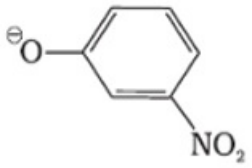
CBSE Test Paper-04

Class - 12 Chemistry (Alcohols, Phenols and Ethers)

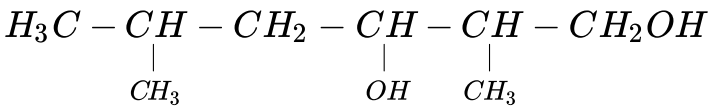
1. Preparation of ethers by acid dehydration of secondary or tertiary alcohols is not a suitable method.
   a. alkyl group is hindered.
   b. None of these
   c. alkyl group should be unhindered
   d. elimination competes over substitution and alkenes are easily formed
2. Which of the following species can act as the strongest base?
   a. 
   b. °OR
   c. °OH
   d. $°C_6H_5$
3. Reaction of an alcohol with organic acid is called the _____
   a. Esterification process
   b. Aldol condensation
   c. Neutralization reaction
   d. Hydrogenation process
4. Alcohol which is used as beverage is
   a. Butan-1-ol
   b. Ethanol
   c. Propan-1-ol
   d. Methanol
5. Arrange the following compounds in increasing order of their acid strength: Propan – 1 – ol, 2,4,6 – trinitrophenol, 3 – nitrophenol, 3,5 – dinitrophenol,phenol, 4 – methylphenol.
   a. 4 – methylphenol, phenol, propan – 1 – ol,3 – nitrophenol, 3,5 – dinitrophenol, 2,4, 6 – trinitrophenol.
   b. Propan – 1 – ol, 4 – methylphenol, phenol, 3 – nitrophenol, 3,5 – dinitrophenol,2,4,

6 – trinitrophenol.

c. 3 – nitrophenol, 3,5 – dinitrophenol,2,4, 6 – trinitrophenol, Propan – 1 – ol, 4 – methylphenol

d. 3, 5 – dinitrophenol,2,4, 6 – trinitrophenol, 3 – nitrophenol ,Propan – 1 – ol, 4 – methylphenol,.

6. Mention two important uses of methanol.
7. Write IUPAC name of the following compound:



8. Write IUPAC names of the compound C_6H_5 - O - C_2H_5.
9. What happens when ethanol is treated with phosphorus tribromide?
10. Name any two reagents used for bringing about the oxidation of alcohols to carboxylic acids.
11. Describe the mechanism of alcohols reacting both as nucleophiles and as electrophiles in their reactions.
12. Describe the mechanism of the formation of diethyl ether from ethanol in the presence of conc. Sulphuric acid.
13. How would you account for the following:
    i. Phenols are much more acidic than alcohols.
    ii. The boiling point of ethers are much lower than those of the alcohols of comparable molar masses.
14. Name the reagents used in the following reactions:
    i. Oxidation of a primary alcohol to carboxylic acid.
    ii. Oxidation of a primary alcohol to an aldehyde.
    iii. Bromination of phenol to 2, 4, 6-tribromophenol.
15. i. a. Give chemical test to distinguish between phenol and ethanol is seemingly conditions.
        b. Write the reaction equation for what happens when tertiary butyl alcohol is heated with reduced copper at about 573 K.
    ii. Give equation only to distinguish between primary, secondary and tertiary alcohol by victor Meyer's test.

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Solutions

1. (d) elimination competes over substitution and alkenes are easily formed

   Explanation: The formation of ethers by dehydration of the alcohol is a bimolecular reaction (S_N2) involving the attack of an alcohol molecule on a protonated alcohol molecule. In the method, the alkyl group should be unhindered. In case of secondary or tertiary alcohols, the alkyl group is hindered. As a result, elimination dominates substitution as 3° carbocation is more stable.

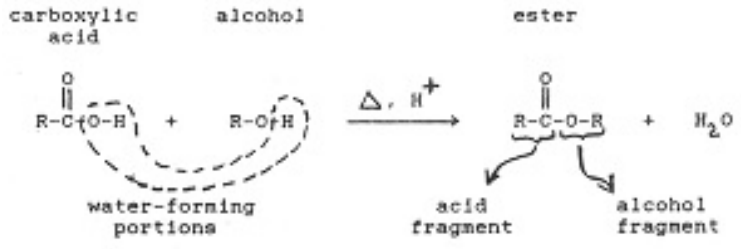
   Hence, in place of ethers, alkenes are formed.

2. (b) °OR

   Explanation: Hydroxy group is more electron donating group than alkoxy because alkoxy have greater number of atoms than that hydroxyl group there electronic density of oxygen of alkoxy group spreads over the whole group and greater the number of atom less will be the electron donating ability.

3. (a) Esterification process

   Explanation: Esterification is the reaction in which a Carboxylic acid combines with an alcohol in the presence of little concentrated sulphuric acid to form an ester. The esters so formed are pleasant smelling.



4. (b) Ethanol

   Explanation: alcoholic beverage, any fermented liquor, such as wine, beer, or distilled spirit, that contains ethyl alcohol, or ethanol (CH_3CH_2OH), as an intoxicating agent.

   Alcoholic beverages are fermented from the sugars in fruits, berries, grains, and such other ingredients as plant saps, tubers, honey, and milk and may be distilled to reduce the original watery liquid to a liquid of much greater alcoholic strength. Beer is the

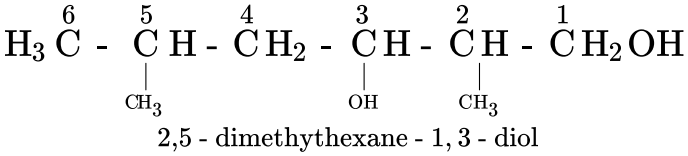
best-known member of the malt family of alcoholic beverages, which also includes ale, stout, porter, and malt liquor.

5. (b) Propan – 1 – ol, 4 – methylphenol, phenol, 3 – nitrophenol, 3,5 – dinitrophenol,2,4, 6 – trinitrophenol.

   Explanation: Phenols are more acidic than alcohols Also in phenols if –M groups like $-NO_2$ are arranged then acidity increases. And –M operates only at o/p position.

   At m only –I operates.

6. Uses of methanol:-
   - Methanol is used as a useful fuel for stunt and racing cars as it is less inflammable and can be mixed with water.
   - Methanol is also used to make other chemicals such as formaldehyde.
   - Being a polar liquid at room temperature, it is used as antifreeze and a denaturant for ethanol.
   - It is used as a solvent for paints & varnishes.

7. 

   2,5 - dimethythexane - 1, 3 - diol

8. Ethoxybenzene

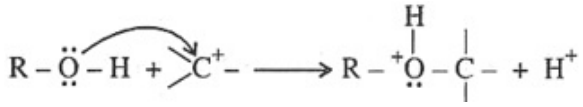
9. $3CH_3CH_2OH + PBr_3 \rightarrow 3CH_3CH_2Br + H_3PO_3$

10. A better reagent for oxidation of primary alcohols to aldehydes in good yield is pyridinium chlorochromate (PCC), a complex of chromium trioxide with pyridine and HCl.

    Secondary alcohols are oxidised to ketones by chromic anhyride(CrO_3).

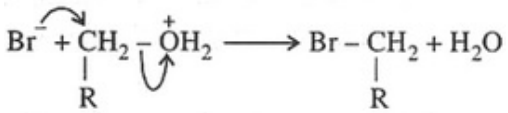
    Tertiary alcohols do not undergo oxidation reaction. Under strong reaction conditions such as strong oxidising agents ($KMnO_4$) and elevated temperatures, cleavage of various C-C bonds takes place and a mixture of carboxylic acids containing a lesser number of carbon atoms is formed.

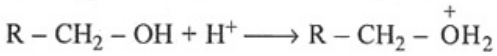
11. Alcohols as nucleophiles:

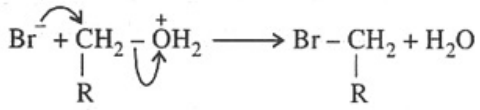


Alcohols as electrophiles: Protonated alcohols act as electrophiles:

$R - CH_2 - OH + H^+ \rightarrow R - CH_2 - \overset{+}{O}H_2$



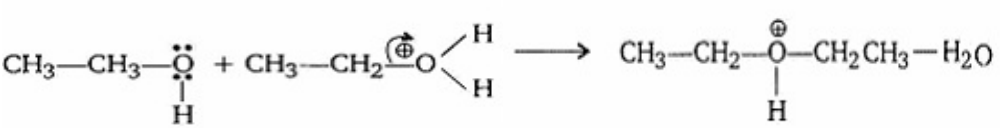


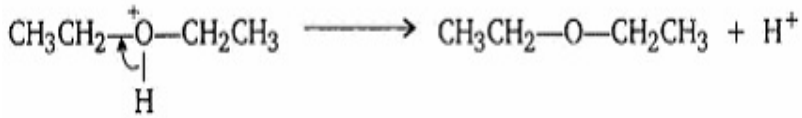


12. $CH_3CH_2OH \xrightarrow[413k]{Conc.H_2SO_4} C_2H_5OC_2H_5$

Mechanism

i. 

ii. 

iii. 

13. i. Since the phenoxide ion left after the removal of a proton is stabilized by resonance whereas alkoxide ion left after the removal of a proton from alcohol is not.

    ii. The large difference in boiling points of alcohols and ethers is due to the presence of hydrogen bonding in alcohols.

14. i. $KMnO_4$/KOH(alkaline $KMnO_4$)

    ii. Cu/573 K (Hot reduced copper)

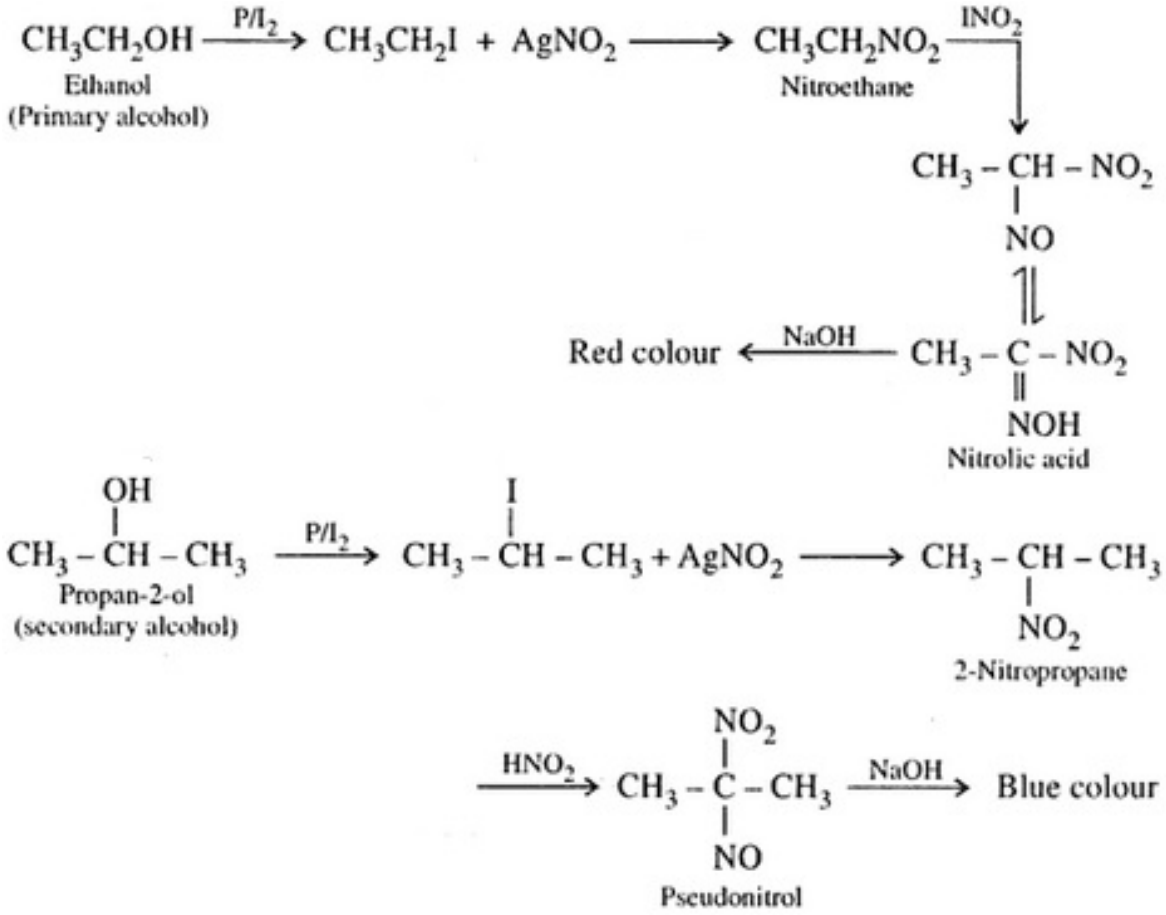
    iii. Br_2(aq)(Bromine water)

15. a. i. Add $FeCl_3$ solution. Phenol will give violet colour whereas ethanol will not

    ii.

$$\underset{tert\ butyl\ alcohol}{CH_3 - \overset{CH_3}{\overset{|}{C}}(OH_3) - CH_3} \xrightarrow[573K]{Cu} \underset{2-methylpropene}{CH_3 - \overset{CH_3}{\overset{|}{C}} = CH_2} + H_2O$$

b. The following equation are involved in distinguish between primary, secondary and tertiary alcohols by victor Meyer's test:



$$CH_3 - \underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_3 \xrightarrow{P/I_2} CH_3 - \underset{\underset{I}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_3 + AgNO_2$$

$2-methylpropan-2-ol$
$(Tertiary\ alcohol)$

$$\rightarrow CH_3 - \underset{\underset{NO_2}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_3 \xrightarrow{NHO_2} No\ reaction$$