

10. ALCOHOLS

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Introduction, Classification, Nomenclature & Isomerism

1. Give the IUPAC name of the following compound: $\text{CH}_2=\text{CHCH}_2\text{OH}$
2. Write the structure of secondary and tertiary alcohols of $\text{C}_4\text{H}_{10}\text{O}$ and give their IUPAC and common names. 2
3. Write down the structural formula and IUPAC name of tert-butyl alcohol.
Write the structural formula for 3° alcohol of $\text{C}_4\text{H}_{10}\text{O}$. 1
4. Write down the isomers of monohydric alcohols from $\text{C}_3\text{H}_8\text{O}$ and give their IUPAC name. 3

Structural isomerism

5. Write the Isomeric alcohols of $\text{C}_3\text{H}_8\text{O}$. 1
Write the structural formula of the secondary alcohol of $\text{C}_3\text{H}_8\text{O}$. 1
6. Write down the isomers of monohydric alcohols from $\text{C}_3\text{H}_8\text{O}$ and give their IUPAC name. **How would you convert one isomer into another and vice versa?** 3

Victor-Meyer Method for distinction of 1° , 2° and 3° alcohols

7. Write short notes on distinction of 1° , 2° and 3° alcohols by Victor-Meyer method. 5
Describe Victor-Meyer's method to distinguish primary, secondary and tertiary alcohols. 5
8. How would you distinguish Ethanol and Propan-2-ol by the Victor-Meyer method?
9. Describe the Victor-Meyer method to distinguish Propan-2-ol and 2-methylpropan-2-ol. 5
10. Write down the isomeric alcohols of $\text{C}_3\text{H}_8\text{O}$ with their IUPAC names. Also, give the Victor-Meyer method to distinguish them. 5
11. How would you distinguish Ethanol, Propan-2-ol and 2-methylpropan-2-ol by the Victor-Meyer method? Write an example each of primary (1°) and secondary (2°) alcohols. How is Victor-Meyer's test applied to distinguish between them? 1+4
12. The organic compound $\text{C}_3\text{H}_8\text{O}$ gives isomeric alcohols A and B
 - i. Identify isomers A and B and draw their structural formula. 1
 - ii. Starting from isomer A, how would you obtain nitrolic acid? 2
 - iii. Convert isomer A into B. 2

General Methods of Preparation

1. From Haloalkane (studied in substitution reactions of haloalkanes)
2. From Esters (By hydrolysis in acidic/alkaline medium and reduction)
3. From Primary amines (by reaction with nitrous acid)

Industrial preparation

1. Oxo process

13. Write the chemical reaction for the preparation of a primary alcohol by the oxo process. 1
Show your familiarity with the chemical reaction for the oxo process. 1
Write a correct example of the Oxo process. 1
Write a chemical equation for the oxo process. 1
14. Write an example of a carbonylation reaction. 1

2. Fermentation of sugar

15. Write a short note on fermentation. 4

- Write a short note on the fermentation of ethyl alcohol. 2
16. Give the reactions for the conversion of cane sugar into ethyl alcohol 2
 How would you obtain Ethanol from cane sugar? Write the reaction only. 2
 Starting from cane sugar, how would you obtain ethyl alcohol? 2
 What is fermentation? 2
17. Ethyl alcohol is a common alcohol and is used to manufacture alcoholic beverages. It can be prepared from sugar-containing materials like molasses by a fermentation process.
 i) Define fermentation.
 ii) What is meant by molasses?
 iii) Mention the function of yeast in the formation of cane sugar into ethyl alcohol.

3. Hydroboration of Ethene(Alkene)

18. Write an example of a hydroboration oxidation reaction. 1

Absolute alcohol, methylated spirit, rectified spirit: alcoholic beverages

19. Give the differences between absolute alcohol and denatured alcohol. 1

Physical Properties

20. Give reasons: though ethanol is an organic compound, it is soluble in water. 1
21. Alcohols of low molecular weight are moderately soluble in water, whereas ethers of about the same molecular weight are not. Explain. 2
22. Why is the boiling point of Ethanol higher than its isomer, methoxymethane? 2
 Why is the boiling point of Ethanol greater than that of Ethoxyethane? 2
23. Isopropyl alcohol has a lower boiling point than n-propyl alcohol, though they have the same molecular mass. Explain. 2

Chemical properties

[A] Reaction involving the cleavage of O-H bond

1. Reaction with active metals like Li, Na, K (acidic nature of alcohol)

24. Give a reaction to show that the H-atom of the -OH in alcohol is weakly acidic. 1

2. Reaction with carboxylic acid - Esterification (test of alcohol)

25. Give an example of Esterification. 2
26. Give a suitable reaction to convert Ethanoic acid into Methyl ethanoate.
27. What happens when ethyl alcohol is treated with acetic acid? 1

[B] Reaction involving cleavage of C-O bond (Nucleophilic Substitution rxⁿ)

1. Reaction with HX, PX₃, PCl₅, SOCl₂ (studied in preparations of haloalkanes)

[C] Other Reactions

1. Dehydration of alcohols

28. What happens when Ethyl alcohol is treated with conc. H₂SO₄?
29. What action takes place when an excess of Ethanol is heated with conc. Sulphuric acid at about 140°C? 2
30. What action takes place when Ethanol is heated with conc. H₂SO₄ at about 160-170°C? 2
31. Write down the reaction for the preparation of Ethoxyethane from Ethanol.

2. Oxidation of primary, secondary and tertiary alcohols

32. Write down the oxidation products of primary, secondary & tertiary alcohols.
 Write down the oxidation of primary and secondary alcohols. 3

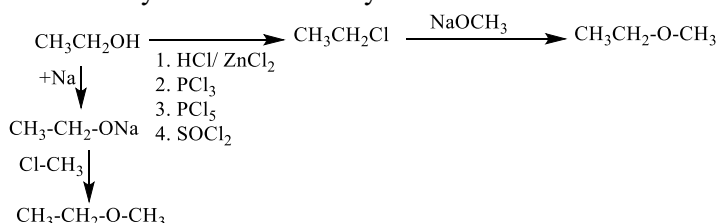
33. Oxidation of various classes of alcohols gives various products.
 I) Name mild and strong oxidizing agent used in the oxidation of alcohols.
 II) Write down the oxidation of 1^o, 2^o and 3^o alcohols. 1+4
34. $A + \text{aq. NaOH} \rightarrow B (+[O]) \rightarrow \text{propanone}$
 i. Identify the compounds (A) and (B).
 ii. Starting from compound (A), how would you obtain 2,3-dimethylbutane?
 iii. Convert (B) into propane.
 iv. Predict the product when compound (A) is heated with sodium methoxide. 2+1+1+1

a) Catalytic dehydrogenation of alcohols

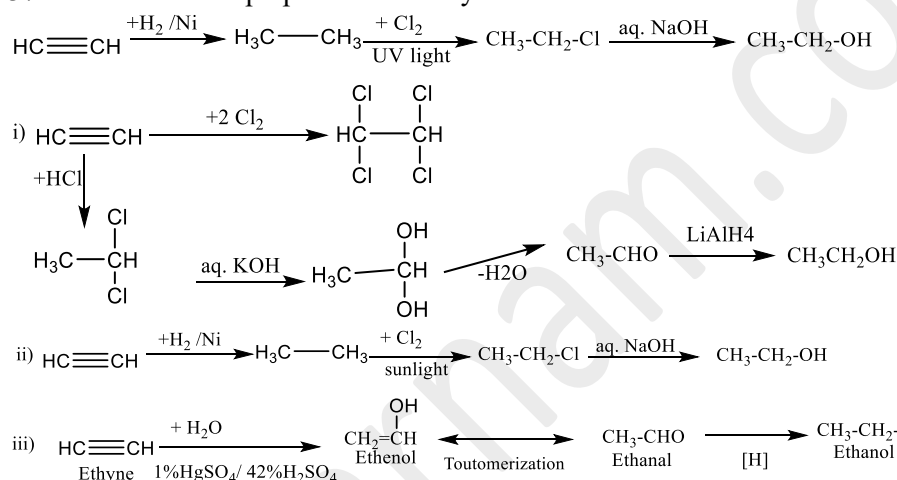
35. How is Propanone prepared from Isopropyl alcohol? 1
 How is Propanone prepared from Propan-2-ol? 1

Conversions

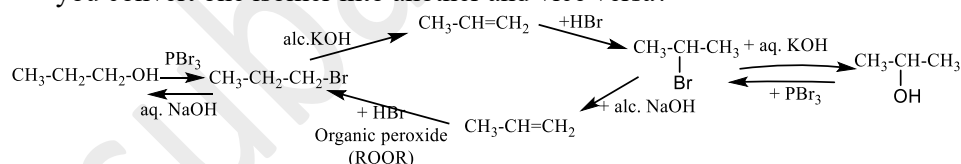
36. How would you obtain Methoxyethane from Ethanol? 1



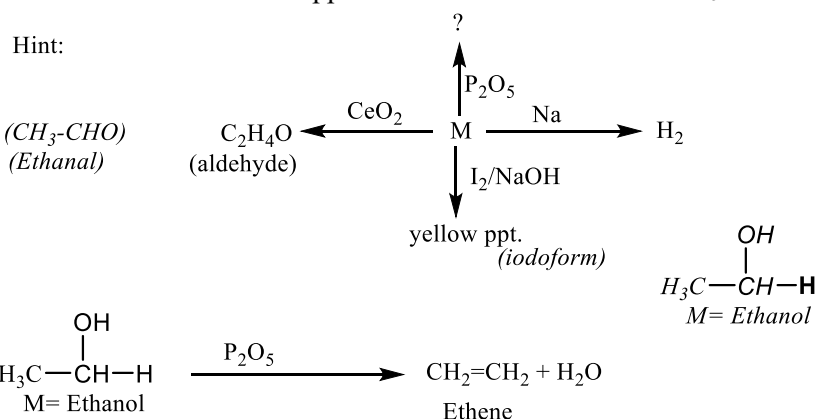
37. How is Ethanol prepared from Ethyne? 1



38. Write down the isomers of monohydric alcohols from C₃H₈O and give their IUPAC names. How would you convert one isomer into another and vice versa? 3



39. An organic compound M gives H₂ gas with sodium metal. On treatment with alkaline iodine gives yellow ppt, and on oxidation with CeO₂ forms an aldehyde (C₂H₄O). Name the compound M and write the reactions involved. What happens when M is heated with P₂O₅? 5



40. The organic compound C_3H_8O gives isomeric alcohols (A) and (B) and draws their structural formula.
- Identify isomeric alcohols (A) and (B) and draw their structural formula. 1
 - Starting from isomer(A), how would you obtain nitrolic acid? 2
 - Convert isomer (A) into (B). 2
41. Convert Propan-1-ol to Propan-2-ol. 2

Laboratory test of Ethanol

1. Esterification test-

2. **Iodoform test** (test for $\begin{array}{c} \text{OH} \\ | \\ \text{CH}_3-\text{CH}- \end{array}$ group)

42. What is the laboratory test of ethanol? 2
43. Give a suitable test of Ethanol that distinguishes it from Propanol. (must be Propan-1-ol) 2
44. Name any suitable secondary alcohol that gives the iodoform test and write the test reaction. 2
Give an example of the iodoform test. 1
45. What happens when Ethanol is heated with iodine in the presence of aqueous NaOH? 2
46. Name the isomer of C_3H_8O which undergoes the iodoform test. 2
What is the isomeric alcohol of C_3H_8O that gives the iodoform test? Write the test reaction. 2
Write down the isomers of **monohydric alcohols** from C_3H_8O and give their IUPAC name. What chemical test would you apply to distinguish them? Write a chemical reaction for it. 3
47. Write any three isomeric alcohols of $C_4H_{10}O$ and name them. Write the reaction for the **positive** iodoform test and **positive** esterification test for one of these alcohols. Mention the observation in each test. Write the oxidation reaction of the remaining alcohols, if it undergoes. 2+1+1+1
48. A 1° alcohol with molecular weight 46 is boiled with sodium hydroxide and iodine. When the same alcohol is heated with Ethanoic acid in the presence of conc. H_2SO_4 , one of the derivatives of carboxylic acids is obtained. Write the reaction involved in both conditions. What would be the product obtained when the same alcohol is heated with conc. H_2SO_4 ? How would you distinguish the above alcohols from Methanol?

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