

## CHEMISTRY

### BOOKS - VK GLOBAL PUBLICATION CHEMISTRY (HINGLISH)

#### CARBON AND ITS COMPOUNDS

##### Ncert Intext Questions

1. What would be the electron dot structure of carbon dioxide which has the formula  $CO_2$ ?

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2. What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? (Hint – the eight atoms of sulphur are joined together in the form of a ring.)

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3. How many structural isomers can you draw for pentane?

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4. What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

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5. Draw the structures for the following compounds:

(i) Ethanoic acid

(ii) Bromopentane

(iii) Butanone

(iv) Hexanal

Are structural isomers possible for bromopentane?

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6. What will be the formula and electron dot structure of cyclopentane?

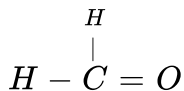
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7. What are the names of compounds?



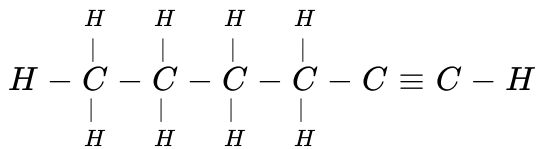
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8. What are the names of compounds?



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9. What are the names of compounds?



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10. Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

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11. A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

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12. How would you distinguish experimentally between an alcohol and a carboxylic acid?

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13. What are oxidising agents?

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14. Would you be able to check if water is hard by using a detergent?

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15. People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes?



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## Ncert Exercises

1. Ethane, with the molecular formula  $C_2H_6$  has

- A. 6 covalent bonds
- B. 7 covalent bonds
- C. 8 covalent bonds
- D. 9 covalent bonds

**Answer: B**



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2. Butanone is a four-carbon compound with the functional group

- A. carboxylic acid

B. aldehyde

C. ketone

D. alcohol

**Answer: C**



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3. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that

A. the food is not cooked completely.

B. the fuel is not burning completely.

C. the fuel is wet.

D. the fuel is burning completely.

**Answer: B**



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4. Explain the nature of the covalent bond using the bond formation in  $CH_3Cl$ .

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5. Draw the electron dot structures for:

(a) ethanoic acid

(b)  $H_2S$

(c) propanone

(d)  $F_2$

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6. What is a homologous series ? Explain with an example.

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7. How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties ?

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8. Why does micelle formation take place when soap is added to water?  
Will a micelle be formed in other solvents such as ethanol also?

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9. Why are carbon and its compounds used as fuels for most applications?

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10. Explain the formation of scum when hard water is treated with soap.

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11. What change will you observe if you test soap with litmus paper (red and blue)?

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12. What is hydrogenation? What is its industrial application?

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13. Which of the following hydrocarbons undergo addition reactions?

$C_2H_6$ ,  $C_3H_8$ ,  $C_3H_6$ ,  $C_2H_2$  and  $CH_4$

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14. Give a test that can be used to differentiate chemically between butter and cooking oil.

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15. Explain the mechanism of the cleaning action of soaps.

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### Very Short Answer Questions

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

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

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3. Write the number of covalent bonds in the molecule of propane,  $C_3H_8$ .

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4. Write the number of covalent bonds in the molecule of butane,  $C_4H_{10}$ .

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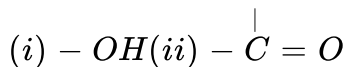
5. Which element exhibits the property of catenation to maximum extent and why?

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

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7. Give the names of the functional groups:



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

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

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

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11. An organic compound 'X' of molecular formula  $C_2H_4O_2$  gives brisk effervescence with sodium bicarbonate. Give the name and formula of X.

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

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13. what is vinegar?

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14. How does carbon attain a stable electronic configuration?

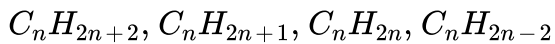


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15. What is isomerism?

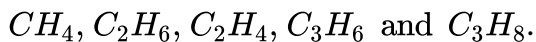
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16. Which of the following formulae represents a saturated hydrocarbon?



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17. Which of the following are alkenes?



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18. What happens when methane is burnt in air?

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

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

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

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

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

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24. Which two of the following organic compounds belong to the same homologous series?

$C_2H_6$ ,  $C_2H_6O$ ,  $C_2H_6O_2$ ,  $CH_4O$

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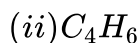
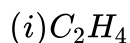
25. Write the name and molecular formula of the first member of the homologous series of alkynes.

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

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



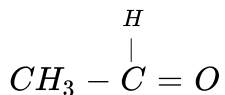
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28. Name the following compounds:



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29. Name the following compounds:

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30. Select saturated hydrocarbons from the following:

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

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

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

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### Short Answer Questions I

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

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

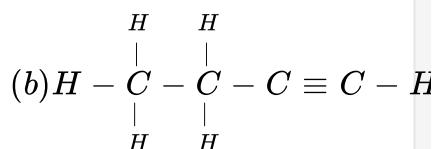
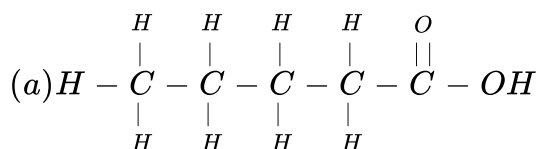
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3. Select the hydrocarbons which are members of the same homologous series. Give the name of each series.

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

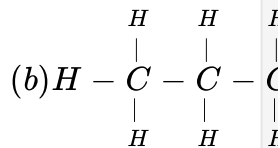
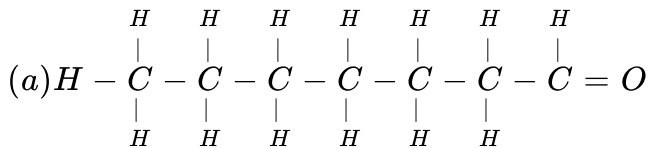
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4. Write the names of the following compounds.



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5. Write the names of the following compounds.

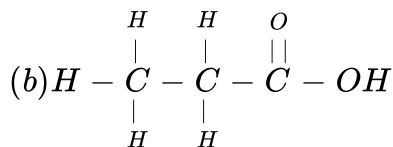
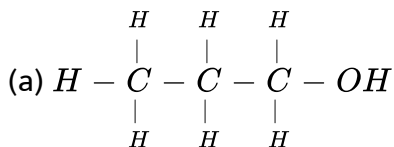


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6. Why are unsaturated hydrocarbons more reactive than saturated hydrocarbons?

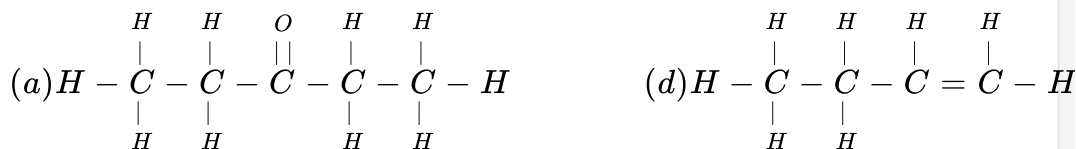
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7. Identify and name the functional groups present in the following compounds.



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8. Identify and name the functional groups present in the following compounds.

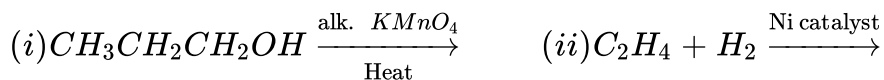


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9. Write the name and molecular formula of an organic compound having its name suffixed with '-ol' and having two carbon atoms in the molecule. With the help of a balanced equation indicate what happens when it is heated with excess of conc.  $H_2SO_4$ .

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



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

Write an example of a compound formed with

(a) Chlorine (Group 17 of Periodic Table) (b) Oxygen (Group 16 of Periodic Table)

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12. How is ethanol obtained for commercial use?

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

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14. Write four uses of ethyl alcohol.

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15. Mention the physical properties of ethanoic acid.

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

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

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18. Intake of small quantity of methanol can be lethal. Comment.

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

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20. Why detergents are better cleansing agents than soaps ? Explain.

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

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22. Two carbon compounds A and B have the molecular formulae  $C_3H_8$  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.

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

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

Write the reactions.

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24. Ethene is formed when ethanol at 443 K is heated with excess of concentrated sulphuric acid. What is the role of acid in the this reaction ?

Write the balanced chemical equation of this reaction.

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## Short Answer Questions II

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

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



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

(i) Ethanol (ii) Ethanoic acid



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

of ethyne and air for this purpose?

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4. What is meant by isomers? Draw the structures of two isomers of butane,  $C_4H_{10}$ . Explain why are cannot have isomers of first three members of alkane series.

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

$C_3H_4$ ,  $C_3H_6$ ,  $C_4H_8$ ,  $C_5H_8$ ,  $C_5H_{10}$

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

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

(b) What is indicated by:

(i) sooty flame (ii) blue flame of a bunsen burner?

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

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8. Explain the given reactions with examples:

(a) Combustion reaction

(b) Oxidation reaction

(c) Substitution reaction

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

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10. Write physical properties of ethanol.

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

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

(ii) Draw the electron dot structure for propanal.



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13. A compound X is formed by the reaction of a carboxylic acid  $C_2H_4O_2$  and an alcohol in the presence of a few drops of  $H_2SO_4$ . The alcohol on oxidation with alkaline  $KMnO_4$  followed by acidification gives the same carboxylic acid as used in this reaction. Give the names and structures of (a) carboxylic acid, (b) alcohol and (c) the compound X. Also write the reaction.



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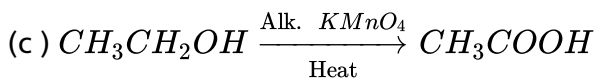
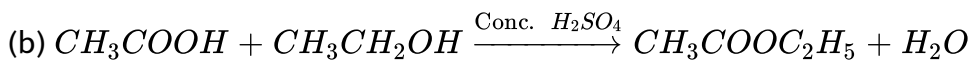
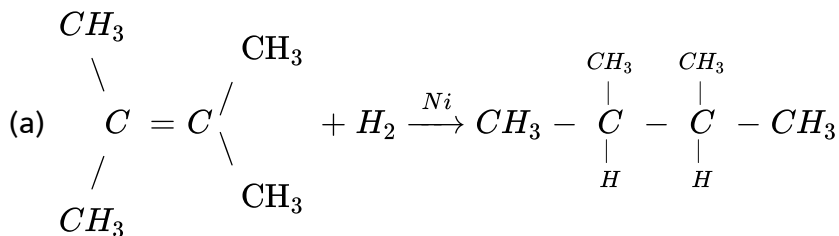
14. An ester has the molecular formula  $C_4H_8O_2$ . Write its structural formula, what happens when this ester is heated in the presence of sodium hydroxide solution? Write the balanced chemical equation for the reaction and name the products. What is a saponification reaction?



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



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

Write the name of one main product of each reaction.

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17. 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.  $H_2SO_4$  in this reaction.

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

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## Long Answer Questions

1. Both soap and detergent are some type of salts. What is the difference between them?

Describe in brief the cleansing action of soap. Why do soaps not form lather in hard water?

List two problems that arise due to the use of detergents instead of soaps.



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2. What happens when

(i) ethanol burns in air.

(ii) ethanol reacts with sodium metal.

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

(iv) ethanol is heated with alkaline potassium permanganate.

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



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

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

(c) What is functional group ? Examples of four different functional groups.



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

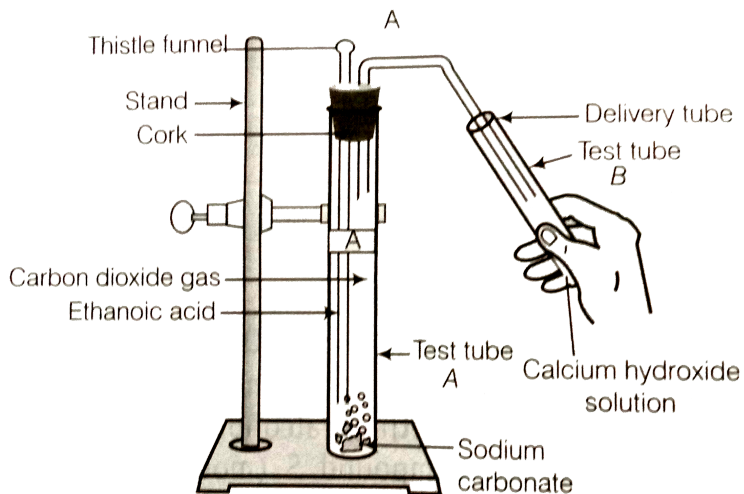
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5. A compound C (molecular formula,  $C_2H_4O_2$ ) reacts with Na metal to form a compound R and evolves a gas which burns with a pop sound. Compound C on treatment with an alcohol A in the presence of an acid form a sweet smelling compound S (molecular formula,  $C_3H_6O_2$ ). On addition of NaOH to C, it also gives R and water. S on treatment with NaOH solution gives back R and A.

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

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



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

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

(c) If ethanol is given instead of ethanoic acid, would you expect same change ?

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

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

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8. (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 liberated.

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

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



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

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



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1. An aldehyde as well as a ketone can be represented by the same molecular formula, say  $C_3H_6O$ . Write their structures and name them. State the relation between the two in the Language of science.

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2. An organic acid X is a liquid, which often freezes during winter time in cold countries having the molecular formula  $C_2H_4O_2$ . On warming it with methanol in the presence of a few drops of concentrated sulphuric acid, a compound Y with a sweet smell is formed.

(a) Identify X and Y. Also write the formula showing the functional group present in them.

(b) Write a chemical equation for the reaction involved.

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3. Give reasons for the observations:

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

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4. Give reasons for the observations:

Use of synthetic detergents causes pollution of water.

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5. Covalent compounds have low melting points because

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6. How are carboxylic acids different from mineral acids from ionisation point of view?



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



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8. An element belonging to group 14 of the periodic table has two common allotropes A and B. A is very hard and a non conductor of electricity while B is soft to touch and good conductor of electricity . Identify the element . Name each of these allotropes.



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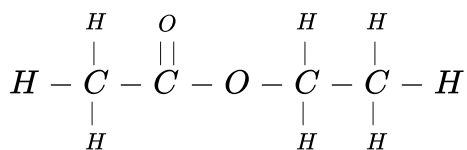
9. An organic compound A on heating with concentrated  $H_2SO_4$  forms a compound B which on addition of one mole of hydrogen in presence of Ni forms a compound C. One mole of compound C on combustion forms two moles of  $CO_2$  and three moles of  $H_2O$ . Identify the compounds A, B and C write the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

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10. A cyclic compound 'X' has molecular formula  $C_6H_6$ . It is an unsaturated compound and burns with sooty flame. Identify 'X' and write its structural formula.

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11. The structural formula of an ester is:



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

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**12.** A neutral organic compound A of molecular formula  $C_2H_6O$  on heating with excess of conc.  $H_2SO_4$  gives compound B of molecular formula  $C_2H_4$ . Compound B on reduction gives compound C of molecular formula  $C_2H_6$ .

(a) Name A, B and C.

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

(c) What is the role of conc  $H_2SO_4$  in the above equation.

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

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

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

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## Proficiency Exercise Very Short Answer Questions

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

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2. What is the general formula of alkanes ? Identify the alkanes from the following:

$CH_4$ ,  $C_2H_2$ ,  $C_2H_6$ ,  $C_3H_6$ ,  $C_3H_8$

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3. Draw the electron dot structure of ethyne and also draw its structure of ethyne and also its structural formula.

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4. State the reason why covalent compounds are generally poor conductors of electricity.

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5. Draw the structural formula of methanoic acid.

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6. A compound 'X' has a formula  $C_3H_6$ . It decolourises bromine water. Write the chemical name of 'X'.

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## Proficiency Exercise Short Answer Questions I

1. What will happen if ethanol reacts with ethanoic acid in the presence of a mineral acid? Name the reaction. Write the chemical equation for this reaction.

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2. Give chemical tests to detect the presence of (a) ethanol and (b) ethanoic acid.

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3. (a) Write your observation, if you dip a red litmus paper in soap solution.

(b) Suggest one method to remove the temporary hardness of water.

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## Proficiency Exercise Short Answer Questions li

1. Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen is possible. State the essential condition for an addition reaction. Stating this condition, write a chemical equation giving the name of the reactant and the product of the reaction.



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2. Name the compound formed when ethanol is heated in excess of conc. sulphuric acid at 443K. 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?



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3. A compound X is formed by the reaction of a carboxylic acid  $C_2H_4O_2$  and an alcohol in the presence of a few drops of  $H_2SO_4$ . The alcohol on oxidation with alkaline  $KMnO_4$  followed by acidification gives the same carboxylic acid as used in this reaction. Give the names and structures of (a) carboxylic acid, (b) alcohol and (c) the compound X. Also write the reaction.

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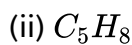
4. Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write balanced chemical equation in each case. Write the name of the reactants and the products other than ethanoic acid and sodium ethanoate in each case.

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5. Name the products obtained on complete combustion of hydrocarbons? How is the gas evolved during combustion tested in the laboratory? Explain in brief.

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6. Write the next higher homologue of the following:



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7. State any three points of differences between ionic and covalent compounds.

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

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2. An organic compound 'A' on heating with another compound 'B' in presence of concentrated sulphuric acid forms a sweet smelling compound 'C':

(i) Identify the name of this chemical reaction.

(ii) Write a balanced chemical equation for the above chemical reaction.

(iii) Write one use of compound 'C'.

(iv) Write a balanced chemical equation for the reaction when an acid or a base is added to compound 'C'.

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3. Explain the following term with the help of chemical reaction:

(i) Oxidation reaction

(ii) Hydrogenation reaction

(iii) Substitution reaction

(iv) Esterification reaction

(iv) Saponification reaction

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4. Name the functional groups present in the following compounds.

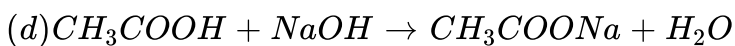
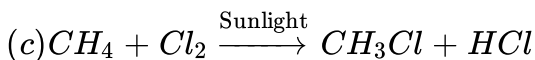
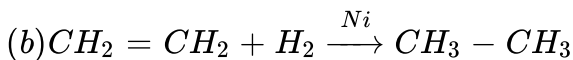
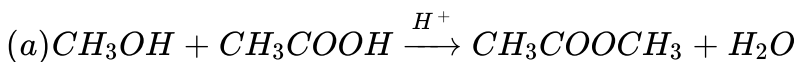
(a)  $CH_3COCH_2CH_2CH_2CH_3$  , (b)  $CH_3CH_2CH_2COOH$

(c)  $CH_3CH_2CH_2CH_2CHO$  , (d)  $CH_3CH_2OH$

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5. Match the reactions given in Column (A) with the names given in Column (B).

Column A



Column B

(i) Addition react

(ii) Substitution

(iii) Neutralisati

(iv) Esterificatio



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6. What is meant by "structural isomers"? Give reason why propane ( $C_3H_8$ ) cannot exhibit this characteristic. Draw the structures of possible isomers of butane ( $C_4H_{10}$ ).



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