

CHEMISTRY(XII) CHAPTER 11 (Alcohols, Phenols and Ethers)

Short Questions:

1. How will you distinguish between primary secondary and tertiary alcohols by Lucas test?

Primary, secondary and tertiary alcohols are identified and distinguished by reacting them with concentrated HCl in anhydrous $ZnCl_2$. An oily layer of alkyl halides separates out in these reactions as follows;

- (i) Tertiary alcohols form an oily layer immediately.



- (ii) Secondary alcohols form an oily layer in 5 to 10 minutes primary.



- (iii) Primary alcohols form an oily layer only on heating.



2. Picric acid is a phenol which behaves like an acid. Justify.

Picric acid 2,4,6 trinitrophenol has 3 nitro groups present which have electron withdrawing nature. Nitro groups can engage the negative charge on benzene ring in delocalization, setting the proton free for longer time. So picric acid act as acid.

3. Why ethers are referred to as inert compounds.

Ethers are comparatively inert substances. The reagents like ammonia, alkalies, dilute acids and metallic sodium, have no reaction on ethers in cold state. Moreover, they are not oxidized or reduced easily. That's why ethers are considered as inert.

4. Compare the reaction of conc. H_2SO_4 with

(i) Ethyl alcohol

Ethyl Alcohol gives different products with conc H_2SO_4 on different temperatures;

At 180C with conc. H_2SO_4 .

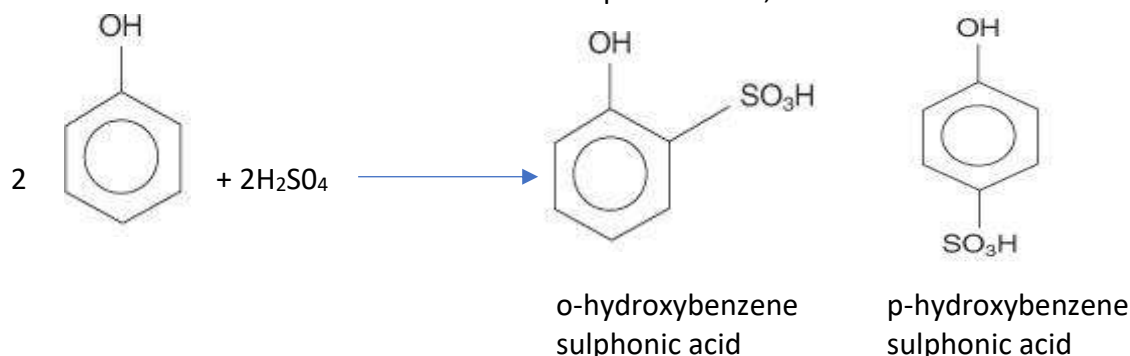


At 140C with conc. H_2SO_4 .



(ii) Phenol.

Phenol reacts with conc sulfuric acid at room temp. as follows;



5. Give preparation of methanol by the reaction between CO and H₂ (i.e. water gas).

On industrial scale methanol is prepared from a mixture of carbon monoxide and hydrogen. The gaseous mixture is subjected to 200 atmospheres and then passed over heated catalyst mixture of ZnO and Cr₂O₃ kept at 400° C to 450° C. This reaction results the formation of methanol vapors which are then condensed to liquid state.



6. Distinguish ethanol and tertiary butyl alcohol by Lucas Test.

Ethanol and tertiary butyl alcohol are distinguished by reacting them with concentrated HCl in anhydrous ZnCl₂. An oily layer of alkyl halides separates out in these reactions

1 Ethyl alcohol form an oily layer immediately

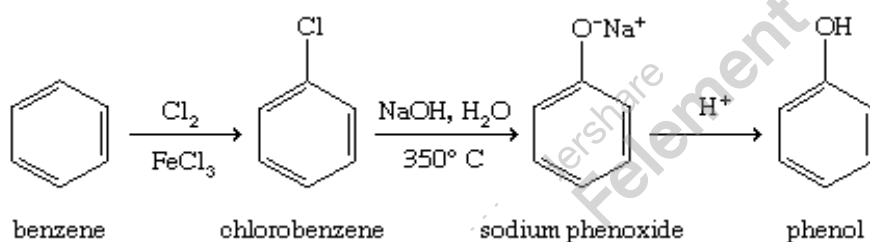


2. Tertiary Butyl alcohol form an oily layer only on heating



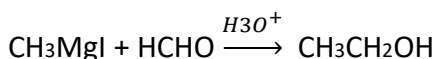
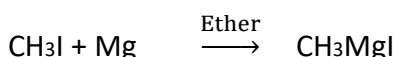
7. Prepare Phenol from Chlorobenzene by Dow's method.

In this method chlorobenzene is treated with 10% NaOH at 360°C and 150 atmospheres pressure sodium phenoxide is produced which is treating with HCl gives phenol.

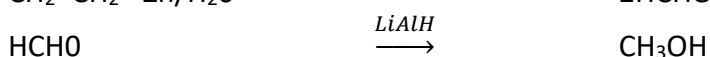
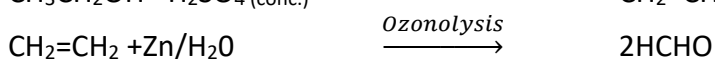
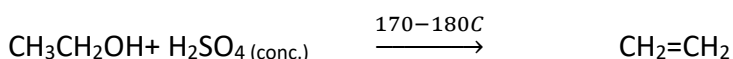


8. How Will you convert:

i. Methanol into Ethanol



ii. Ethanol into Methanol



9. Write structural formulas of:



10. What are alcohols? How are they classified?

Alcohols are represented by a general formula ROH where R is an alkyl group.

On the bases of hydroxyl group, alcohols are classified into monohydric and polyhydric alcohols. Monohydric alcohols contain one -OH group while polyhydric alcohol as may contain two, three or more OH groups and are named as dihydric or trihydric alcohol, etc.

Monohydric alcohols are further classified into primary secondary and tertiary alcohols.

Primary Alcohol R-CH₂-OH

Secondary Alcohol R₂CH-OH

Tertiary Alcohol R₃C-OH

11. Why absolute alcohol can't be prepared by fermentation?

Alcohol obtained by fermentation is only up to 12% and never exceeds 14% because beyond this limit enzymes become inactive. That's why absolute alcohol cannot be prepared by fermentation.

12. What are primary and secondary alcohols? Give one example of each.

Primary Alcohols are in which alpha carbon is further attached with only one carbon atom.

Ethanol CH₃-CH₂-OH

Secondary Alcohols are in which alpha carbon is further attached with two carbon atoms.

Isopropyl Alcohol (CH₃)₂CH-OH

Tertiary Alcohols are in which alpha carbon is further attached with three carbon atoms.

2-Methyl-2-Propanol (CH₃)₃C-OH

13. Give any four uses of Methyl alcohol.

1. Methanol is widely used in the production of acetic acid and formaldehyde
2. In order to discourage the recreational consumption of ethanol, methanol is often added to it as a denaturant
3. This compound is also used as an antifreeze (an additive that is used to lower the freezing point of a liquid) in many pipelines
4. It is also used as solvent for fats, oils and paints.

14. Write two uses of each of methanol and ethanol.

Uses of Methanol;

- i. Methanol is used as an antifreeze
- ii. It is also used as solvent for fats, oils and paints

Uses of Ethanol;

- i. It is used as a fuel in some countries
- ii. It is used as preservative for biological specimens

15. How does phenol react with alkali?

Phenol reacts with sodium hydroxide solution to give a colorless solution containing sodium phenoxide.



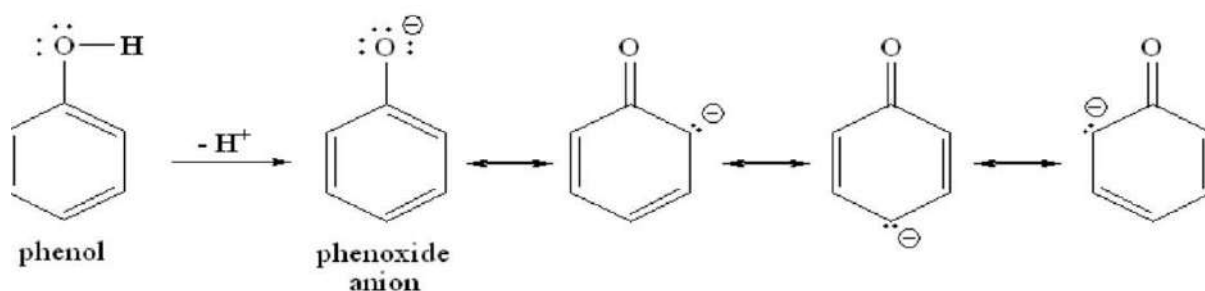
16. How is Methylated spirit prepared?

Sometimes ethanol is denatured by addition of 10% methanol to avoid its use for drinking purpose. Such alcohol is called methylated spirit. A small quantity of pyridine or acetone may also be added for this purpose.

17. Why Phenol is acidic in nature?

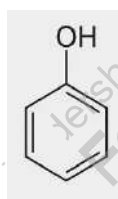
Phenol is much more acidic than alcohols but less acidic than carboxylic acids. The reason why phenol is acidic lies in the nature of the phenoxide ion. The negative

charge on oxygen atom can become involved with the π -electron cloud on the benzene ring. The negative charge is thus delocalized in the ring and the phenoxide ion becomes relatively stable. This type of delocalization is not possible with alcohols.

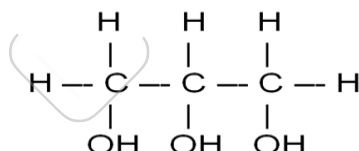


18. Write structural formulas of:

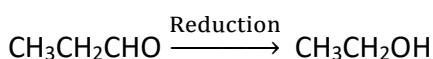
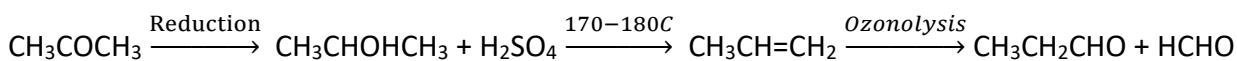
i. Carboic acid



ii. Glycerol



19. Convert acetone into ethyl alcohol.



20. Water has higher boiling point than Ethanol. Explain.

There is less extensive hydrogen bonding between ethanol molecules than between water molecules, thus less energy is needed to vaporize ethanol than water. That's why water has higher boiling point than ethanol.

21. How will you distinguish between methanol and ethanol by one test?

Ethanol gives iodoform with iodine in presence of sodium hydroxide. formation of yellow crystals indicate that alcohol is ethanol. Whereas Methanol does not give iodoform test.



22. Write any four uses of ethyl alcohol.

Uses of Ethanol are as follows;

- (i) It is used as solvent
- (ii) It is used as a drink
- (iii) It is used as a fuel
- (iv) It is used as a preservative for biological specimen.

23. What is denaturing of alcohols?

Sometimes to avoid the use of ethanol for drinking, 10% methanol is added into it. This is called denaturing of alcohol, also known as methylated spirit. A small quantity of pyridine or acetone may also be added for this purpose.

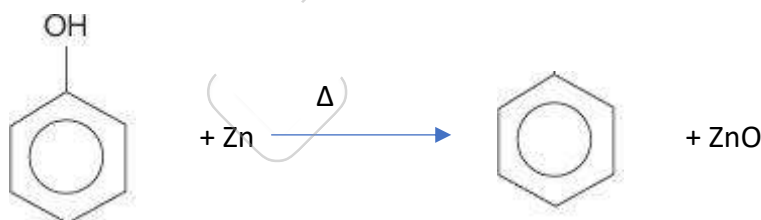
24. How Lucas test is used to distinguish between primary secondary and tertiary alcohols?

Primary, secondary and tertiary alcohols are identified and distinguished by reacting them with concentrated HCl in anhydrous $ZnCl_2$. An oily layer of alkyl halides separates out in these reactions as follows;

- (i) Tertiary alcohols form an oily layer immediately.
 $R_3C-OH + HCl \longrightarrow R_3C-Cl + H_2O$
- (ii) Secondary alcohols form an oily layer in 5 to 10 minutes primary.
 $R_2CHOH + HCl \longrightarrow R_2CH-Cl + H_2O$
- (iii) Primary alcohols form an oily layer only on heating.
 $R-CH_2OH + HCl \longrightarrow R-CH_2-Cl + H_2O$

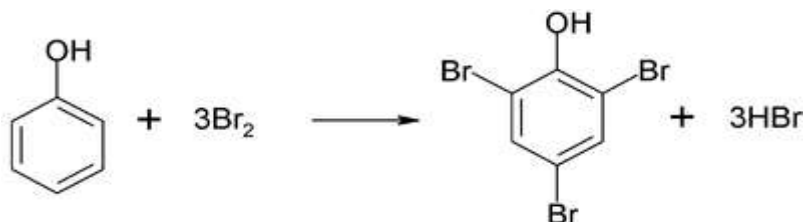
25. How phenol can be converted to benzene?

Phenol can be converted into Benzene by the reduction with Zinc.



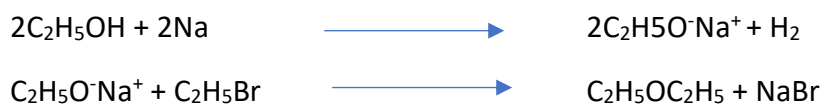
26. How does phenol react with bromine water?

An aqueous solution of phenol reacts with bromine water to give white ppts of 2,4,6-Tribromophenol.



27. What is Williamson's synthesis?

Alcohols are reacted with metallic sodium to form alkoxides. this alkoxide ion is a strong nucleophile and readily reacts with alkyl halide to produce an ether. This method is called Williamson's synthesis.



28. Ethanol gives different products with conc. H₂SO₄ under different conditions. Justify?

Ethyl Alcohol gives different products with conc H₂SO₄ on different temperatures;

At 180C with conc. H₂SO₄.



At 140C with conc. H₂SO₄.



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