# Alcohols Phenols and Ether

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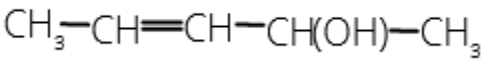
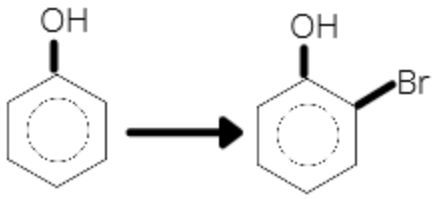
1. Phenol, when it first reacts with concentrated sulphuric acid and then with concentrated nitric acid, gives
    1. 2,4,6-Trinitrobenzene
    2. o-Nitrophenol
    3. p-Nitrophenol
    4. Nitrobenzene
2. The number of stereoisomers possible for a compound of the molecular formula



1 . 3 2. 2 3. 4 4. 6

3. The compound which reacts the fastest with Lucas reagent at room temperature is
    1. Butan-1-ol
    2. 2-methyl-propan-2-ol
    3. 2-methyl-1-propan-1-ol
    4. Butan-2-ol
4. Which of the isomers of nitrophenol is steam volatile?
    1. Ortho
    2. Para
    3. Meta
    4. None of these
5. A compound develops red colour with a solution of ceric ammonium nitrate. The compound may be
    1. An alkene
    2. An alcohol
    3. A ketone
    4. An aldehyde
6. Glycerol reacts with phosphorus triiodide to form
    1. Allyl alcohol
    2. Allyl iodide
    3. Acrolein
    4. 1,2,3-triiodopopane
7. Choose the reagent to carry out the following reaction

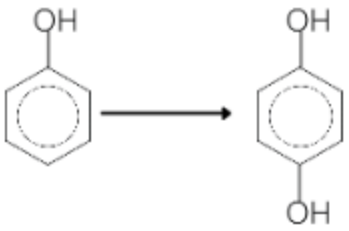



1 . Bromine water 2. Bromine in $CCl_4$

3. Either 1 or 2 4. Reaction is not possible

8. Benzylamine reacts with nitrous acid to form
    1. Azobenzene
    2. Benzene
    3. Benzyl alcohol
    4. Phenol
9. Which of the following will not be soluble in sodium bicarbonate?
    1. 2,4,6-Trinitrophenol
    2. Benzoic acid
    3. o-Nitrophenol
    4. Benzenesulphonic acid
10. Which of the following gives alkene with ethylene glycol?
    1. $PCl_3$
    2. $PI_3$
    3. $PBr_3$
    4. None of these

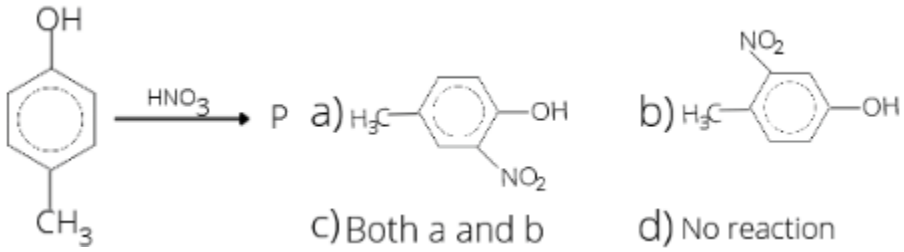
11. Which of the following is not true in the case of reaction with heated copper at 300°C?
    1. Phenol → Benzyl alcohol
    2. Primary alcohol → Aldehyde
    3. Secondary alcohol → Ketone
    4. Tertiary alcohol → Olefin
12. 1-phenylethanol can be prepared by the reaction of benzaldehyde with
    1. Methyl bromide
    2. Ethyl iodide and magnesium
    3. Methyl iodide and magnesium
    4. Methyl bromide and aluminium bromide
13. What is the reagent required in the following reaction



1 . Hydrogen peroxide 2. $CrO_3$

3. Chromyl chloride 4. All of these

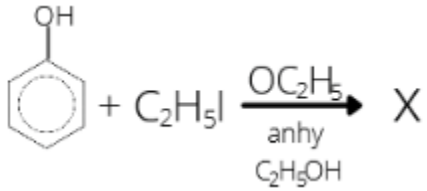
14. In the following reaction, P is




1 . (a) 2. (b) 3. (c) 4. (d)

15. Dichloroacetic acid on hydrolysis gives
    1. Ethane-1,2-dione
    2. Formylmethanoic acid
    3. 2-Hydroxyethanoic acid
    4. Ethane-1,2-diol

16. Identify X in the following reaction




1 . $C_2H_5OC_2H_5$ 2. $C_6H_5OC_6H_5$

3. $C_6H_5I$ 4. $C_6H_5OC_2H_5$

17. Which of the following reagent convert the propene to 1-propanol?
    1. $H_2O$, $H_2SO_4$
    2. Aqueous KOH
    3. $MhSO_4$, $NaBH_4/H_2O$

4. $B_2H_6$, $H_2O_2$, $OH^-$

18. Which of the following can not be formed by hydrolysis of alkenes?
    1. Ethanol
    2. Propanol
    3. Methanol
    4. None of these
19. Decolourisation of $KMnO_4$ solution takes place when it reacts with ethene. The final product of this reaction which is used as antifreeze is
    1. Propylene glycol
    2. Ethanol
    3. Propanol
    4. Ethylene glycol
20. 1-Bromopentane on boiling with alcoholic potassium hydroxide gives
    1. Pentan-1-ol
    2. Pent-1-ene
    3. Pentan-2-ol
    4. Pent-2-ene
21. Among ethanol, dimethyl ether, methanol and propanol, the isomers are
    1. Ethanol, dimethyl ether, methanol and propanol
    2. Ethanol and methanol
    3. Ethanol, dimethyl ether and methanol
    4. Ethanol and dimethyl ether
22. Ether is obtained from ethyl alcohol in presence of $H_2SO_4$ at?
    1. 113 K
    2. 443 K
    3. 413 K
    4. 213 K
23. Alkyl halides are converted into ether through
    1. Frankland reaction
    2. Williamson synthesis
    3. Fittig reaction
    4. Grignard reaction
24. The compound having the lowest boiling point is
    1. $H_2O$
    2. $C_2H_5OH$
    3. $CH_3OH$
    4. $CH_3OCH_3$
25. Which if the following pairs show ideal behavior?
    1. $C_6H_5CH_3 + C_6H_6$
    2. $CH_3OH + H_2O$
    3. $CH_3COCH_3 + CHCl_3$
    4. $H_2O + HCl$

26. One of the following which can not undergo dehydro-halogenation is
    1. Iso-propyl bromide
    2. Ethanol
    3. Ethyl bromide
    4. None of these
27. Dehydration of alcohol is an example of
    1. Substitution reaction
    2. Elimination reaction
    3. Rearrangement reaction
    4. Addition reaction
28. Which of the following is the most soluble in water?
    1. n-Butyl alcohol
    2. Isobutyl alcohol
    3. Tertiary alcohol
    4. Secondary butyl alcohol
29. Which of the following is not a character of alcohol?
    1. They are lighter than water
    2. Their boiling points rise fairly uniformly with increasing molecular weight
    3. Lower members are insoluble in water and organic solvents but solubility regularly increases with molecular weight
    4. Lower members have pleasant smell and burning taste, while higher members are odourless and tasteless
30. Enzymes used in the fermentation of cane sugar to alcohol are
    1. Diastase, invertase
    2. Invertase, zymase
    3. Diastase, zymase
    4. Maltase, zymase
31. Cyclohexanol is a
    1. Primary alcohol
    2. Secondary alcohol
    3. Tertiary alcohol
    4. Phenol
32. Which of the following substances can not be used for the replacement of -OH group in organic compounds by Cl?
    1. $S_2Cl_2$
    2. $SOCl_2$
    3. $PCl_3$
    4. $PCl_5$
33. The formation of phenol from benzene diazonium chloride is a
    1. Pyrolysis reaction
    2. Photosynthesis reaction

3. Hydrolysis reaction
4. Combustion reaction

34. Sodium benzene sulphonate reacts with NaOH and then on acidic hydrolysis, it gives
    1. Benzoic acid
    2. Benzene
    3. Disodium benzaldehyde
    4. Phenol
35. Wood spirit is known as
    1. Methanol
    2. Ethanol
    3. Acetone
    4. Benzene
36. Carbinol is a trivial name of
    1. $C_2H_5OH$
    2. $CH_3OH$
    3. HCOOH
    4. $CH_3COOH$
37. Which among the following reactions does not give methyl alcohol?
    1. The reaction of water gas with hydrogen at high temperature
    2. Alkaline hydrolysis of methyl bromide
    3. The reaction of ethylene with H2SO4 at 80℃
    4. Both 1 and 2
38. The other name of syngas is
    1. Fuel gas
    2. Tear gas
    3. Producer gas
    4. Water gas
39. 4-chloro-3,5-dimethyl phenol is called
    1. Chloramphenicol
    2. Paracetamol
    3. Barbital
    4. Dettol
40. IUPAC name of m-cresol is
    1. 3-methylphenol
    2. 3-chlorophenol
    3. 3-methoxyphenol
    4. Benzene-1,3-diol
41. IUPAC name of picric acid
    1. M-nitrobenzoic acid
    2. 2,4,6–trinitrophenol
    3. Trinitrotoluene

4. Trinitroaniline

42. Diethyl ether dissociates when it reacts with
    1. NaOH
    2. $H_2O$
    3. HI
    4. $KMnO_4$
43. Cresols are
    1. Hydroxy toluenes
    2. Dihydric phenols
    3. Trihydric phenols
    4. Trihydric alcohols
44. IUPAC name of sec butyl alcohol is
    1. 1-butanol
    2. 2-butanol
    3. 2-methyl-1-butanol
    4. 2-methyl-2-butanol
45. Methyl phenyl ether can be produced by reacting
    1. Phenolate ions and methyl iodide
    2. Bromobenzene with methoxide ions
    3. Methanol and phenol
    4. Bromobenzene and methyl iodide
46. Ortho-nitrophenol is less soluble in water than p- and m-nitrophenol because
    1. Melting point of o-nitrophenol is lower than of m- and p- isomers
    2. O-nitrophenol is more volatile in steam than those of m- and p- isomers
    3. O-nitrophenol shows intramolecular H-bonding
    4. O-nitrophenol shows intermolecular H-bonding
47. Primary alcohols can be prepared from alkenes by
    1. Mercuration and demercuration of alkene
    2. Direct hydration of alkenes
    3. Hydroboration of alkenes
    4. All of the above
48. The reaction of alkoxide ion with alkyl halide to form ether is called
    1. Wurtz reaction
    2. Kolbe's reaction
    3. Perkins reaction
    4. Williamsons synthesis
49. In which case would a Williamson ether synthesis fail?
    1. Sodium ethoxide + iodomethane
    2. Sodium ethoxide + iodoethane
    3. Sodium ethoxide + 2-iodopropane
    4. Sodium ethoxide + 2-iodo-2-methylpropane
50. Grain alcohol is the common name of

1. Ethyl alcohol
2. Amyl alcohol
3. Methanol
4. None of these

## Answer

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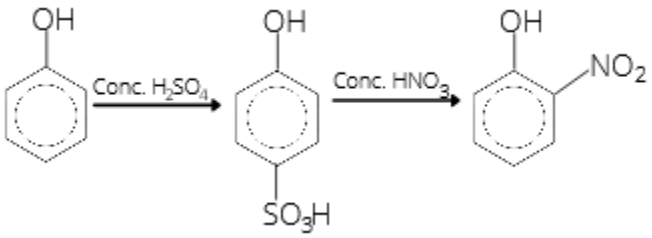
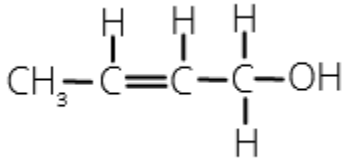
**1 . (2)**




-OH group is the ortho and para directing group, but -$SO_3H$ group being bigger preferably occupies the para position. As the temperature is not mentioned, ortho nitrobenzene will be more stable.

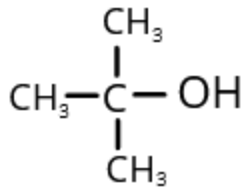
**2. (3)**




One chiral carbon means two enantiomers and two geometrical isomers (cis and trans) are also possible. So, a total of four isomers are possible.

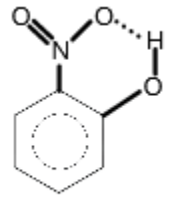
**3. (2)**

Lucas test is used to distinguish between primary, secondary and tertiary alcohol. As tertiary alcohol is the most stable, it reacts the fastest with the Lucas reagent and causes turbidity. Then comes the secondary alcohol and at last, the primary alcohol. As 2-methyl-propan-2-ol is a tertiary alcohol, it will react the fastest with the Lucas reagent.

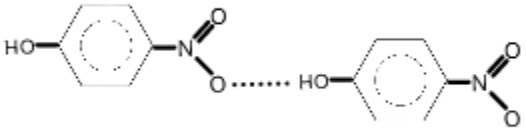


**4. (1)**

Ortho nitrophenol will be more volatile due to the presence of intramolecular hydrogen bonding. Para nitrophenol has intermolecular hydrogen bonding which is comparatively forms much stronger bonds, due to which the boiling point will also increase.



Ortho nitrophenol

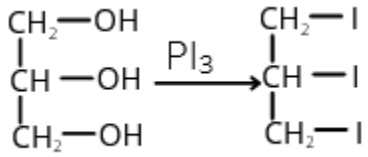


Para nitrophenol

**5. (2)**

An alcoholic group gives red colour with ceric ammonium nitrate.

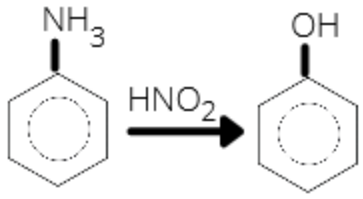
**6. (2)**



**7. (2)**

Bromine water

**8. (4)**




**9. (3)**

The reaction moves in forward direction if the reactants are more acidic than $NaHCO_3$. As o-nitrophenol is less acidic than $NaHCO_3$, it wont react.

**10. (2)**

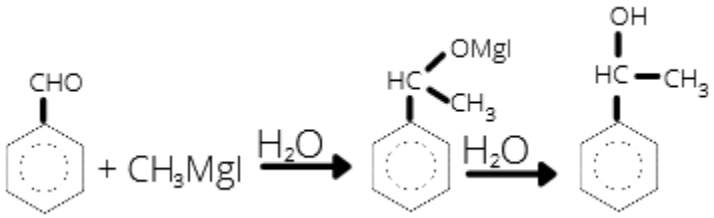
Ethylene glycol + $PI_3$ → Ethylene

**11. (1)**

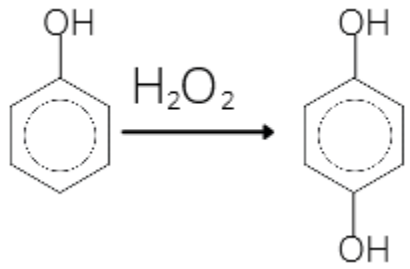
Phenol can not be converted to benzyl alcohol because the oxidation of phenol can't give benzyl alcohol.

**12. (3)**

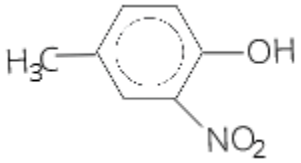
When benzaldehyde reacts with methyl iodide and magnesium followed by hydrolysis, the formation of 1-phenylethanol takes place.




**13. (1)**



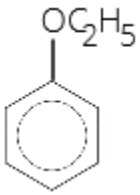
**14. (1)**




**15. (2)**

Formylmethanoic acid

**16. (4)**




**17. (2)**

Aqueous KOH

**18. (3)**

Hydrolysis of alkene mainly gives alcohol simplest alkene that is ethane on hydrolysis gives ethanol. So methanol can not be formed by hydrolysis of alkene.

**19. (4)**

Hydrolysis of ethene takes place in the presence of cold $KMnO_4$ to form ethylene glycol ($HOCH_2$-$CH_2OH$).

**20. (2)**

When haloalkane is treated with conc. alcoholic solution of KOH, a molecule of hydrogen halide is eliminated to form alkene. The eliminated hydrogen atom comes from the B-carbon atom, so it is called B-elimination. Most highly substituted alkene is a major product.

**21. (4)**

Ethanol ($C_2H_5OH$) and dimethyl ether ($CH_3$-O-$CH_3$) have the same molecular formula but different functional groups, so they are isomers.

**22. (3)**

Ether is obtained from ethyl alcohol at 413 K.

**23. (2)**

Alkyl halides are converted into ether through Williamson synthesis.

**24. (4)**

Due to less amount of hydrogen bonding in ether, boiling point will be the less.

**25. (1)**

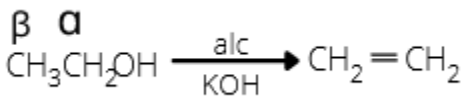
$C_6H_5CH_3$ (Toluene) + $C_6H_6$ (Benzene)

**26. (2)**

Ethanol doesn't have a halogen group attached. Hence, it can't undergo dehydrohalogenation.

**27. (2)**

Dehydration of alcohol is an example of β-elimination.




**28. (3)**

Solubility decreases with an increase in size of the alkyl group which is a hydrophobic group, which makes the alcohol less hydrophilic.

In the case of isomers, the order of solubility is 3°>2°>1° due to increase in polar character.

**29. (1)**

Lower members are soluble in water and solubility decreases with increasing molecular mass because the length of hydrocarbon chain increases.

**30. (2)**

Invertase and zymase are used in the fermentation of cane sugar to alcohol.

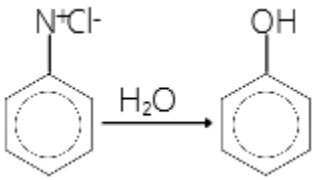
**31. (2)**

In cyclohexanol, -OH is attached to a secondary carbon in the ring.

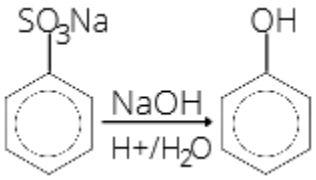
**32. (1)**

$S_2Cl_2$ can't be used.

**33. (3)**




**34. (4)**




**35. (1)**

Methanol is known as wood spirit.

**36. (2)**

Carbinol is a trivial name of methanol ($CH_3OH$).

**37. (3)**

The reaction of ethylene with $H_2SO_4$ at 80°C gives

$CH_2CH_2 + H_2SO_4 \rightarrow CH_3CH_2OSO_2OH$

Water gas at high temperature gives

$CO + 2H_2 \rightarrow CH_3OH$

Alkaline hydrolysis of methyl bromide gives methanol

$CH_3Br + H_2O \rightarrow CH_3OH + HBr$

**38. (4)**

The other name of syngas is water gas.

**39. (4)**

Dettol

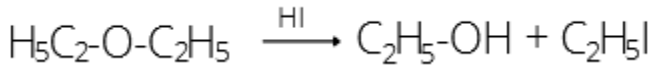
**40. (1)**

3-methylphenol $(CH_3)C_6H_5OH$

**41. (2)**

2,4,6-Trinitrophenol

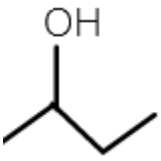
**42. (3)**




**43. (1)**

Cresols are hydroxy toluenes

**44. (2)**




2-butanol

**45. (1)**

Methyl phenyl ether (anisole) can be produced by reacting phenolate ions and methyl iodide.

**46. (3)**

Ortho-nitrophenol is less soluble in water than p- and m-nitrophenol because o-nitrophenol shows intramolecular H-bonding.

**47. (3)**

Primary alcohols can be prepared from alkenes by hydroboration of alkenes.

**48. (4)**

Williamsons synthesis

**49. (4)**

2-iodo-2-methylpropane is a tertiary alcohol which will undergo dehydrohalogenation.

**50. (1)**

Grain alcohol is the common name of ethyl alcohol.

## Assertion And Reasoning

Codes

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

(b) Both A and R are true and but R is not a correct explanation of A

(c) A is true but R is false

(d) A is false, but R is true

1. **Assertion (A)** $(CH_3)_3$-CONa and $CH_3CH_2Br$ react to form $(CH_3)_3C$-O-$CH_2CH_3$.

**Reason (R)** Good yields of ethers are obtained when teri-alkyl halides are treated with alkoxide.

2. **Assertion (A)** Ortho and para nitrophenols can be separated by steam distillation.

**Reason (R)** Ortho isomer associates through intermolecular hydrogen bonding while Para isomer associates through intramolecular hydrogen bonding.

3. **Assertion (A)** In Lucas test, 3° Alcohol react immediately.

**Reason (R)** An equimolar mixture of anhyd. $ZnCI_2$ and conc. HCI is called Lucas reagent.

4. **Assertion (A)** The water solubility of the alcohols follow the order: tert-butyl alcohol > sec-butyl alcohol > n butyl alcohol .

**Reason (R)** Alcohols form H-bonding with water to show solution nature.

5. **Assertion (A)** Tert-butyl alcohol undergoes acid catalysed dehydration readily than propanol .

**Reason (R)** 3° Alcohol do not give Victor-Meyer's test.

6. **Assertion (A)** Phenol is less acidic than p-nitrophenol.

**Reason (R)** Phenolate ion is more stable than p-nitrophenolate ion.

7. **Assertion (A)** Reimer-Tiemann reaction of phenol with $CCI_4$ in NaOH at 340 K gives salicylic acid as the major product.

**Reason (R)** The reaction occurs through intermediate formation of dichlorocarbene.

8. **Assertion (A)** The C-O-C bond angle in ethers is slightly less than tetrahedral angle.

**Reason (R)** Due to the repulsive interaction between the two alkyl groups in ethers.

9. **Assertion (A)** Phenol undergo Kolbe reaction, ethanol does not.

**Reason (R)** Phenoxide ion is more basic than ethoxide ion.

10. **Assertion (A)** Etherates are coordination complexes of ethers with Lewis acids.

**Reason (R)** Ethers are easily cleaved by mineral acids such as HCI and $H_2SO_4$ at 373K.

11. **Assertion (A)** Boiling point of alcohols are higher than that of ethers of comparable molecular mass.

**Reason (R)** Alcohols can form intermolecular hydrogen bonding while ethers can not.

## Answers

**1. (c)**

$(CH_3)_3$-CONa and $CH_3CH_2Br$ react to form $(CH_3)_3C$-O-$CH_2CH_3$. Good yeild of ether are obtained when primary alkyl halides are treated with alkoxides derived from any alcohol.

**2. (c)**

Ortho and para iomers of nitro phenol can be separated be steam distillation because of nearby same boiling point of both and ortho ieomers associated by intramolecular hydrogen bonding and para isomers by hydrogen bonding.

**3. (b)**

In Lucas test, tertiary alcohols react immediately because of the formation of the more stable tertiary carbocation.

**4. (b)**

The tendency to show H-bonding decreases with increasing hydrophobic character of carbon chain. The hydrophobic character of carbon chain increases with the length of carbon chain.

**5. (b)**

Alcohols which form the most stable carbocations undergo dehydration more readily. Since tert-butyl alcohol forms more stable tert-butyl cation, therfore, it undergoes dehydration more readily than propanol.

**6. (c)**

p-Nitrophenolate ion is more stable than phenolate ion.

**7. (c)**

Nucleophilic attack of phenolate ion through the ortho-carbon atom occurs on $CCl_4$ to form an intermediate which on hydrolysis gives salicylic acid.

**8. (d)**

In ethers, bond angle around oxygen has deviation caused due to repulsive interaction between bulkier alkyl groups.

**9. (b)**

On using tert-butyl bromide and sodium ethoxide as reactants, the major product would be 1-methylpropene and ethanol.

**10. (c)**

Ethers being Lewis bases form etherates with Lewis acids. Ethers are not easily cleaved by $H_2SO_4$.

**11. (a)**

Alcohols have high boiling point than ethers because intermolecular H-bonding is found in alcohols.