problems:

(a) Non-biodegradable.

(b) Water pollution / soil pollution.

Detailed Answer:

S.No	Soap	Detergents
(i)	They are sodium or potassium salts of long chain fatty acids	These are sodium or potassium salts of sulphonic acids of hydrocarbons
(ii)	Soaps cannot be used with hard water.	Detergents work well with hard and sot water both.
(iii)	They are fully biodegradable.	They are non-biodegradable.
(iv)	They take time to dissolve in water.	They dissolve faster in water.

Cleansing Action of Soap: When soap is dissolved in water, if forms acolloidal suspension. In this colloidal suspension, the soap molecules cluster together to form micelles and remain radially suspended in water with the hydrocarbon end towards the centre and the ionic end directed outward. The centre and the ionic end directed outward. The dirt particles always adhere to the oily or grease layer present on the skin or clothes. Its non-polar hydrocarbon end of micelles gets attached to the grease or oil present in dirt and polar end remains in water layer.

The mechanical action of rubbing subsequently dislodges the oily layer from the dirty surface shaping it into small globules. A stable emulsion of oil in water is formed. The emulsified oil or grease globules bearing the dirt can now be readily washed with water.

Soap do not form lather when the water is hard. When soap is added to heard water, calcium and magnesium salts present in water displace sodium or potassium ions from the soap molecules forming an insoluble substance called scum.

Problems that aries due to use of detergent instead of soap:

(i) Detergents being non-biodegradable, they accumulate in the environment causing pollution.

(ii) In soil, the presence of detergents leads to pH changes making soil infertile.

(iii) The entry of detergents into food chain leads to bioaccumulation in living beings and leads to serious health issues.

10. Explain esterification reaction with the help of a chemical equation. Describe an activity to show esterfication.

Ans. • **Esterification** : A Process in which an alcohol and a carboxylic acid react in the presence in the presence of conc.H_2SO_4 to form an ester.

$CH_3COOH + C_2H_5OH \xrightarrow{Conc\ H_2SO_4} CH_3COOC_2H_5 + H_2O$

Activity:

- Take 1 mL of ethanol mixed with 1 mL of acetic acid along with few drops of conc. H_2SO_4 in a test tube.
- Warm it for 5 min . in a water bath.
- Pour the contents in a beaker containing 20 – 50 mL of water and smell the resulting mixture.
- It will give a fruity smell indicating the formation of ester.

11. What are micelles? Why does it form when soap is added to water? Will a micelle be formed in other solvents such as ethanol also? State briefly how the formation of micells help to clean the clothes having oily spots.

Ans. (i) Soap molecules have tow ends – one end is the hydrocarbon chain which is water repellent, where as the other end is the ionic part that is water soluble end. When soap is dissolved in water it forms a group of many molecules, known as micelle.

(ii) These micelles are formed because their hydrocarbon chains come together and the polar end are projected outwards.

(iii) Micelle formation in ethanol will not occur because the hydrocarbon chain end of the soap will dissolve in ethanol.

(iv) Soaps in the form of micelle are able to clean dirty clothes having oily spots, as the oily dirt is collected in the centre of the micelle, which forms an emulsion in water and on rinsing , the water washes away the micelles with dirt attached to them.

12. (i) 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 in different test tubes by chemical tests using litmus paper and sodium metal.

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

Ans. (i)

Solution	Blue Litmus paper	Red Litmus paper	Sodium Metal
Ethanol	No Change	No Change	Hydrogen gas
Ethanoic acid	Turns red	No Change	Hydrogen gas
Soap	No Change	Turns blue	Hydrogen gas

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

13. (a) How coal was formed?

(b) How petroleum was formed?

(c) Which is better for health butter or oil? Why?

Ans. (a) Coal was formed by the decomposition of plants and trees buried under the surface of the earth long long ago. It is believed that millions of year ago, duo to earthquakes, flood, and volcanic activities , the forests were buried under the surface of the earth and were buried under the surface of the earth and were covered with sand, clay and water. Due to high temperature and pressure inside the earth, wood, in the absence of air, was converted into coal.

(b) It is believed that millions of years age, the plants and animals which lived in seas, died. Their bodies sank to the bottom of the sea bed and were covered with layers of silt. Over a period of millions of years, these remains, in the absence of air, got converted into Petroleum under the combined effect to high temperature, high pressure and bacteria. The petroleum so formed passed through porous rocks until it got trapped between some impervious rock like water in a sponge.

(c) Vegetable oil is better for health because it is unsaturated and does not increase cholesterol in our body.

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

Ans. Carbon has atomic number 6 . Its electronic configuration is 2,4 . It cannot lose four electrons because very high energy is required to move four electrons.

It cannot gain four electrons because 6 protons cannot hold 10 electrons.

∴ Carbon can share four electrons forming four covalent bonds.

(i) Catenation: Carbon forms maximum number of compounds due to property of catenation (Self linking).

(ii) Tetra Valency: Carbon can form four covalent bonds, therefore, it form large number of compounds.

Isomerism is also responsible for large number of carbon compounds. Carbon is small in size, therefore it forms strong bonds with most other elements. It can also form double and triple bonds with some of element which are very strong.

15. Give two example of covalent compounds which you have studied. State any four properties in which covalent compounds differ from ionic compounds differ from ionic compound.

Ans. CCl_4 (carbon tetra chloride) and C_6H_6 (Benzene) are covalent compounds.

Property	Covalent Compounds	Ionic compounds
Physical state Melting & Boiling point Solubility Conductor	(i) They exist as solids, liquids and gases (ii) They have low melting and boiling points. (iii) They are generally insoluble in water. (iv) They do not conduct electricity in molten state or in aqueous solution .	(i) They exist as solid (ii) They have high melting boiling (iii) They are mostly soluble in water. (iv) They conduct electricity in molten state and in aqueous solution

16. Element 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 forms its compounds. Name the type of bond 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. The atomic number of carbon is 6. This means that it has 4 electrons in its outermost shell and it needs 4 more electrons to attain noble gas electronic configuration. It cannot from C^{4-} anion, as it nucleus with 6 protons cannot hold 10 electrons. Thus, carbon achieves noble gas electronic configuration by sharing is 4 electrons with other elements, i.e. it forms covalent compounds.

In ionic compounds, ionic bonds are formed; while in carbon compound, covalent bonds are formed. Carbon compounds are covalent in nature, they are bas conductor of electricity; because they lack free electrons.

17. Give reason for the following:

(i) Element carbon forms compounds mainly by covalent bonding.

(ii) Diamond has a high melting point.

(iii) Graphic it a good conductor of electricity.

(iv) Acetylene burns with a sooty flame.

(v) Kerosene does not decolourise bromine water while cooking oils do.

Ans. (i) It is because carbon has four valence electrons, it cannot gain or lose four electrons because high energy is needed. It can only share four electrons.

(ii) It is due to presence of free electrons in graphite because each carbon is linked to three more carbon atoms.

(iii) It is due to high percentage of carbon, it burns with sooty or smoky flame.

(iv) Kerosene oil is mixture of saturated hydrocarbons therefore does not decolourise bromine water.

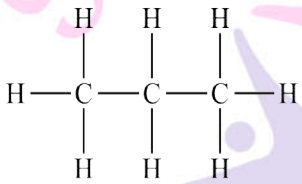
18. What are hydrocarbons? Distinguish alkynes from alkenes and each of them from alkynes, giving one example of each. Draw the structure of each compound cite as example to justify your answer.

Ans. A hydrocarbon is an organic compound made of carbon and hydrogen atoms only. Saturated hydrocarbon s have as many hydrogen atoms as possibly attached to every carbon.

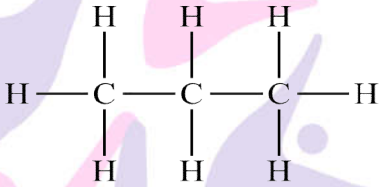
They have only single bonds between adjacent carbon atoms. Unsaturated hydrocarbons have double and / or triple bonds between some of the carbon atoms.

Alkanes are hydrocarbons that have single covalent bonds joining the carbon atoms. Molecular formula. C_nH_{2n+2}, where n is the number of carbon atoms. For example, propane (C_3H_8).

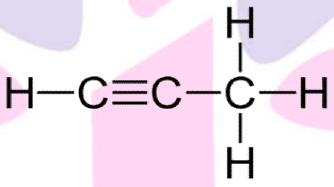
Alkene are hydrocarbons that have one or more __C = C ___ bonds. General formula , C_nH_{2n}, which is two hydrogen atoms less than the correspond alkane, For example, propyne(C_3H_4).



Propane



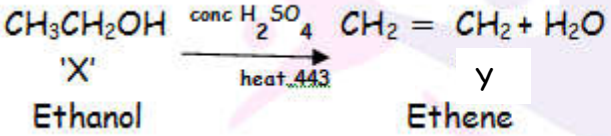
Propene



Propyne

19. An organic compound 'X' on heating with conc. H_2SO_4 forms a compound 'Y' which on addition of one molecule of hydrogen in the presence of nickel forms a compound 'Z' . One molecule of compound 'Z' on combustion forms two molecules of CO_2 and three molecules of H_2O. Identify giving reason the compounds 'X', 'Y' and 'Z'. Write the chemical equations for all the chemical reactions involved.

Ans.



Ethanol, on dehydration with conc. H_2SO_4 gives ethane. Ethene, on addition with H_2 in presence of Ni as catalyst as i=undergoes hydrogenation to form ethane. Ethene, on addition with H_2 in presence of Ni as catalyst as undergoes hydrogenation to form ethane.

$CH_2 = CH_2 + H_2 \xrightarrow{Ni} CH_3 - CH_3$

'Y' 'Z'

One molecule of ethane on combustion gives 2 molecules of CO+2 and 3 molecules of H_2O .

$C_2H_6(g) + \frac{7}{2} O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(l)$

Ethane Oxygen Carbon dioxide Water

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

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

Ans.

(a) Ethanol will not be affected by blue litmus as well as red litmus paper. Ethanoic acid will turn blue litmus read whereas read litmus will remain as it is. Soap solution will turn red litmus blue but blue litmus will remain as it. Sodium metal will liberate hydrogen gas with ethanol as well as ethanoic acid. Soap solution will not react with sodium metal.

(b) It is because soap will react will Ca^{2+} and Mg^{2+} ions present in hand water to form calcium salts of fatty acids which are insoluble and called scum.

21. (a) Give a chemical test to distinguish between saturated and unsaturated hydrocarbon .

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

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

Ans.

(a) Add bromine water. Unsaturated hydrocarbon will decoluise bromine water whereas saturated hydrocarbon will not react.

(b) Carbon dioxide and water are formed .

$2C_2H_6(g) + 7O_2(g) \longrightarrow \underset{\text{Carbon dioxide}}{4CO_2(g)} + \underset{\text{Water}}{6H_2O} + \text{Heat} + \text{Light}$

(c) $CH_2(g) + Cl_2(g) \xrightarrow{\text{Sunlight}} CH_3Cl(g) + HCl(g)$

It is because hydrogen atom of methane gets substituted by chlorine atom to form chloromethane, therefore, it is called substitution reaction.

22. A carbon Compounds X turns blue litmus to red and has a molecular formula $C_2H_4O_2$. Identify X and draw its structure . Write chemical equation for the reaction and name of the product formed in each case when X reacts with

(a) ethanol in the presence of conc. H_2SO_4

(b) sodium carbonate.

Ans.

'X' is ethanoic acid

Its structure is $CH_3-\overset{\overset{O}{\|}}{C}-OH$

(a) $CH_3COOH + C_2H_5OH \xrightarrow{\text{conc } H_2SO_4} CH_3COOC_2H_5 + H_2O$

Ethanoic acid — Ethanol — Ethyl ethanoate — water

(b) $2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$

Ethanoic acid — Sodium carbonate — Sodium ethanoate — Water — Carbon dioxide

23. List in tabular form three physical and two chemical properties on the basis of which ethanol and ethanoic acid can be differentiated.

Ans. Physical properties:

Ethanol	Ethanoic acid
(i) It has specific smell	(i) It has vinegar like smell
(ii) It has burning taste	(ii) It is sour in taste.
(iii) It does not freeze in winters	(iii) It freezes in winters.

Chemical properties:

Ethanol	Ethanoic acid
(i) It does not react with $NaHCO_3$	(i) It gives CO_2 With $NaHCO_3$
(ii) It burns with blue flame	(ii) It does not burn with blue flame.
(iii) It does not affect blue litmus	(iii) It turns blue litmus red.

24. (a) In tabular form, differentiate between ethanol and ethanoic acid under the following heads:

(i) Physical state (ii) taste (iii) $NaHCO_2$ test (iv) Ester test

(b) Write a chemical reaction to show the dehydration of ethanol.

Ans. (a)

Properties	Ethanol	Ethanoic acid
(i) Physical state	It is liquid with specific smell	It is also liquid with vinegar like smell.
(ii) Taste	It has burning taste	It has sour taste
(iii) $NaHCO_3$	It does not react	It gives brisk effervescence due to CO_2
(iv) Ester test	Add acetic acid and conc. H_2SO_4. pleasant fruity smelling compound, ester if formed	Add ethyl alcohol and conc. H_2SO_4. Pleasant fruity smelling compound, ester is formed.

(b) $CH_3CH_2OH \xrightarrow[443\ k]{conc\ H_2SO_4} CH_2 = CH_2 + H_2O$

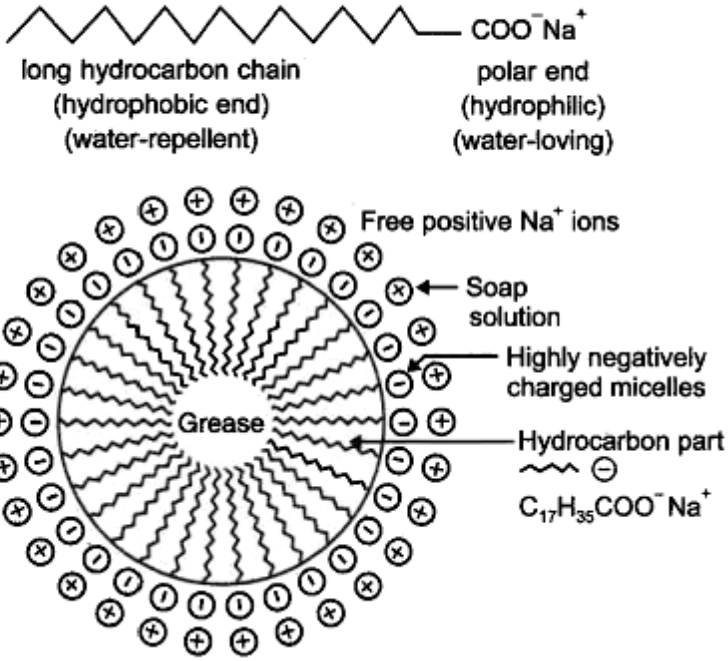
Ethanol Ethane Water

25. Soap and detergents are both types of salts. State the difference between the two. Write the mechanism of the cleaning action of soap. Why do soap from lather (foam) with hard water ? Mention any two problem that arise due of the use of detergents instead of soaps.

Ans. Soaps ar sodim or potassium salts of fatty acids having -COONA group. Detergent are sodium or potassium salt of sulphonic acids having $-SO_3$ Na and $-SO_4$ Na group.

Cleaning Action of soap. Soaps consist of a large hydrocarbon tail which is hydrophobic (wate-hating or water repelling) with a negatively charged head which is hydrophilic (water- loving) as shown in figure.

which is hydrophilic (water-loving) as shown in figure. 2(



A1

When a soap is dissolved in water in water the molecule associate together as cluster called micelles in which, water molecules being polar in nature, surround the ions and the hydrocarbon part of the molecule attracts grease, oil and dirt.

Hard wate has Ca^{2+} and Mg^{2+} ions when reacts with soap to form insoluble compound and soap goes waste.

Disadvantages of Detergents

(i) Detergents of expensive.

(ii) Many detergents are branched chain hydrocarbon which are not biodegradable and create water pollution.

26. What are detergent chemically ? List two merits and two demerits of using detergents for cleaning. State the reason for the suitability of detergents for washing, even in the case of water having calcium and magnesium ions.

Ans. Detergents chemically are sodium or potassium salts of sulphonic acid benzene alkene.

Merits:

(i) They work well hard water.

(ii) They are more edective than soaps.

Demerits:

(i) They are expensive.

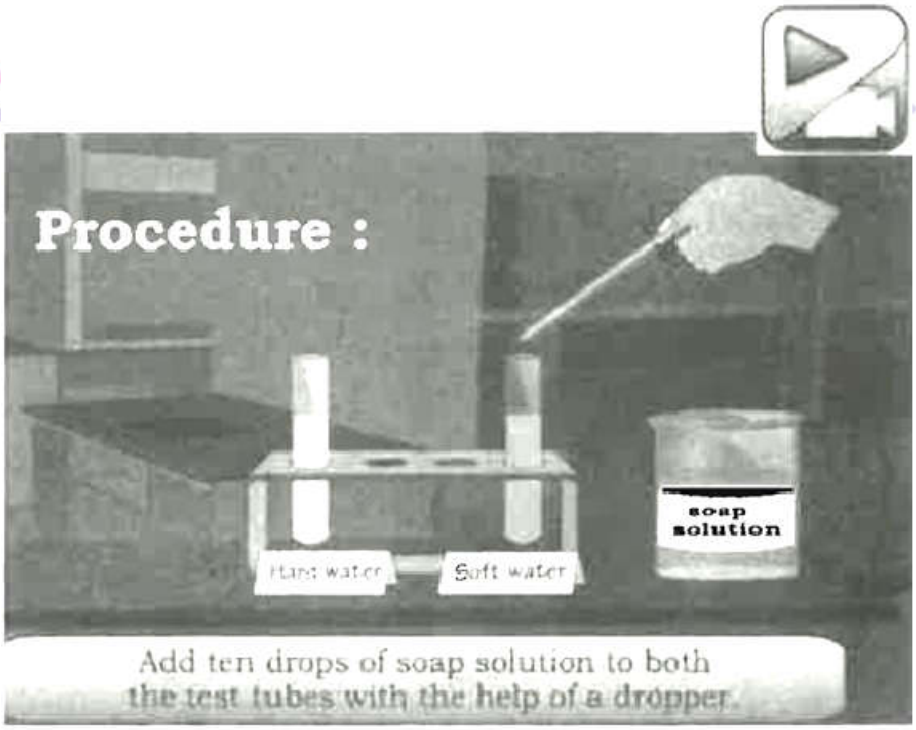
(ii) Some of them having branching are non-biodegrade, therefore create water pollution. Detergents are suitable for hard water having Ca^{2+} and Mg^{2+} ions because they do not form insoluble salts with Ca^{2+} and Mg^{2+} ions.

27. (a) What is a soap ? Why are soaps not suitable for washing clothes when the water is hard?

(b) Explain the action of soap in removing an oily spot from a piece of cloth.

Ans. (a) Soap is a sodium or potassium salt of fatty acid. Soaps are not suitable for washing clothes when the water is hard because Ca^{2+} and Mg^{2+} ions react with soap to form calcium anf magnesium salts of fatty acids which are insoluble in water.

(b) Soap has hydrophilic (water loving) and hydrophilic(water hatting) hydrocarbon part which attracts oil and stabilises the emulsion. Hydrophilic part of soap attracts water and oil and dirt is washed away from from the cloth



28. What are micelles? Why does it from when soap is added to water? Will a micelle be formed in other solvent such as ethanol also? State briefly how the formation of micelles help to clean the clothes having oily spots.

Ans. Micelles: When molecular ions in soap and detergents aggregate, they form micelles. It is because large number of molecular ions of soaps get aggregated and form colloidal solution. Soap has hydrophobic part and hydrophilic part dissolves in water. Ethanol is non-polar solvent therefore micelles are not formed because hydrocarbon part get attracted toward ethanol and ionic end will not dissolve in alcohol.

29. A compound (A) $C_2H_4O_2$ reacts with sodium motelto form a compound 'B' and evolves a gas which burning with a 'Pop' sound. Compounds 'A' on treatment with alcohol 'C' in the presence of acid to form a sweet smelling with alcohol 'C' acid to form a sweet smelling with alcohol 'C' in the presence of acid to form a sweet smelling compound 'D' ($C_4H_8O_2$). On addition of NaOH to D gives back 'B' and 'C'. Identify A,B,C and D and write the reaction involves.

Ans. 'A' is CH^3COOH (Ethanoic acid)

'B' is CH_3COONa (Sodium ethanoate)

'C' is CH_3CH_2OH, Ethanol

'D' is $CH_3COOC_2H_5$ Ethyl ethanoate

$2CH_3COOH + 2Na$

$$2CH_3COOH + 2Na \rightarrow \underset{\text{'B'}}{2CH_3COONa} + H_{2(g)}$$

$$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$$

'C' 'D'

$$CH_3COOCH_3 + NaOH \rightarrow \underset{\text{'B'}}{CH_3COONa} + \underset{\text{'C'}}{CH_3OH}$$

30. A Salt 'X' is formed and a gas is evolved when ethanoic acid react 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 the chemical equation of the reaction involved.

Ans. $CH_3COOH + NaHCO_3 \longrightarrow \underset{\text{'X'}}{CH_3COONa} + H_2O + CO_2$

The salt 'X' is sodium ethanoate. The has evolved is CO_2.

Pass the gas through lime water. It will turn milky. It shows that gas evolved is CO_2.

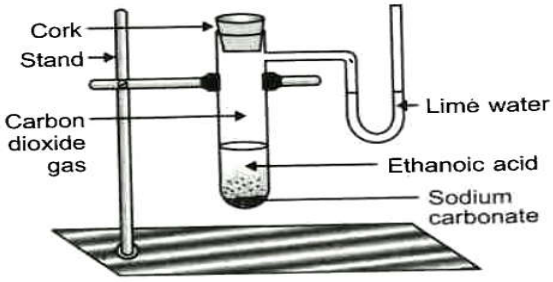
$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$

Aim: To demonsrate the reaction of carboxylic acid with sodium carbonate and sodium hydrogencarbonate.

Materials Required: Ethanoic acid, sodium carbonate, sodium hydrogen- carbonate, lime water.

Procedure:

1. Set the apparatus as show in diagram
2. Take 1 g of Na_2CO_3 and add 2 ml of ethanoic acid into it.
3. Pass the gasformed through lime water and note down the observations.
4. Repeat the same procedure with sodium hydrogen-carbonate and record your observation.



Evolution of carbon dioxide gas by reaction of ethanoic acid with sodium carbonate

Observation: Brisk effervescence due to carbon dioxide formed which turns lime water milky.

Chemical Reaction:

$2CH_3COOH(l) + Na_2CO_3(s) \longrightarrow 2CH_3COONa(aq) + H_2O(l) + CO(g)$

$CH_3COOH\ (l) + NaHCO_3 \longrightarrow CH_3COONa(aq) + H_2O(l) + CO_2(g)$

$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_2(s) + H_2O(l)$
Lime water (White ppt.)

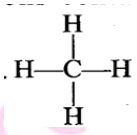
Conclusion: Carboxylic acid reacts with sodium carbonate and sodium hydrogenacarbonate to liberate CO_2 gas which lime milky.

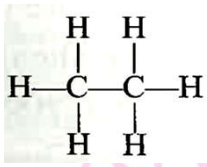
31. (a) What are hydrocarbons? Give examples.

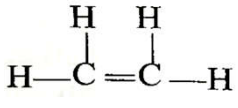
(b) Give the structural differences between saturated and unsaturated hydrocarbons with two example each.

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

Ans. (a) Hydrocarbons are the compound made up of carbons and hydrogen atoms only, e.g. CH_4 (methane), C_2H_6(ethane), $CH_2 = CH_2$ (Ethene), etc.

(b) Saturated hydrocarbons contain single covalent bonds only, e.g  (methane) and

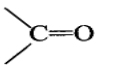
 (ethane) are saturated hydrocarbons. Unsaturated hydrocarbons contain double or triple covalent bonds, e.g.

 (ethane) and H __C ≡ __ H (ethyne) are unsaturated hydrocarbons.

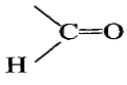
(c) Functional group is an atom or group of atoms or reactive part of the compound which determines chemical properties of the those compounds, e.g.

(i) ___OH(Alcohol)

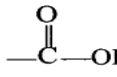
CHB_3CH_2OH(Ethanol)

(ii)  (Ketone)

CH_3COCH_3 (Propanone)

(iii)  (Aldehyde)

CH_3CHO (Ethanal)

(iv)  (Carboxylic acid)

CH_3COOH (Ethanoic acid)

32. Esters are sweet smelling substances and are used in making perfumes. Suggest one activity and the reaction involved for the preparation of ester with well labelled diagram.

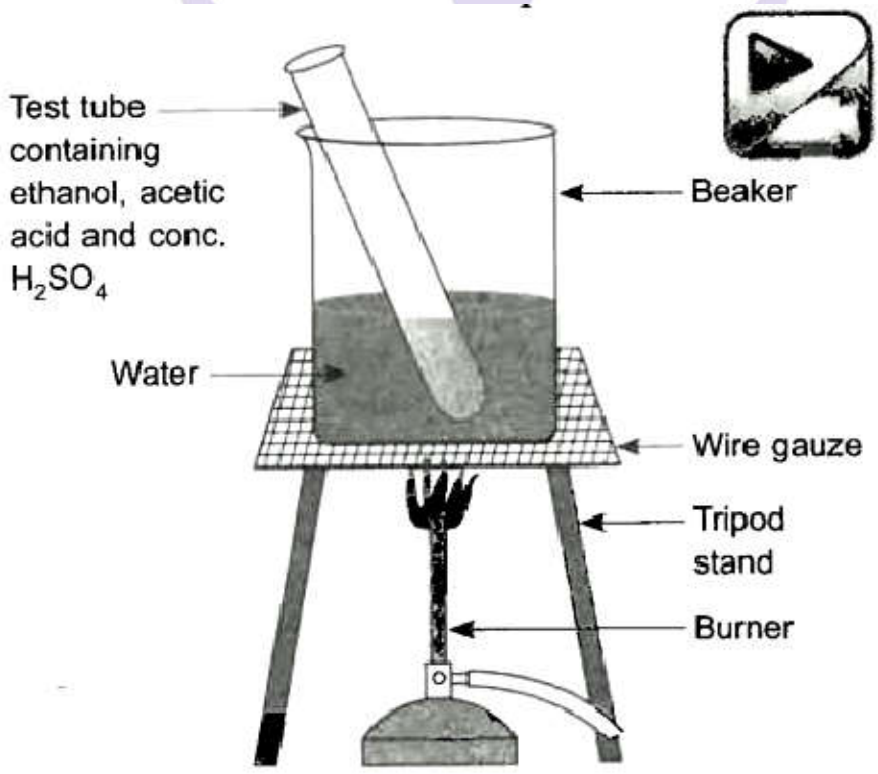
Aim:

Material Required: Beaker, water, test tube, ethanol, acetic acid, conc, H_2SO_4 , tripod stand, burner, wire gauze, etc.

Materials Reuired: Beaker, water, test tube, ethanol, acetic acid, conc. H_2SO_4 tripod stand, burner, wire gauze, etc.

Method:

1. Take 2 ml ethanol in a test tube.
2. Add 2 ml of ethanoic acid (acetic acid) into it.
3. Add few drops of conc. H_2SO_4.
4. Warm it in a beaker containing water.
5. Oberve the smell of the products formed.



Formation of ester (ethyl acetate)

Observations : Pleasant fruity smelling compound (called ester) is formed.

Chemical Reaction Involved :

$$\underset{\text{Ethanoic acid}}{CH_3COOH\ (l)} + \underset{\text{Ethanol}}{C_2H_5OH\ (l)} \xrightarrow{\text{conc. } H_2SO_4} \underset{\text{Ethyl ethanoate}}{CH_3COOC_2H_5(l)} + \underset{\text{Water}}{H_2O(l)}$$

Conclusion : Carboxylic acid acid ract with alcohol in presence of conc. H_2SO_4 which acts as a dehydrating agent to form easter.

A compound 'C ' (molecular formula, $C_2H_4O_2$) 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 $C_3H_6O_6$). On addition of NaOH to 'C', it also gives 'R' and 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' , 'S' and write down the reactions involved.

Ans.

$$\underset{\text{'C'}}{2CH_3COOH(l)} + \underset{\text{Sodium}}{2Na(s)} \longrightarrow$$

Ethanoic acid ($C_2H_4O_2$)

$$\underset{\text{'R'}}{2CH_3COONa(aq)} + \underset{\text{Hydrogen}}{H_2(g)}$$

(Sodium ethanoate)

H_2 gas burns with 'pop' sound.

$$\underset{\text{'C'}}{CH_3COOH} + \underset{\text{'A'}}{CH_3OH} \longrightarrow \underset{\text{'S'}}{CH_3COOCH_3} + \underset{\text{Water}}{H_2O}$$

Ethanoic acid — Methanol — Methyl ethanoate ($C_3H_6O_2$)

$$\underset{\text{'C'}}{CH_3COOH} + \underset{\text{Sodium hydroxide}}{NaOH} \longrightarrow \underset{\text{'R'}}{CH_3COONa} + \underset{\text{Water}}{H_2O}$$

Ethanoic acid — Sodium ethanoate

$$\underset{\text{'S'}}{CH_3COOCH_3} + \underset{\text{Sodium hydroxide}}{NaOH} \longrightarrow$$

Methyl ethanoate

$$\underset{\text{'R'}}{CH_3COONa} + \underset{\text{'A'}}{CH_3OH}$$

Sodium ethanoate — Methanol

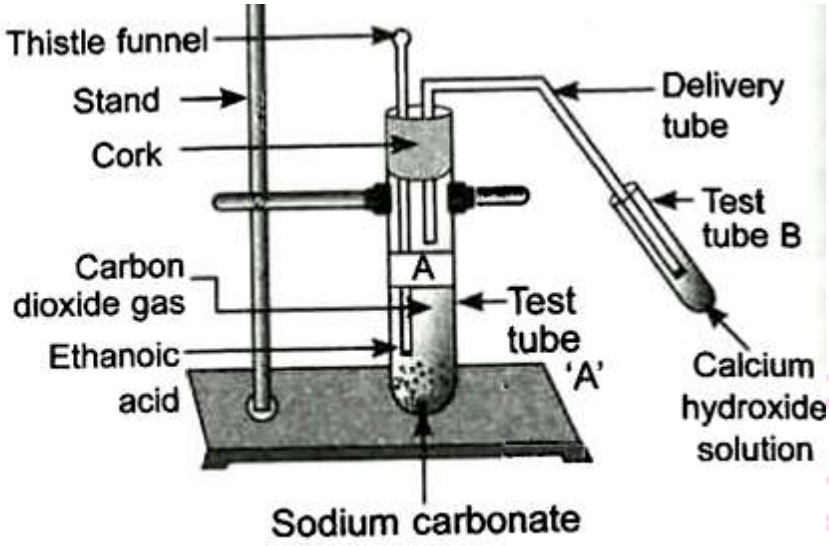
'C' is ethanoic acid, 'R' is sodium ethanoate, 'A' is methanol and 'S' is methyl ethanoate.

33. Look at figure and answer the following questions:

(a) What change wuld you observe in the calcium hydroxide solution taken in tube 'B'?

(b) Write the reaction involved in test tubes 'A' and 'B' respectively.

(c) How can a solution of lime water be prepared in the laboratory?



Ans. (a) Lime water will turn milky.

(b) Test tube A:

$2CH_3COOH\ (l) + Na_2CO_3(s) \longrightarrow 2CH_3COONa(aq) + H_2O(l) + CO_2(g)$

Test tube B:

$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O(l)$

(c) Ethanol will not react with Na_2CO_2 and CO_2 gas will not be formed.

(d) Add $Ca(OH)_2$ in water, shake it well. Filter the solution. The filtrate is lime water.

34. How would you bring about the following convertion? Name the process and write the reaction involved.

(a) Ethanol to ethane

(b) Propanol to propanic acid

Ans. (a)

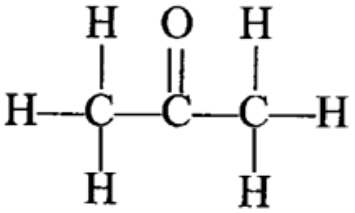
$$(a)\ \underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[\text{Heat}]{\text{Conc. } H_2SO_4} \underset{\text{Ethene}}{CH_2{=}CH_2} + H_2O$$

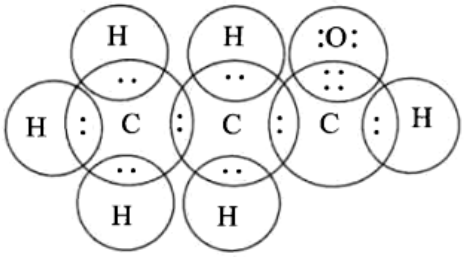
The reaction is called dehydration.

$$(b)\ \underset{\text{Propanol}}{CH_3CH_2CH_2OH} + 2[O] \xrightarrow[KMnO_4]{\text{Alkaline}} \underset{\text{Propanoic acid}}{CH_3CH_2COOH} + H_2O$$

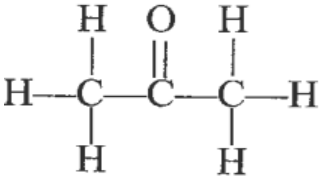
35. Draw the possible isomers of compound with molecular for formula C_3H_6O and also give their electron dot structures.

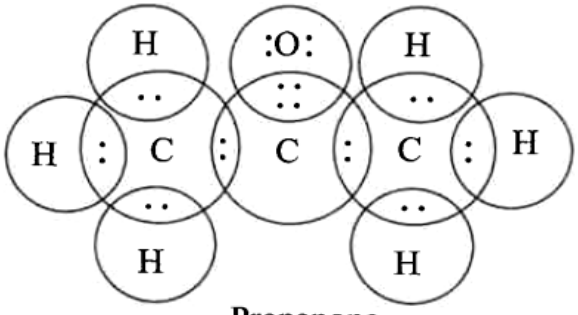
Ans. C_3H_6O represent aldehyde as well as ketone





Propanal





Propanone

36. Explain the given reaction with the examples

(a) Hydrogenation reaction

(b) Oxidation reaction

(c) Substitution reaction

(d) saponification reaction

(e) Combustion reaction

Ans. (a) Hydrogenation reaction : When hydrogen is addee to unsaturated hydrocarbons having double or triple bond in presence of Ni as catalyst, the reaction is called hydrogenation, e.g.

$$\underset{\text{Ethene}}{CH_2{=}CH_2} + H_2 \xrightarrow[573\ K]{Ni} \underset{\text{Ethane}}{CH_3{-}CH_3}$$

(b) Those reactions in which oxygen is added or hydrogen is removed are called oxidation reaction. e.g.

$$\underset{\text{Methanol}}{CH_3OH} + [O] \xrightarrow[KMnO_4]{\text{Alkaline}} \underset{\text{Methanoic acid}}{HCOOH} + H_2O$$

(c) Substitution reaction: The reaction in which one or more atoms of compound is replaced by another atom or group of atoms, it is called substitution reaction, e.g.

$$\underset{\text{Methane}}{CH_4} + Br_2 \xrightarrow{\text{Sunlight}} \underset{\text{Bromomethane}}{CH_3Br} + HBr$$

(d) Saponification reaction: When an easter reacts with sodium hydroxide to form sodium salt of carboxylic acid and alcohol, it is called saponification, e.g.

$$\underset{\text{Methyl propanoate}}{C_2H_5COOCH_3} + \underset{\text{Sodium hydroxide}}{NaOH} \longrightarrow \underset{\text{Methanol}}{CH_3OH} + \underset{\text{Sodium propanoate}}{C_2H_5COONa}$$

(e) Combustion reaction: When an organic compound burns in presence of ion to form CO_2 and H_2O along with heat and light is called combustion reaction, e.g.,

$$\underset{\text{Ethane}}{2C_2H_6(g)} + 7O_2(g) \longrightarrow \underset{\text{Carbon dioxide}}{4CO_2(g)} + \underset{\text{Water}}{6H_2O(l)} + \text{Heat} + \text{Light}$$

37. An organic compound 'A' on heating with conc. H_2SO_4 forms a compound B, Which on addition with 1 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 equation of the reactions involved.

Ans.

The compounds are as follows:

A—Ethanol, B—Ethene, C—Ethane

$$\underset{\text{'A' Ethanol}}{CH_3CH_2OH} \xrightarrow{\text{Conc. } H_2SO_4} \underset{\text{'B' Ethene}}{CH_2{=}CH_2} + H_2O$$

$$\underset{\text{'B' Ethene}}{CH_2{=}CH_2} + H_2 \xrightarrow[\text{Heat}]{\text{Ni}} \underset{\text{Ethane 'C'}}{CH_3{-}CH_3}$$

$$\underset{\text{Ethane 'C'}}{C_2H_6} + \frac{7}{2}\underset{\text{Oxygen}}{O_2} \longrightarrow \underset{\text{Carbon dioxide}}{2CO_2(g)} + \underset{\text{Water}}{3H_2O(l)}$$

Competency Based Questions (4 Marks)

1. Read the given passage and answer the questions that follow:

1. Name the characteristic property of carbon as depicted in the fig.

a. Catenation b. Polymerization

c. Isomerisation c. None of the above

2. Carbon forms large number of compounds due to :

a. Cartenation only b. Teravalency only

c. Both catenation and tetravalency d. None of the above

3. Carbon is

a. Divalent b. Monovalent

c. Tetravalent d. Trivalent

4. Write the name and structure of a saturated compound in which 6 carbon atoms are arranged in ring.

a. Hecane **b. Cyclohexane**

c. Pentane d. Cyclopentane

II. Read the given passage and answer the questions that follow:

Homologous series is a series of compounds with similar chemical properties and same functional group differing from the successive member by $-CH_2$ unit. Carbon chain s of varying length have been observed in organic compounds having the same general formula. Such organic compounds that vary from one another by a repeating unit and have the same general formula C_nH_{2n+2}, and alkaynes with general formula C_nH_{2n} and alkynes with general formula C_nH_{2n-2} from the most basic homologous series in organic chemistry.

All the members belonging to this series have the same members belonging to this series have the same functional group. They have similar physical properties and follow a fixed gradation scientists to study different organic compounds systematically. They can predict the properties or organic compounds belonging to a particular homologous series based on the data available from the other members of the same series. The study of organic compounds has been simplified.

1. Which of these statement is correct about the

   a. Which of these statement empirical formula.

   b. They have same general formula

   c. They have same molecular formula.

   d. They have same physical properties.

2. Two compounds CH_3OH and C_2H_5OH are provided. The difference in its formulae and molecular masses are ___ I ____ and ____ II ____.

   a. I- CH_3, II – 16 units

   b. I- CH_2, II- 14 units

   c. I – CH_4, II – 18 units

   d. I – CH_3, II – 16 units

3. What is the molecular formula of the 5^{th} member of the homologous series of carbon compounds is represented by the general formula $C_nH_{2n+1}OH$?

   a. C_5H_{10} **b.$C_5H_{11}OH$** c.$C_5H_{12}OH$ d. $C_5H_{11}CHO$

4. The general formula for alkene is :

   a. C_nH_{2n} b. C_nH_{2n+2} C. C_5H_{2n-2} d. C_nH_{2n+1}

Case Based Subjective Questions

1. Read the given passage and answer the questions that follow:

Homologouse series is a series of compounds with similar chemical properties and same functional group differing from the successive member by CH2. Carbon chain of varying length have been observed in organic compounds having the same general formula. Such organic compounds having the same general formula. Such organic compounds that vary from one another by a repeating unit and have the same genral formula form a series of compounds. Alkanes with general formula C_nH_{2n+2}, alkanes with general formula C_nH_{2n-2} from the most basic homologous series in organic chemistry.

All the members belonging to this series have the same functional groups. They have similar physical properties ans follow a fixed gradation with increasing mass. This series has enabled scientists to study different organic compounds systematically. They can predict the properties of organic compounds belonging to a particular homologous series based on the data available from the other members of the same series. The study of organic compounds has been simplified.

1. What is the difference in the molecular formula of any two consecutive members of homologous series of organic compounds?
2. Name the fourth members of the alkaline series.
3. Name the functionalgroup present in the following compound:

   (i) $CH_3 - COOH$ (ii) $CH_3 - \overset{\overset{O}{\|}}{C} - CH_3$
4. What is a homologous series? Which two of the following organic compounds belongs to the same homologous?

   $CH_3, C_2H_6O, C_2H_6O_2, CH_4$

Ans. 1. $-CH_2-$ is the difference in the molecular formula of any two consecutive members of a homologous series of organic compounds.

2. Fourth members is pertane (C_5H_{12})

3. (i) Carboxylic acid group

   (ii) Ketone group

4. Homologous series is a series organic compounds which have same functional group and similar chemical properties.

II. Read the given passage ans answer the questions that following:

Soap and detergent are widely used as cleaning agents. Chemically soaps and detergents are quite different from each other. The common feature of soap and detergents is the that when dissolved in water the molecules of soap and detergent tend to concentrate at the surface of the solution or at interface. Therefore, the surface tension of the solution is reduced, it causes foaming of the solution is reduced, it causes foaming of the solution. A Sample of water which gives lather with soap with difficulty is known as hard water, while a sample of water which gives lather with soap easily is known as soft water. Hardness of water is due to the presence of bicarbonates, sulphates and chlorides of calcium and magnesium. When harfness. When hardness of water of water is due to the presence of sulphates and chlorides of magnesium and calcium, it is called permanent hardness.

1. What is the difference between the molecules of soap and detergents chemically?
2. Why does micelle formation take place when sopa is added to water?
3. Why do soaps not form lather in hard water?
4. List two problem that arise dure to the use of detergents instead of soaps.

Ans. 1. Soaps are sodium or potassium salts of long chain fatty acids while detergents are ammonium or sulphonate salt of long carboxylix acids.

2. It is because large number of molecular ions of soaps gets aggregated and form colloidal solution. Soap has hydrophobic tail(hydrocarbon) Which dissolves in hydrocarbon part and hydrophilic part dissolves in water.
3. Hard water contains chlorides and sulphates of calcium and maganesium which react with soap to forms insoluble scum. Therefore, soap is not able to perform its cleansing action.
4. Detergents are not biodegradable substances. Thus, they may cause water pollution. Detergents are highly basic in nature. They may affect the skin.