

## Section-I: Alcohols

## 11.1 INTRODUCTION

**Definition of alcohol :** These are hydroxy derivatives of hydrocarbons obtained by replacing one of more hydrogen atoms from corresponding hydrocarbons by hydroxy groups.

e.g.  $\text{CH}_3 - \text{OH}$ ,  $\text{C}_2\text{H}_5 - \text{OH}$

## 11.2 ISOMERISM IN ALCOHOLS

**Monohydric alcohols:** They shows chain, position, optical isomerism themselves and functional isomerism with ethers. Total number of isomeric alcohols can be calculated by formula,  $1 = 2^{n-2}$ .

**Ethers :** They shows metamerism, optical isomerism themselves and functional isomerism with alcohols.

Total number of isomeric ethers can be calculated by formula,  $1 = 2^{n-1} - 1 - (2^{n-2})$  from  $\text{C}_3$  onwards.

Total number of isomeric alcohols and ethers can be calculated by formula,  $1 = 2^{n-1} - 1$ .

e.g. i)  $\text{C}_2\text{H}_6\text{O}$  (2-isomers)

a)  $\text{CH}_3\text{CH}_2\text{OH}$  ethyl alcohol

b)  $\text{CH}_3\text{OCH}_3$  dimethyl ether

ii)  $\text{C}_3\text{H}_8\text{O}$  (3-isomers. 2 alcohol, 1 ether)  
Alcohols –

a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$  n-propyl alcohol

b)  $\text{CH}_3\text{CHOHCH}_3$  iso-propyl alcohol  
Ether –

a)  $\text{CH}_3\text{OC}_2\text{H}_5$  ethyl methyl ether

iii)  $\text{C}_4\text{H}_{10}\text{O}$  (7-isomers. 4 alcohols, 3 ethers)  
Alcohols –

a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$  n-butyl alcohol

b)  $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$  isobutyl alcohol

c)  $\text{CH}_3\text{CH}_2\text{CHOHCH}_3$  2° butyl alcohol

d)  $(\text{CH}_3)_3\text{COH}$  3° butyl alcohol

'a' and 'b' are chain isomers.

'a' and 'c', are position isomers. Only 'c' show optical isomerism.

Ethers – Following ethers are metamers.

a)  $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$  diethyl ether

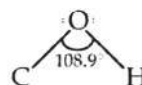
b)  $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$  methyl n-propyl ether

c)  $\text{CH}_3\text{OCH}(\text{CH}_3)_2$  methyl isopropyl ether

## 11.3 STRUCTURE OF –OH GROUP IN ALCOHOL

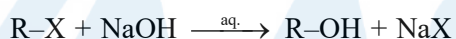
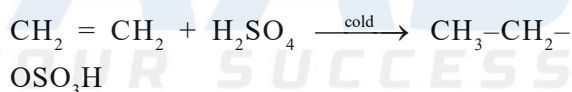
In alcohols, oxygen atom of the –OH group is attached to  $\text{sp}^3$  hybridised carbon atom, by overlapping of  $\text{sp}^3$  hybrid orbital of carbon and p-orbital of oxygen i.e  $\text{sp}^3 - \text{p}$  overlapping.

The bond angle C–O–H is slightly less than the tetrahedral angle. It is due to repulsion of lone pair electrons of the oxygen atom.

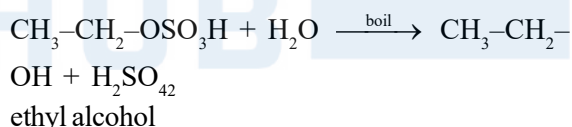


## 11.4 PREPARATION METHODS

## 1. Alkaline hydrolysis of alkyl halides:

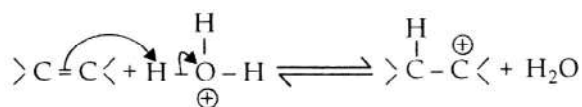
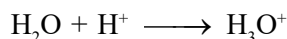
2. From hydration of alkene (Olefin) by using conc.  $\text{H}_2\text{SO}_4$  :

ethylene conc. ethyl hydrogen sulphate

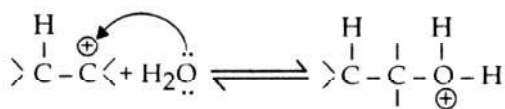
**Mechanism:**

The mechanism of reaction involves three steps.

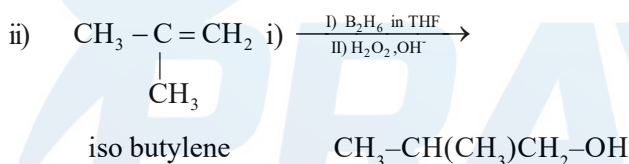
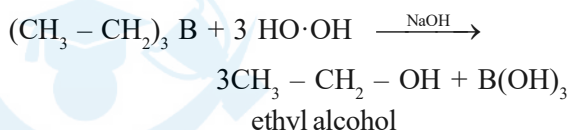
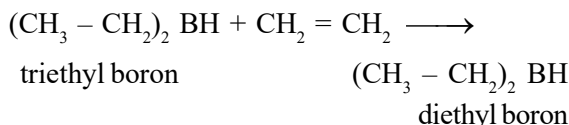
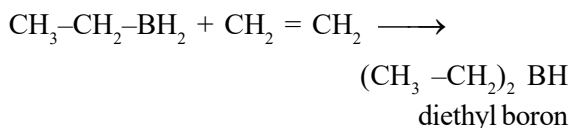
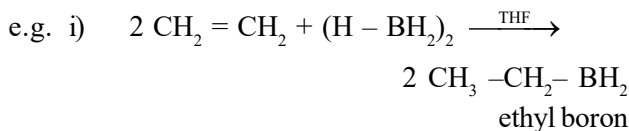
**Step-(i):** Protonation of water followed by attack of electrophilic  $\text{H}_3\text{O}^+$  to form carbocation.



**Step-(ii):** Nucleophilic attack of water on carbocation.

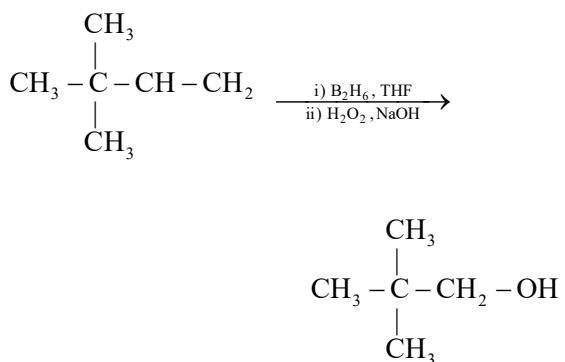


### 3. By hydroboration oxidation of alkenes (HBO Reaction of alkenes) :



#### Note:

- The overall process occurs with addition of  $\text{H}_2\text{O}$  by anti Markownikoffs rule. Boron is electron deficient compound and behave as electrophiles.
- The good yield of primary alcohols is obtained by this method.
- In hydroboration oxidation (HBO) process, the carbocation are not formed hence no rearrangement takes place.
- $1^\circ, 2^\circ, 3^\circ$  alcohol can be obtained by this method.



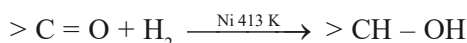
### 4. From reduction of carbonyl compounds:

#### I) By the reduction of aldehydes and ketones:

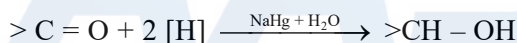
Aldehydes on reduction gives  $1^\circ$  alcohols. While ketones on reduction gives  $2^\circ$  alcohols. These are reduced by two methods.

- Catalytic hydrogenation in the presence of nickel or raney nickel platinum or palladium as catalyst at 413K to 453K. Raney nickel is an alloy of aluminium and nickel (50 %) leached by NaOH solution.
- Reduction by using  $\text{Na Hg} + \text{H}_2\text{O}$  or  $\text{NaBH}_4$  or  $\text{Na} + \text{ethanol}$  or  $\text{Zn} + \text{HCl}$  or  $\text{LiAlH}_4$  or  $\text{B}_2\text{H}_6$  as reducing agents.

a) **Catalytic hydrogenation by using  $\text{H}_2$  and Ni or Pt or Pd at 413 K :** When aldehydes and ketones are reduced by passing  $\text{H}_2$  gas in presence of Ni or raney Ni or Pt or Pd catalyst at 413K to 453K to give alcohols. Which affect unsaturation.

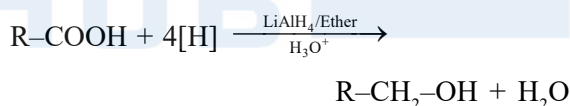


b) **Reduction by using  $\text{NaHg} + \text{H}_2\text{O}$  (Bouveault- Blanc reduction) :** When aldehydes and ketones are reduced by  $\text{Na.Hg} + \text{H}_2\text{O}$  or  $\text{LiAlH}_4$  or  $\text{NaBH}_4$  gives alcohols.



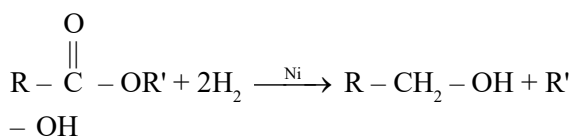
Note:  $\text{LiAlH}_4$  or  $\text{B}_2\text{H}_6$  or  $\text{NaBH}_4$  does not reduce  $>\text{C} = \text{C} <$ ,  $-\text{C} \equiv \text{C}-$  bonds.

#### II) By reduction of carboxylic acids :



#### III) By reduction of esters:

Esters are reduced by  $\text{LiAlH}_4$  or by passing hydrogen gas in the presence of catalyst like Ni or Pt or Pd or raney Ni to give mixture of alcohol. But it is easily reduced by  $\text{LiAlH}_4$  in ether because it is more reactive.



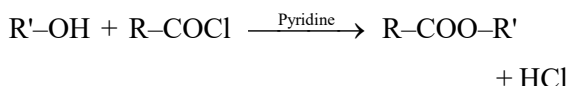
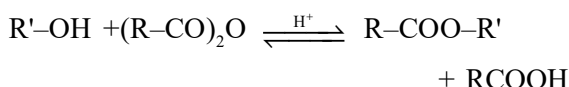
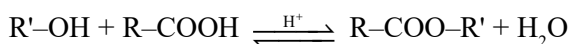
### 5. From Grignards reagent (From action of $\text{R} - \text{MgX}$ on carbonyl compounds)

**Preparation of  $1^\circ$  alcohols:**



hydrogen bond (–O–H) such type of reaction follows the order,  $1^\circ$  alco.  $>$   $2^\circ$  alco.  $>$   $3^\circ$  alco. Tertiary alcohols are almost inert to sodium metal and aluminium metal.

**b) Reaction with carboxylic acid, acid chloride and acid anhydride (ester formation):**



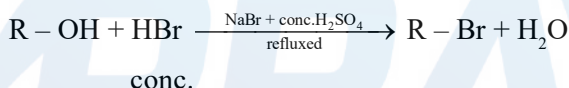
**11.6.2 Reaction involving breaking of C–O bond:**

**1. Reaction with cone. HX :**

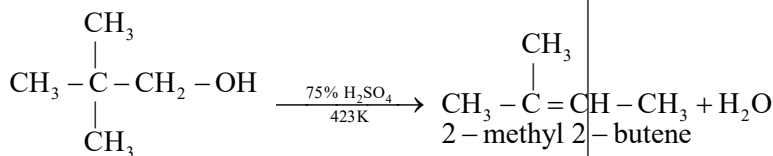
**a) Reaction with cone. HCl (Grooves process)**

Reaction with cone. HCl in the presence of anhydrous  $ZnCl_2$  with alcohol is known as Lucas test. This test is used to distinguish between  $1^\circ$ ,  $2^\circ$ ,  $3^\circ$  alcohols.  $R-OH + \xrightarrow[\Delta]{\text{HCl Anhydrous } ZnCl_2}$  cone.  $R-Cl + H_2O$

**b) Reaction with cone. HBr :**

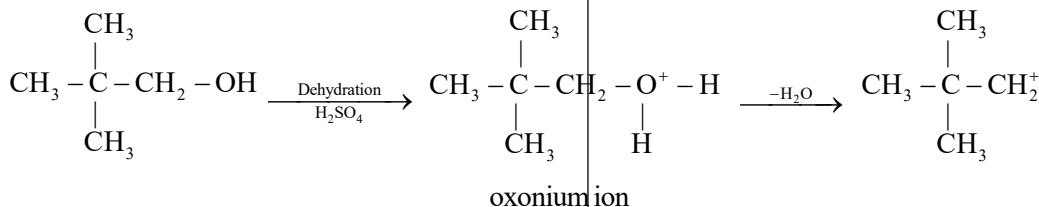


**Note :** In the case of HBr, a small amount of concentrated  $H_2SO_4$  is also added for the reaction with primary alcohols. But no catalyst is added with secondary and tertiary alcohols, which get dehydrated in the presence of concentrated  $H_2SO_4$ .

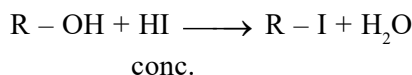


neo-pentyl alcohol

This reaction can be proceeding through following steps –

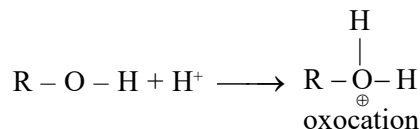


**c) Reaction with cone. HI :**

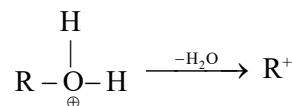


**Mechanism of action of HX :**

**Step-I:** Formation of oxocation by protonation of alcohol.



**Step-II:** Loss of water from oxocation gives carbocation



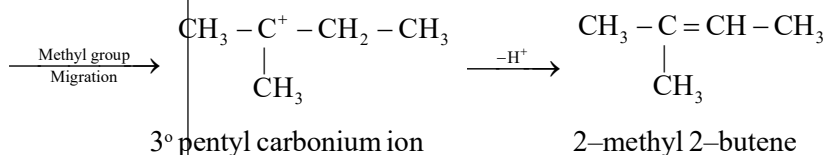
**Step-III:** Action of  $X^-$  on carbocation



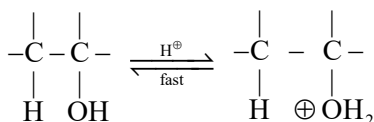
**2. Dehydration of alcohols:** Dehydration of alcohol is a  $\beta$ -elimination reaction in which  $H_2O$  molecule is removed from adjacent carbon atoms ( $\alpha$ ,  $\beta$  carbon atoms). Dehydration of all types of alcohols leads to olefins.

Alcohols are dehydrated by cone.  $H_2SO_4$  or  $Al_2O_3$  or  $H_3PO_4$  or  $P_2O_5$  or  $KHSO_4$  or  $ThO_2$  or Boric acid ( $H_3BO_3$ ). Ease of dehydration is,  $3^\circ > 2^\circ > 1^\circ$  alcohols.

**a) Dehydration by using cone.  $H_2SO_4$  (liquid phase dehydration) :** Alcohol which do not contain  $\beta$ -H atom on dehydration gives alkene through rearrangement reaction in the presence of acid only.

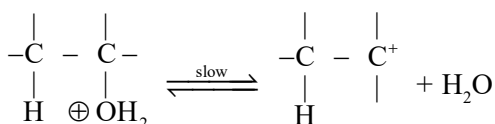
**Mechanism of dehydration :**

- i) Formation of protonated alcohol ( $\text{R} - \text{O}^+ \text{H}_2$ )



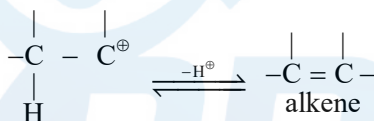
protonated alcohol (oxonium ion)

- ii) Formation of carbonium ion by loss of water molecule

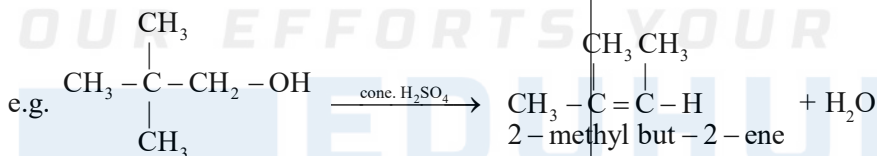


carbonium ion

- iii) Formation of alkene by loss of proton



In all cases, reaction intermediate is carbocation, and in higher alcohols there may be 1-2 hydride shift or 1-2 methyl shift to form more stable carbocation.

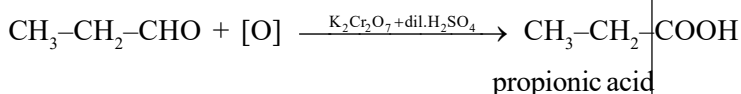
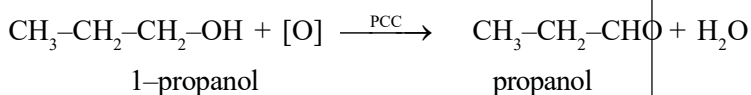
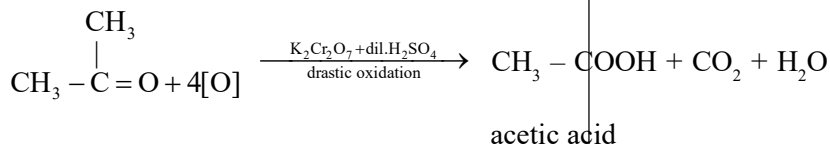
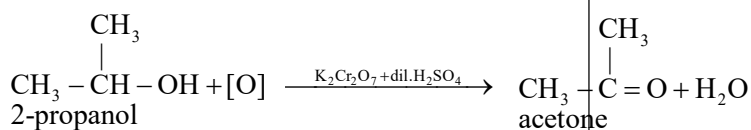
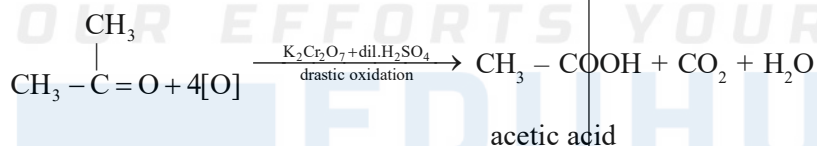
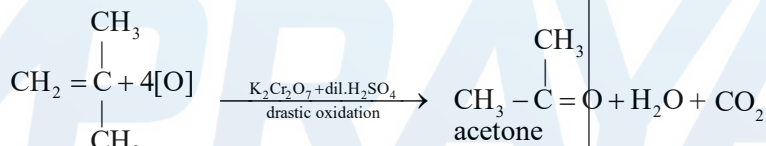
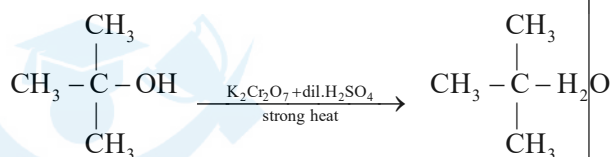


### 11.7 Oxidation of primary, secondary and tertiary alcohols OR Distinction of primary, secondary and tertiary alcohols by oxidation reaction:

The oxidation can be carried out by various oxidising agents such as

- $\text{K}_2\text{Cr}_2\text{O}_7 + \text{dil. H}_2\text{SO}_4$
- $\text{KMnO}_4 + \text{dil. H}_2\text{SO}_4$
- Neutral and aqueous  $\text{KMnO}_4$
- Oil.  $\text{HNO}_3$
- $\text{CrO}_3$  Chromium oxide
- $\text{H}_2\text{CrO}_4$  Chromic acid
- Alkaline  $\text{KMnO}_4$
- Pyridinium chloro chromate (PCC) or Pyridinium dichromate (PDC)  $\text{C}_5\text{H}_5\text{NHCrO}_3\text{Cl}^-$  – Mild oxidising agent. It is also known as Collin's reagent. PCC is mixture of pyridine,  $\text{CrO}_3$  and  $\text{HCl}$  in 1 : 1 : 1 ratio.

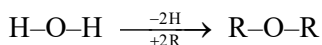
**Ease of oxidation of alcohol is  $1^\circ > 2^\circ > 3^\circ$**

**a) Primary alcohols:****b) Secondary alcohols:****c) Tertiary alcohols:**

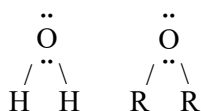
Actually, formic acid is obtained along with acetic acid but it readily undergoes further oxidation gives  $\text{CO}_2$  and water.

**Section –II Ethers****11.8 INTRODUCTION**

Ethers are dialkyl derivatives of water obtained by replacing both hydrogen atoms from water by alkyl groups.



Ethers are represented as,  $\text{R--O--R}$ , known as ether linkage. These are represented by general formula  $\text{C}_n\text{H}_{2n+2}\text{O}$ . In ethers, central oxygen atom is  $\text{sp}^3$ -hybridised state forming two sigma bonds with two alkyl groups leads to angular V shaped geometry like water, having bond angle  $110^\circ$ , bond angle in water is  $104.5^\circ$ . Thus ethers have bent structure and dipolar in nature.





### 11.8.1 ISOMERISM

They show optical, metamerism themselves and functional isomerism with monohydric alcohols.

#### Metamerism:

Metamerism is present in same class of compounds.

Organic compound having same molecular formula and different structural formula and different alkyl groups (nature and type) attached to either side of oxygen atom.

e.g. i) Molecular formula  $C_4H_{10}O$  have three ethers and all are metamers.

$C_2H_5-O-C_2H_5$  diethyl ether

$CH_3-O-CH_2-CH_2-CH_3$  methyl n-propyl ether

$CH_3-O-CH(CH_3)_2$  methyl iso propyl ether

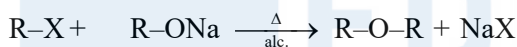
ii) Methyl n-propyl ether and methyl iso propyl ether are position isomers

$CH_3-O-CH_2-CH_2-CH_3$ ,  $CH_3-O-CH(CH_3)_2$

**Note:** Metamers are either chain or position isomers. If metamerism is mentioned never write chain or position isomerism.

### 11.9 PREPARATION METHODS

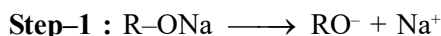
- Williamson's synthesis :** When alkyl halides are heated with alcoholic sodium alkoxide to give ethers. This is the laboratory method used for preparation of simple and mixed aliphatic and aromatic ethers. But this method is conveniently used to prepare mixed ether



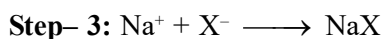
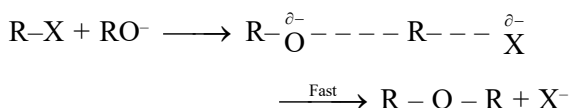
alkyl halide sod. alkoxide ether

e.g. When methyl chloride is heated with alc. sodium methoxide, gives dimethyl ether.

**Mechanism:** It is  $SN^2$  reaction of  $R-X$ , in which  $-X$  is replaced by  $RO^-$

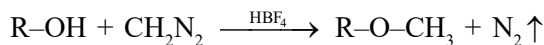


**Step-2 :**



- From diazomethane and alcohol:** This method is used to prepare simple and mixed ethers.

When alcohols are reacted with diazomethane in the presence of fluoroboric acid  $HBF_4$  or  $BF_3$  as catalyst to give ethers.

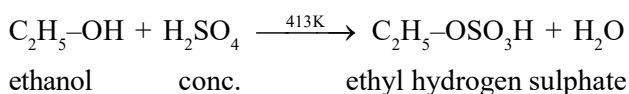


**Note:** This is also known as methylation of alcohols.  $CH_2N_2$  acts as methylating agent. Ether produced is pure will always have methyl as one of the groups. These are nucleophilic substitution reactions.

### 3. By continuous etherification process (Inter molecular dehydration of alcohols) :

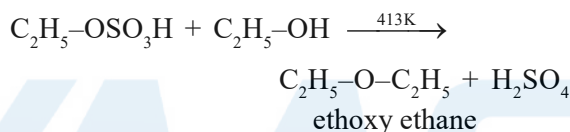
#### Step-I:

When ethyl alcohol is heated with conc.  $H_2SO_4$  at 413K, gives ethyl hydrogen sulphate.



#### Step-II:

Ethyl hydrogen sulphate is reacted with another molecule of ethyl alcohol gives ethoxy ethane.



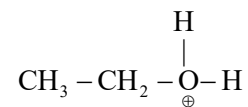
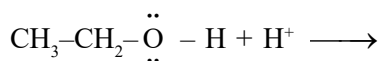
The  $H_2SO_4$  produced in second step is used to convert more and more alcohol into ether. Hence this method is known as continuous etherification process.

#### Purification:

Ether obtained by this method contains  $H_2O$ , alcohol and  $H_2SO_4$ . To remove these impurities it is first shaken with  $NaOH$ , which neutralises  $H_2SO_4$  then add  $CaCl_2$  to remove alcohol. Then dried over fused  $CaCl_2$ .

#### Mechanism:

- Formation of ether is  $SN^2$  reaction involving the attack of proton on alcohol to form protonated alcohol.

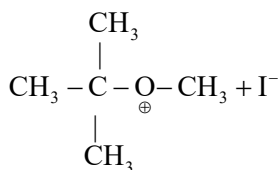


protonated alcohol

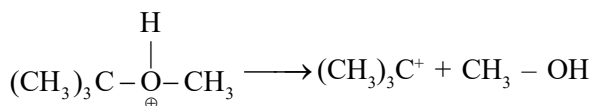
- Attack of protonated alcohol on another alcohol to form oxocation.





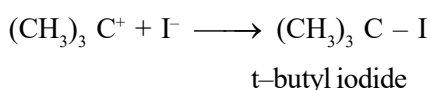


**Step-II:** Dissociation of C – O bond and formation of stable t-butyl carbonium ion by  $\text{S}_\text{N}1$  reaction.



t-butyl carbonium ion

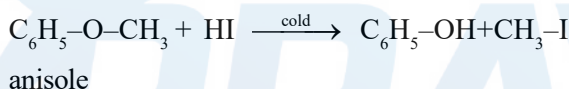
**Step-III:** Attack of nucleophile ( $\text{I}^-$ ) on t-butyl carbonium ion.



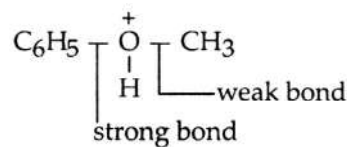
**Note:** This reaction is useful for detection of alkyl group in mixed ether.

**Aromatic ethers :**

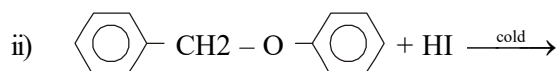
e.g. i) When anisole is reacted with cold HI to give phenol and iodo methane.



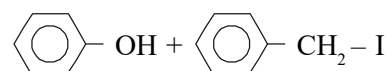
In case of anisole methyl phenyl oxonium ion is formed by protonation



The bond in  $\text{CH}_3 - \text{O}$  is weaker than  $\text{C}_6\text{H}_5 - \text{O}$  because carbon of phenyl group is  $\text{sp}^2$  hybridised state and there is a partial double bond character. Therefore attack of  $\text{I}^-$  breaks  $\text{CH}_3 - \text{O}$  bond to form  $\text{CH}_3\text{I}$ , and  $\text{C}_6\text{H}_5 - \text{O}^-$  combine with  $\text{H}^+$  to form  $\text{C}_6\text{H}_5\text{OH}$ .



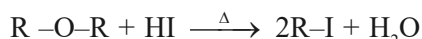
benzyl phenyl ether



phenol

benzyl iodide

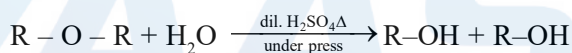
**II) Reaction with hot cone. or dry (excess) HI :**



**Note:** Both alkyl group produces alkyl iodide.

**III) Acid hydrolysis (Reaction with dil.  $\text{H}_2\text{SO}_4$ ):**

When ethers are hydrolysed by dilute  $\text{H}_2\text{SO}_4$  under pressure to give alcohols.



ether

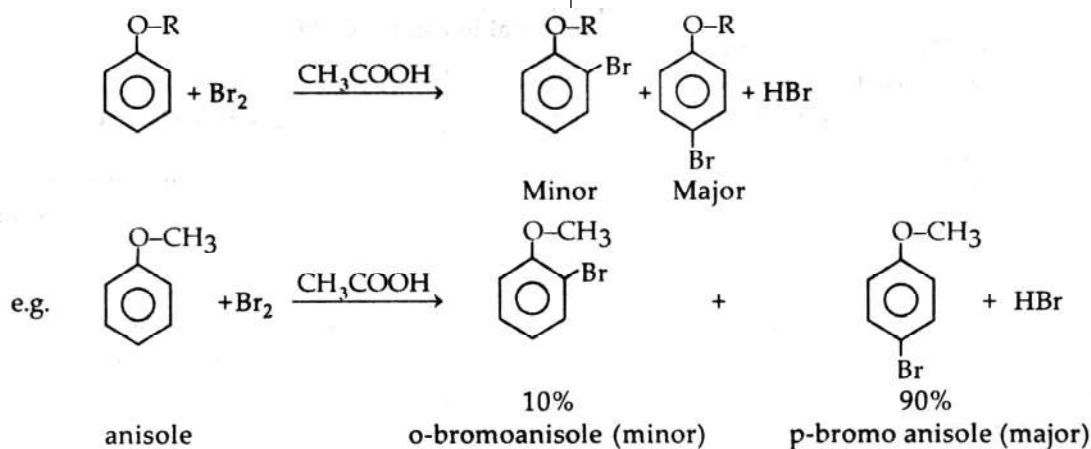
alcohol

**Note:** Both alkyl group produces alcohols.

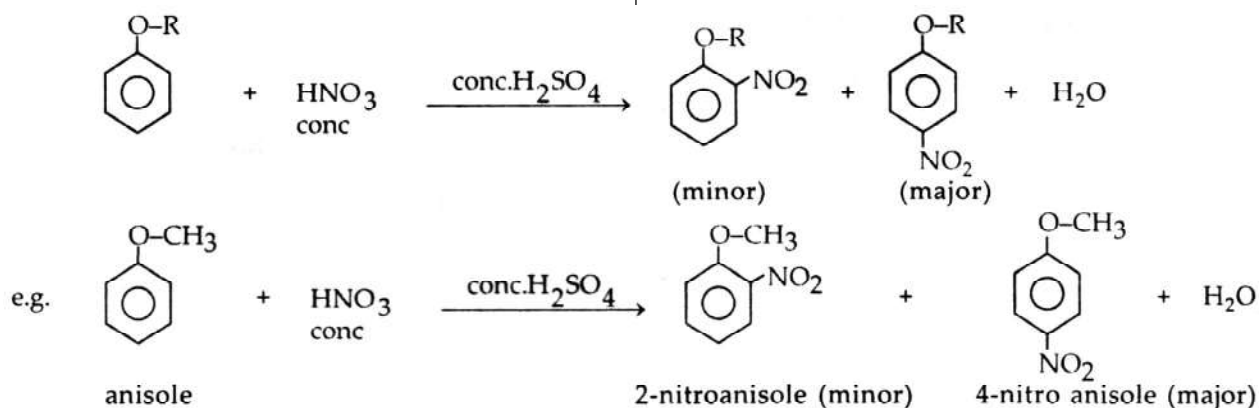
### 11.11 ELECTROPHILIC SUBSTITUTION REACTION OF AROMATIC ETHERS

The alkoxy group attached to benzene ring is ortho and para directing like phenol

1. **Halogenation :** Alkyl phenyl ether reacts with bromine in acetic acid in the absence of  $\text{FeCl}_3$  or  $\text{FeBr}_3$  catalyst to give ortho bromo alkyl phenyl ether (10%) and parabromo alkyl phenyl ether (90%).

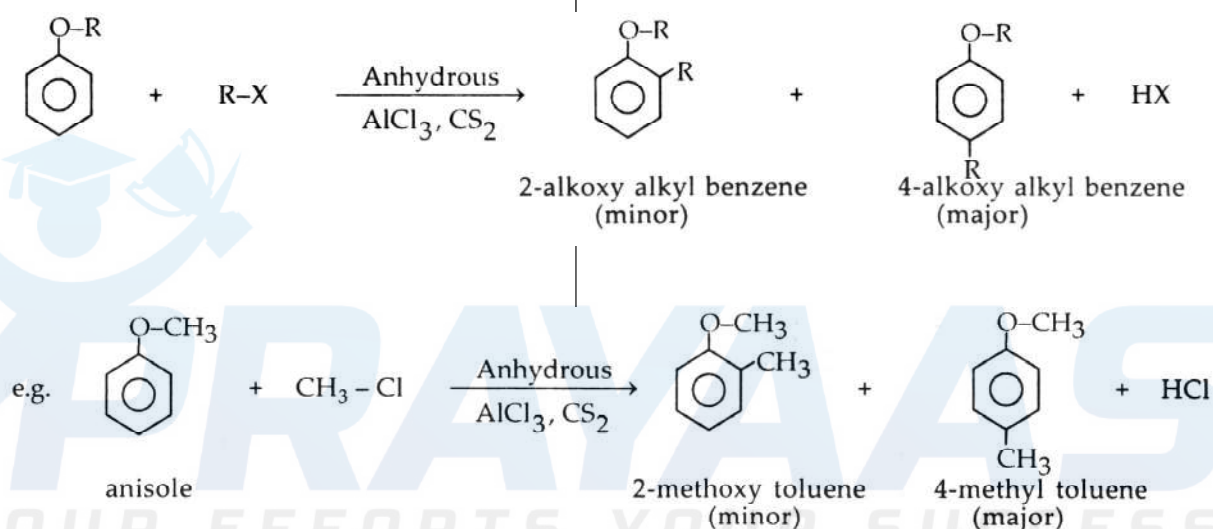


2. **Nitration:** Alkyl phenyl ether reacts with nitrating mixture (cone.  $\text{HNO}_3$  + cone.  $\text{H}_2\text{SO}_4$ ) to give a mixture of o-nitro alkyl phenyl ether (minor) and p-nitro alkyl phenyl ether (major).

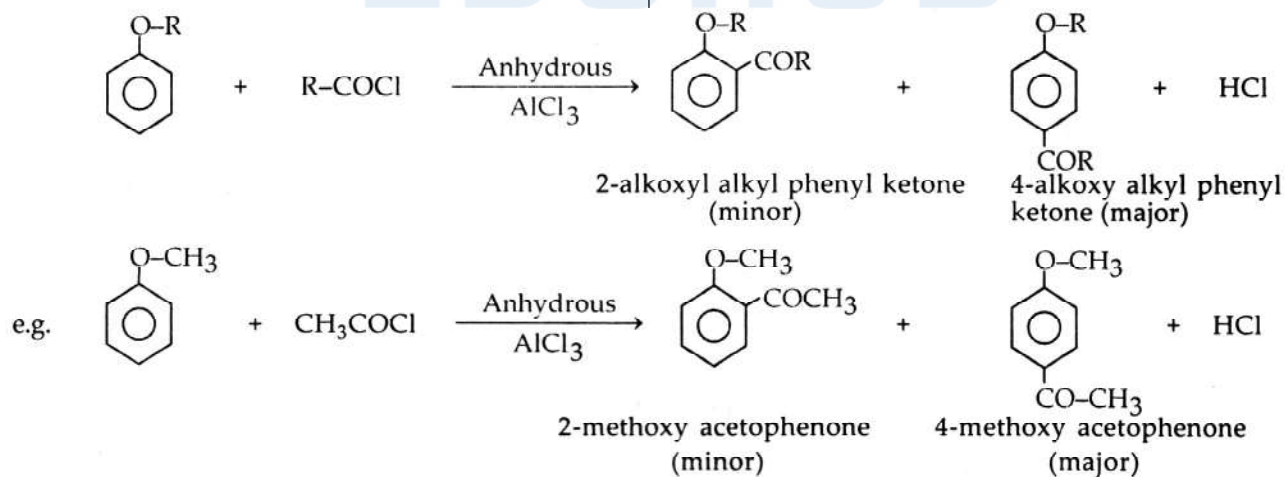


### 3. Friedel – Craft reactions :

a) **Friedel – Craft alkylation :** In this reaction alkyl groups is attached to ortho and para position.



b) **Friedel– Craft acylation:** Acylation can be carried out by acylating agents like  $\text{RCOCl}$ ,  $(\text{RCO})_2\text{O}$ ,  $\text{R-COOH}$



### 11.12 CROWN ETHERS

Charles J. pederson discovered crown ether. It is macrocyclic polyether containing large ring of carbon and oxygen atoms. Crown ethers are named as n-crown-m. Where 'n' is the total carbon and

oxygen atoms and 'm' is the total oxygen atoms.

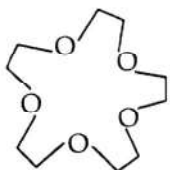
- a) The first crown ether is 18-crown 6-ether



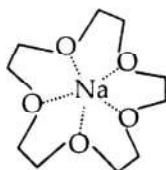
18-crown 6-ethers

The cavity inside is able to trap  $K^+$  but not  $Na^+$  and  $Li^+$

- b) The another crown ether is 15-crown-5 ether, it is able to trap  $Na^+$  ions.



15-crown 5-ether



crown ether sodium ion complex

In crown ether each oxygen atom is co-ordinately bonded with sodium atom.

- c) Crown ether also form complex with  $NH_4^+$  and  $R-NH_3^+$   
 d) Stability of these complexes depends upon size of the metal ion and cavity available in the ring of particular crown ether.  
 e) **Application:**  
 i) It is used for increasing solubility of ionic salt in non-polar solvent  
 ii) They also act as catalyst in certain reactions involving organic salt.  
 iii) They are used to extract specific ion from mixtures and enrich isotopic mixtures.  
 iv) It is used to remove radioactive elements from radioactive waste.  
 vi) Specific crown ether 18-crown-6 is used to extract cesium and strontium.

### Section –III : Phenols

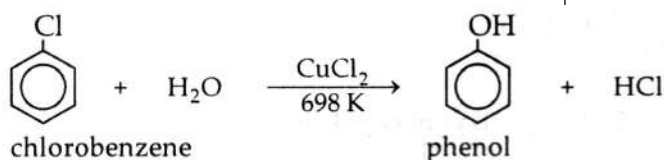
#### 11.1 INTRODUCTION

Phenols are aromatic hydroxy compounds in which one or more hydroxy groups are directly attached to benzene nucleus.

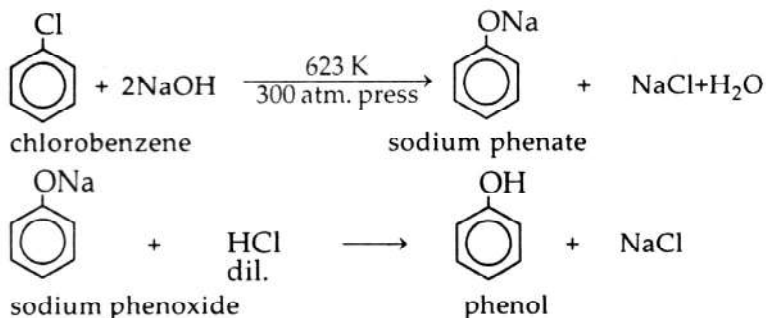
Simple phenol is hydroxy benzene or phenyl hydroxide or benzenol or phenol it self also known as carbolic acid. It is represented as  $Ar-OH$  or  $Ph-OH$  where  $Ar$  or  $Ph$  is  $C_6H_5-$  group.

#### 11.2 PREPARATION OF PHENOL (CARBOLIC ACID)

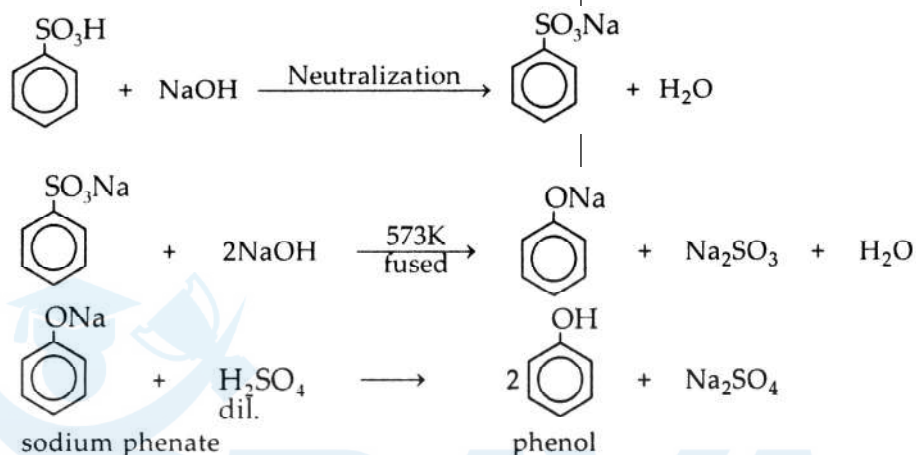
1. From chlorobenzene by Raschig's method (1943) Industrial method:



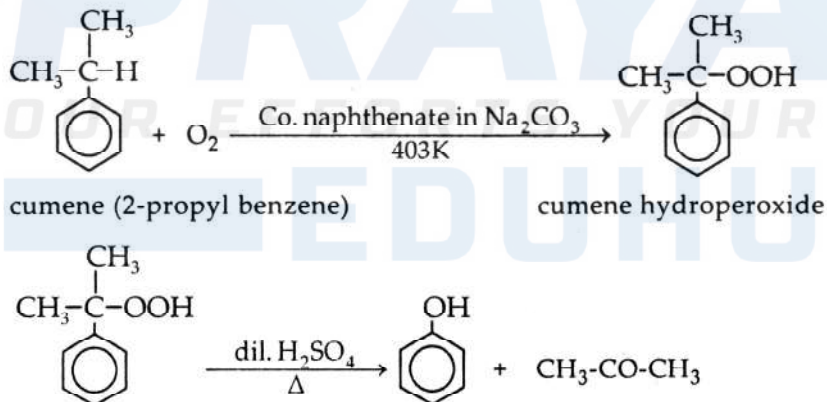
2. From chlorobenzene by Dow's method (1928) Industrial method :



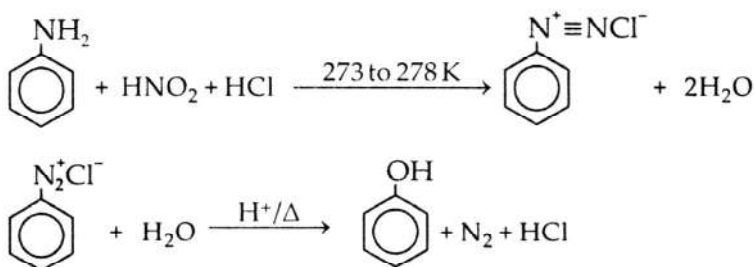
3. From benzene sulphonic acid:



4. From oxidation of cumene (isopropyl benzene or 2-propyl benzene or 2-phenyl propane) :



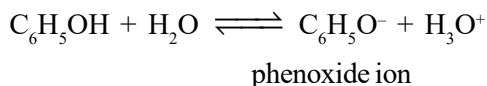
5. From diazotisation reaction:



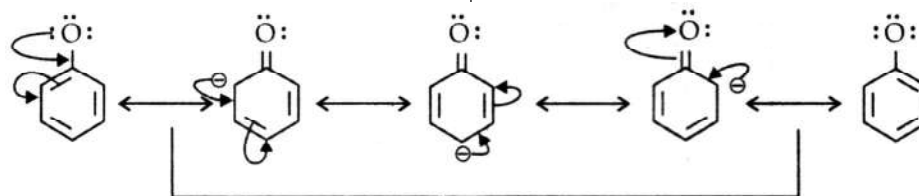
### 11.3 ACIDITY OF PHENOLS

The reaction of phenol with sodium, potassium, aluminium metal, NaOH, KOH, indicates the acidic nature of phenol. It does not react with  $\text{NaHCO}_3$ ,  $\text{Na}_2\text{CO}_3$ .

In phenols –OH group is directly attached to  $\text{sp}^2$  hybridised carbon atom, this increase the polarity of O – H bond and increase the ionisation of phenols than alcohols.



Phenoxide ion is more stabilized than phenol by resonance. Hence phenol is acidic in nature.



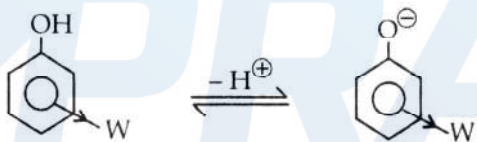
Resonating structure of phenoxide ion

### 11.4 EFFECT OF SUBSTITUENTS ON ACIDITY OF PHENOLS

The presence of electron attracting and electron donating groups affects the acidic strength of phenols.

#### 1. Effect of electron withdrawing group (EWG) like $-\text{NO}_2$ , $-\text{CHO}$ , $-\text{COOH}$ , $-\text{CN}$ etc on acidity of phenols:

Electron withdrawing groups or atoms stabilize the phenoxide ion and increase the acidic strength of phenols.



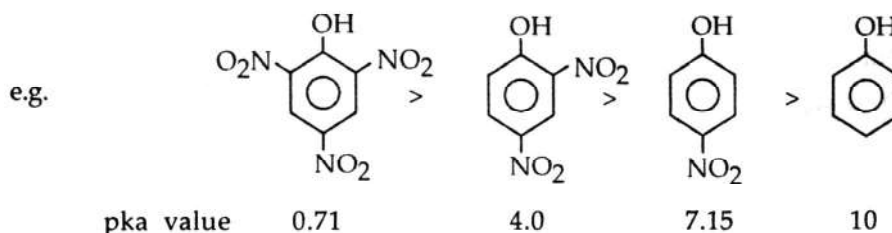
Acidic strength more W-stabilize the anion

But this effects is more when substituents is present on ortho and para position than meta position.

It follows the order  $p > o > m > \text{Ph} - \text{OH}$

Greater the number of electron withdrawing groups at ortho and para position, more the acidity of phenol.

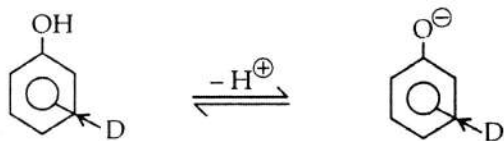
Thus increasing order acidic strength of nitrophenol is  $p\text{-nitrophenol} > o\text{-nitrophenol} > m\text{-nitrophenol} > \text{phenol}$ .



#### 2. Effect of electron donating groups (EDG) like $\text{R}-$ , $-\text{OH}$ , $-\text{OR}$ , $-\text{NH}_2$ , $-\text{NR}_2$ etc. on acidity of phenols:

Electron donating groups destabilize the phenoxide ion by donating electron to benzene ring and decrease the acidic strength of phenol. Acidic nature is more when electron donating group is present on meta position.

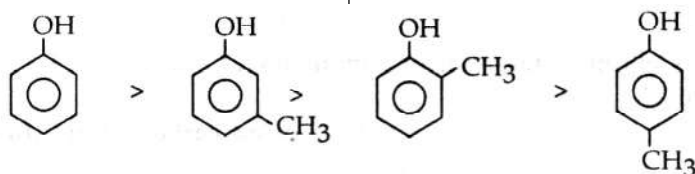




Acidic strength less

D-destabilize the anion

Thus cresols are less acidic than phenols. The decreasing order of acidic strength of cresols is,



pKa value	phenol	m-cresol	o-cresol	p-cresol
	10	10.1	10.14	10.2

**Note:** Lower the pKa value stronger the acid, or higher the Ka value stronger the acid. The pKa value of ethanol is 15.9 hence it very very less acidic than phenol.

Compounds	pKa value
-----------	-----------

Ethanol	15.9
p-amino phenol	10.5
p-cresol	10.2
o-cresol	10.14
m-cresol	10.1
Phenol	10.0
p-chloro phenol	9.4
m-chloro phenol	9.1
o-chloro phenol	8.6
m-nitro phenol	8.3
o-nitro phenol	7.2
p-nitro phenol	7.1

Following groups increases the acidity of phenol in decreasing order.

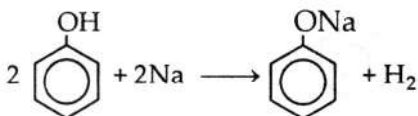


### 11.5 CHEMICAL PROPERTIES

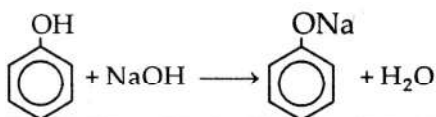
Phenol undergoes two types of reactions by breaking of O-H bond and by breaking of C-O bond. Hence reactions are divided in to two groups.

#### 1. Reaction involving breaking of -OH bond (acidity of phenol)

##### i) Reaction with Na metal



##### ii) Reaction with NaOH

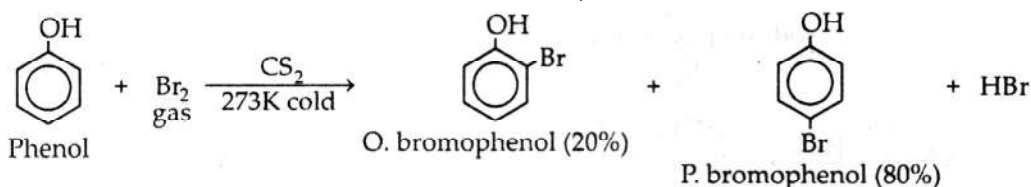




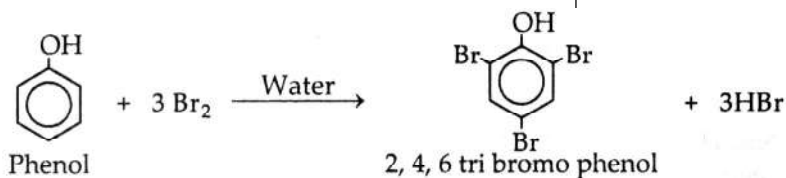
### 11.6 ELECTROPHILIC SUBSTITUTION REACTION OF PHENOL (REACTION INVOLVING BREAKING OF C – O BOND)

#### 1. Bromination in different solvent:

a) Reaction with  $\text{Br}_2$  gas in inert solvent non polar solvent ( $\text{CS}_2$ ,  $\text{CHCl}_3$ ,  $\text{CCl}_4$ ) :

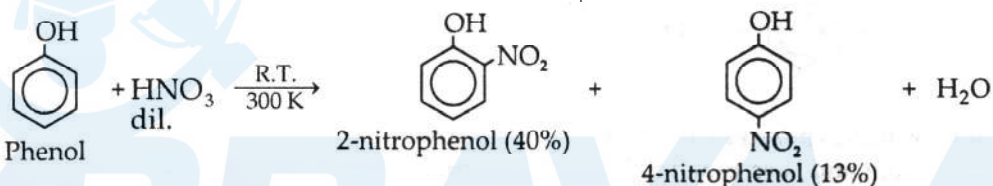


b) Reaction with bromine water:

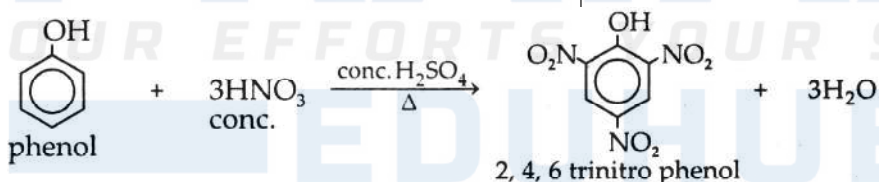
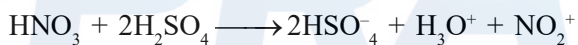


#### 2. Nitration at different condition:

a) Reaction with dil.  $\text{HNO}_3$  :

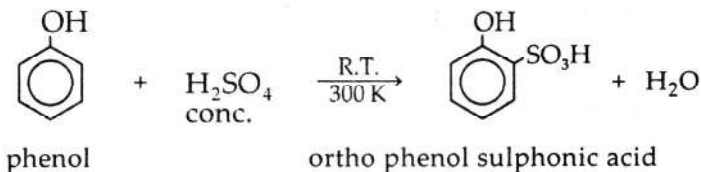


b) Reaction with cone. nitric acid (nitrating mixture) :

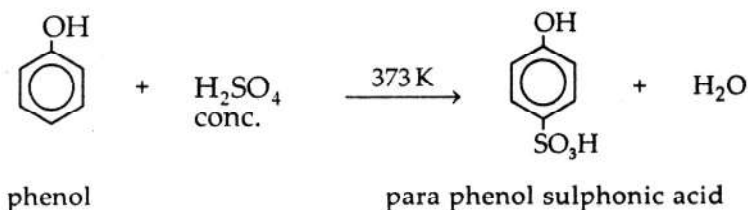


#### 3. Sui phonation at different temperature:

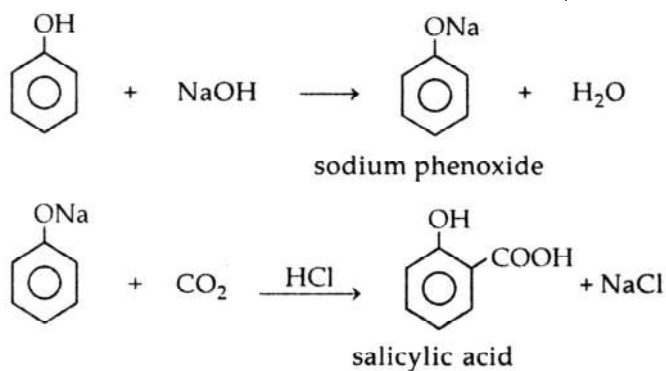
a) Reaction with cone.  $\text{H}_2\text{SO}_4$ , at R.T./300K :



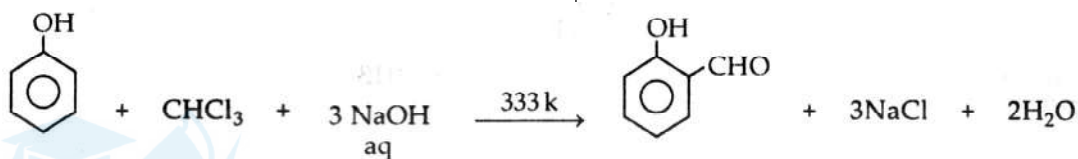
b) Reaction with cone.  $\text{H}_2\text{SO}_4$  at high temperature (373K) :



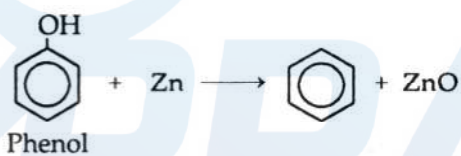
## 4. Kolbe's Schmidt reaction



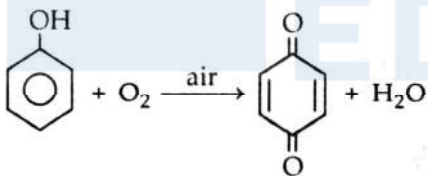
## 5. Reimer and Tiemann reaction:



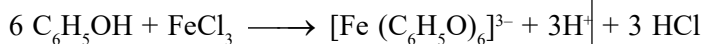
## 6. Reaction with Zn metal



7. **Oxidation of Phenol:** When exposed to air or heating with strong oxidising agent like  $\text{K}_2\text{Cr}_2\text{O}_7$  + dil.  $\text{H}_2\text{SO}_4$ , it undergoes slow oxidation and turn pink to form phenoquinone or p-benzoquinone or conjugated diketone



8. **Colour test of phenols:** In fact all compound containing enolic group ( $\text{C}=\text{C}-\text{OH}$ ) gives  $\text{FeCl}_3$  test, forming chelate compound. Phenol gives ferric phenoxide as chelate compound.



○○○



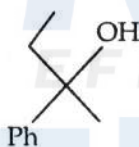
## MULTIPLE CHOICE QUESTIONS

## INTRODUCTION, NOMENCLATURE, CLASSIFICATION ISOMERISM

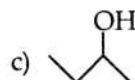
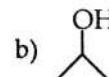
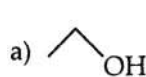
1. IUPAC name of following compound is



- a) pent-3-en-2-ol      b) pent-2-en-4-ol  
c) but-3-en-2-ol      d) but-2-en-4-ol
2. How many isomers of  $C_5H_{11}OH$  will be  $1^\circ$  alcohols?
- a) Five                      b) Four  
c) Two                      d) Seven
3. Which of the following is trihydric alcohol?
- a) Glycine                  b) Glycerol  
c) Glycol                  d) 2-heptanol
4. In glycerine,
- a) one  $1^\circ$  OH group is present  
b) one  $2^\circ$  OH group is present  
c) two  $2^\circ$  OH groups are present  
d) one  $3^\circ$  OH group is present
5. Correct IUPAC name of the following compound is



- a) 3-phenyl butan-3-ol  
b) 2-phenyl propan-2-ol  
c) 2-phenyl butan-2-ol  
d) 3-phenyl butan-2-ol
6. General representation of primary alcohol is
- a)  $>C=O$                   b)  $-CH_2OH$   
c)  $>CHOH$                 d)  $COH$
7. The general formula, which represent the homologous series of alcohol is
- a)  $C_nH_{2n}O$                 b)  $C_nH_{2n+1}O$   
c)  $C_nH_{2n}O_2$               d)  $C_nH_{2n+2}O$
8. Grain spirit is
- a) isopropyl alcohol      b) isobutyl alcohol  
c) methyl alcohol        d) ethyl alcohol
9. Which of the following has primary alcoholic group?



10. The characteristic grouping of secondary alcohol is
- a)  $>C=O$                   b)  $-CH_2OH$   
c)  $>CHOH$                 d)  $COH$
11. Which of the following alcohol contain vinyl group

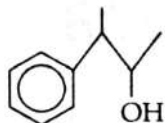


12. How many ethers are possible for formula  $C_4H_{10}O$ ?
- a) 2                          b) 3  
c) 4                          d) 5
13. In allylic alcohol - OH group is attached to
- a)  $sp$  - hybridised carbon atom  
b)  $sp^2$  - hybridised carbon atom  
c)  $sp^3$  - hybridised carbon atom  
d)  $sp^3$ -d-hybridised carbon atom
14. Which of the following is allylic alcohol

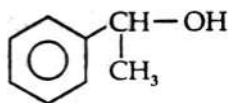


15. Butane - 2-ol is
- a) primary alcohol        b) secondary alcohol  
c) tertiary alcohol        d) aldehyde
16. Allylic alcohols may be
- a)  $1^\circ$  types                  b)  $2^\circ$  types  
c)  $3^\circ$  types                  d)  $1^\circ, 2^\circ, 3^\circ$  types
17. Which is a primary alcohol ?
- a) Butan-2-ol              b) Butan-1-ol

- c) Propan-2-ol      d) Isopropyl alcohol
18. Aralkyl alcohols are also named as  
 a) allylic alcohol      b) vinylic alcohol  
 c) benzylic alcohol      d) aryl alcohol
19. IUPAC name of the compound  $\text{CH}_3\text{CH}(\text{C}_2\text{H}_5)\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$  is  
 a) 2-methyl 3-hexanol  
 b) 4-methyl 2-hexanol  
 c) heptanol  
 d) all of these
20. Following alcohol can be named as



- a) 1-phenyl 1-methyl propan-2-ol  
 b) 3-phenyl butan-2-ol  
 c) 1-methyl 1-phenyl butan-2-ol  
 d) 3-phenyl 3-methyl propan-2-ol
21. Wood alcohol is  
 a) phenol      b)  $\text{CH}_3\text{OH}$   
 c)  $\text{C}_2\text{H}_5\text{OH}$       d)  $\text{CH}_3\text{COOH}$
22. In vinyl alcohol - OH group is attached to  
 a)  $\text{sp}$  - hybridised carbon atom  
 b)  $\text{sp}^2$  - hybridised carbon atom  
 c)  $\text{sp}^3$  - hybridised carbon atom  
 d)  $\text{sp}^2$  - d-hybridised carbon atom
23. How many metamers are possible for  $\text{C}_4\text{H}_{10}\text{O}$  ?  
 a) 1      b) 2  
 c) 3      d) 4
24. IUPAC name of the following compound is



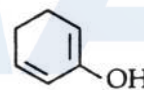
- a) 1-methyl 1-phenyl methanol  
 b) 2-methyl benzyl alcohol  
 c) 2-phenyl ethan-2-ol  
 d) 1-phenyl ethan-1-ol
25. Ethyl methyl carbinol is,  
 a) n-butyl alcohol      b) t-butyl alcohol  
 c) sec. butyl alcohol      d) isobutyl alcohol
26. Following alcohol is the type of



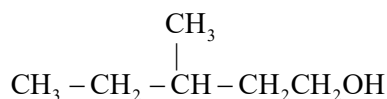
- a) allylic alcohol      b) vinylic alcohol  
 c) aralkyl alcohol      d) benzylic alcohol
27. Methyl carbinol is  
 a) ethanol      b) 2-propanol  
 c) 1-propanol      d) methanol

28. Vinyl carbinol is  
 a)  $\text{HO}-\text{CH}_2-\text{CH}=\text{CH}_2$   
 b)  $\text{CH}_3-\text{C}(\text{OH})=\text{CH}_2$

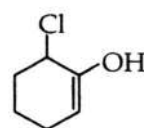
- c)  $\text{CH}_3-\text{CH}=\text{CH}-\text{OH}$   
 d)  $\text{CH}_2=\text{CH}-\text{OH}$
29. C-OH group is present in  
 a)  $1^\circ$  R-OH      b)  $2^\circ$  R-OH  
 c)  $3^\circ$  R-OH      d)  $4^\circ$  R-OH
30. Ethanol containing some methanol is called as  
 a) methylated spirit      b) rectified spirit  
 c) absolute spirit      d) proof spirit
31. IUPAC name of secondary butyl alcohol is  
 a) 2-methyl propan-1-ol  
 b) butan-2-ol  
 c) 2-methyl propan-2-ol  
 d) 1-butanol
32. IUPAC name of the following compound is



- a) cyclohexa 1-3-dien-3-ol  
 b) cyclohexa 1, 2-dien-1-ol  
 c) cyclohexa 1, 3-dien-3-ol  
 d) cyclohexa 1, 5-dien-1-ol
33. IUPAC name of following compound is

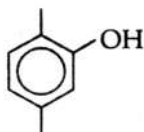


- a) 5-ethyl 3-methyl pent-1-ol  
 b) 3-methyl pent-1-ol  
 c) 3-ethyl pent-1-ol  
 d) 3, 5-diethyl pent-1-ol
34. IUPAC name of the following compound is

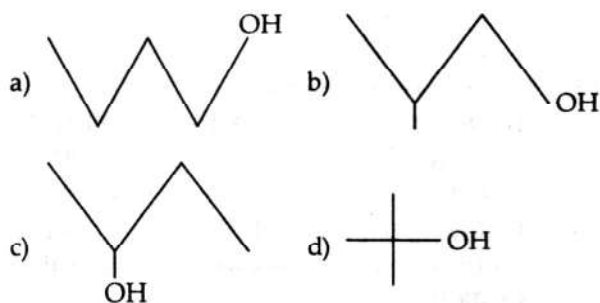


- a) 2-chloro cyclohex-1-en-1-ol

- b) 1-chloro 2-hydroxy cyclohex-2-en  
 c) 6-chloro cyclohex-1-en-1-ol  
 d) 2-chloro 1-hydroxy cyclohex-1-en
35. IUPAC name of t-butyl alcohol is  
 a) 2-methyl propan-1-ol  
 b) 2-methyl butan-1-ol  
 c) 2-methyl propan-2-ol  
 d) 1-methyl propan-2-ol
36. IUPAC name of following compound



- a) 2, 5-dimethyl phenol  
 b) 3-5-dimethyl phenol  
 c) para-dimethyl phenol  
 d) dimethylene phenol
37. The compound which is not isomeric with diethyl ether is  
 a) n-propyl methyl ether  
 b) butan-1-ol  
 c) 2-methyl propan-2-ol  
 d) butanone
38. How many compounds show optical isomerism of molecular formula  $C_5H_{12}O$ ?  
 a) 2                      b) 3  
 c) 4                      d) 5
39. Molecular formula  $C_2H_6O$  represents  
 a) alcohols and acids  
 b) alcohols and ethers  
 c) only alcohols  
 d) only ethers
40. Which isomer of  $C_4H_{10}O$  is optically active?



41. Molecular formula  $C_3H_8O$  shows  
 a) chain and optical isomers  
 b) position and functional isomers

- c) functional and metamers  
 d) chain and position isomers
42. IUPAC name of following compound is



- a) pent-2-yn-5-ol  
 b) pent-3-yn-1-ol  
 c) pentane-2-yn-5-ol  
 d) pentane-3-yn-1-ol
43. Alcohols exhibit  
 a) chain isomerism      b) position isomerism  
 c) optical isomerism    d) all of these
44. Total number of isomers including structural and stereo isomers of molecular formula  $C_4H_{10}O$   
 a) 4                      b) 7  
 c) 8                      d) 10
45. What type of isomerism is exhibited by pentanol?  
 a) Position                b) Chain  
 c) Optical                d) All of these
46. Number of isomeric ethers with molecular formula  $C_5H_{12}O$  are  
 a) 4                      b) 6  
 c) 8                      d) 10
47.  $C_4H_{10}O$  represents  
 a) aldehydes              b) ketones  
 c) alcohols                d) acids
48. Which of the following are functional isomers?  
 a) Alcohols and ethers  
 b) Alcohols and acids  
 c) Alcohols and aldehydes  
 d) Alcohols and ketones
49. How many  $3^\circ$  alcohols are possible for  $C_3H_8O$ ?  
 a) 0                      b) 1  
 c) 2                      d) 3

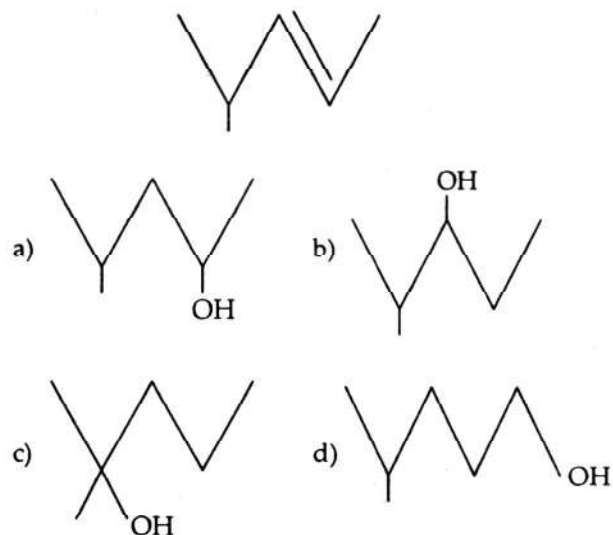
#### PREPARATION METHODS

50. Hydration of alkene produces  
 a)  $1^\circ$  alcohols or  $2^\circ$  alcohols  
 b)  $1^\circ$  alcohols or  $3^\circ$  alcohols  
 c)  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols  
 d)  $1^\circ$  or  $2^\circ$  or  $3^\circ$  alcohols
51. Hydration:  
 a) takes place through carbocation  
 b) is a reversible process  
 c) follows electrophilic addition

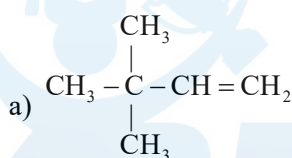


d) follows all of the above

52. Hydration of following compound gives



53. Which is hydrated to a maximum extent?



- b)  $\text{CH}_3\text{-CH}=\text{CH}_2$   
 c)  $\text{CH}_2=\text{CH}_2$   
 d)  $\text{CH}=\text{CH}$

54. Which reagent can bring about following conversion,



- a)  $\text{CrO}_3$  b) acidic  $\text{KMnO}_4$   
 c) dil.  $\text{H}_2\text{SO}_4$  d) dil.  $\text{KOH}$

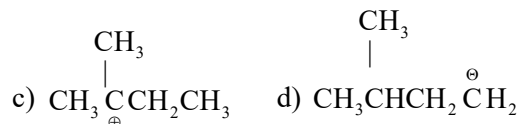
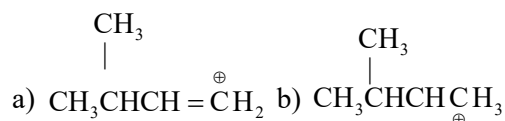
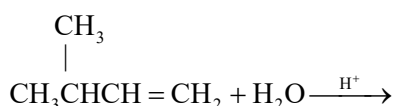
55. Hydroboration oxidation of alkene give

- a) acids b) aldehydes  
 c) ketones d) alcohols

56. In hydration of alkene first step is

- a) nucleophilic attack of water on carbocation  
 b) deprotonation of carbocation  
 c) protonation of alkene  
 d) attack of  $\text{H}_3\text{O}^+$

57. In the following reaction most stable intermediate is



58. In the hydration of an alkene carbocation is formed from :

- a) carbanion b) oxonium ion  
 c) hydroxide ion d) hydride ion

59. Reaction intermediate in hydration of alkene is

- a) carbanion b) carbon free radicals  
 c) carbocation d) carbene



In above reaction A and B respectively

- a)  $\text{H}_2/\text{Pt}$ ,  $\text{LiAlH}_4/\text{H}_2\text{O}$   
 b)  $\text{H}_2/\text{Pt}$ ,  $\text{H}_2/\text{Pt}$   
 c)  $\text{LiAlH}_4/\text{H}_2\text{O}$ ,  $\text{LiAlH}_4/\text{H}_2\text{O}$   
 d)  $\text{LiAlH}_4/\text{H}_2\text{O}$ ,  $\text{H}_2/\text{Pt}$

61. In hydroboration oxidation of alkene, the initial attack is

- a) boron b)  $\text{NaOH}$   
 c)  $\text{H}_2\text{O}_2$  d)  $\text{H}^+$

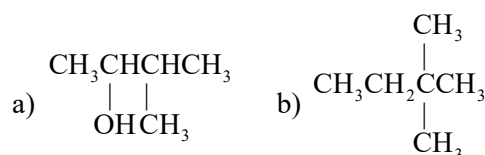
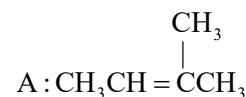
62. Select incorrect statement about hydroboration oxidation:

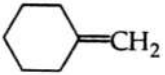
- a) Addition is against Markownikoff rule  
 b) Intermediate is a carbocation  
 c) It does not involve rearrangement  
 d) It is a addition reaction

63. Reagents used in hydroboraion oxidation reaction

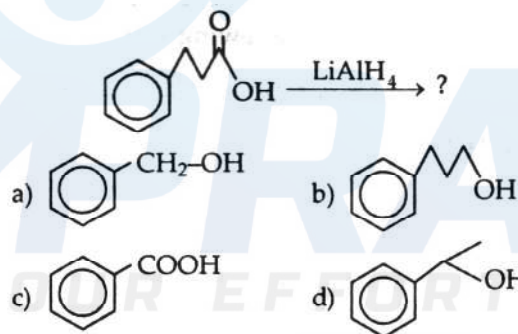
- a)  $\text{B}_2\text{H}_6 + \text{CrO}_3 + \text{NaOH}$   
 b)  $\text{B}_2\text{H}_6 + \text{H}_2\text{O}_2 + \text{NaOH}$ , THF  
 c)  $\text{B}_2\text{H}_6 + \text{acidic KMnO}_4 + \text{NaOH}$   
 d)  $\text{B}_2\text{H}_6 + \text{dil. HNO}_3 + \text{NaOH}$

64. A changes to ..... with hydroboration-oxidation

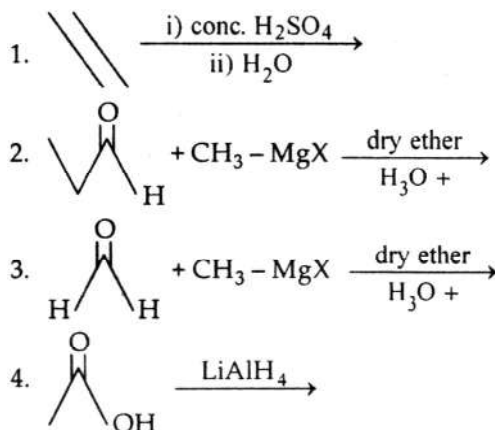


- c)  $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{OH}$  d) none of these
65. Alcohol containing least number of carbon which can be prepared using Grignard reagent is :  
 a)  $(\text{CH}_3)_2\text{CHOH}$  b)  $(\text{CH}_3)_3\text{COH}$   
 c)  $\text{CH}_3\text{OH}$  d)  $\text{CH}_3\text{CH}_2\text{OH}$
66. Following alkene will give same product by any method out of hydration, hydroboration oxidation:  
 a)  $\text{CH}_3\text{CH}=\text{CH}_2$  b)  $\text{CH}_3\text{CH}=\text{CHCH}_3$   
 c)  $\text{CH}_3\text{CH}(\text{CH}_3)=\text{CH}_2$  d) 
67. Find out (B) in the following reaction  
 $\text{C}_3\text{H}_5 + \text{Br}_2 \xrightarrow{\text{AlBr}_3} (\text{A}) \xrightarrow{\text{Aq. KOH}} (\text{B})$   
 a)  $\text{CH}_3-\text{CH}=\text{CH}_2$   
 b)  $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{OH}$   
 c)  $\text{CH}_3-\text{CHOH}-\text{CH}_3$   
 d)  $\text{CH}_3-\text{O}-\text{C}_2\text{H}_5$
68. Which of the following reactions will yield 2-propanol ?  
 1)  $\text{CH}_2=\text{CH}-\text{CH}_3 + \text{H}_2\text{O} \xrightarrow{\text{H}^+}$   
 2)  $\text{CH}_3\text{CHO} \xrightarrow[\text{H}_3\text{O}^+]{\text{CH}_3\text{MgI}}$   
 3)  $\text{HCHO} \xrightarrow[\text{H}_3\text{O}^+]{\text{C}_2\text{H}_5\text{MgI}}$   
 4)  $\text{CH}_3\text{COCH}_3 \xrightarrow[\text{H}_3\text{O}^+]{\text{CH}_3\text{MgI}}$   
 a) 1 and 2 b) 2 and 3  
 c) 3 and 1 d) 2 and 4
69. Treatment of 1-butene with cone.  $\text{H}_2\text{SO}_4$  followed by treatment with water forms  
 a) 1-butanol b) 2-butanol  
 c) 2-propanol d) 1-2-propan-diol
70. Acetone is treated with sodium amalgam and water gives,  
 a)  $(\text{CH}_3)_2\text{CHOH}$  b)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$   
 c)  $\text{C}_2\text{H}_5\text{OH}$  d)  $\text{CH}_3\text{CH}_2\text{COOH}$
71. 2-methyl 2-pentanol is prepared from acetone and what?  
 a)  $\text{C}_2\text{H}_5\text{MgI}$   
 b)  $(\text{CH}_3)_3\text{CMgI}$   
 c) 2-molecules of  $\text{CH}_3\text{MgI}$   
 d)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{MgI}$
72. The only primary alcohol that can be prepared by the indirect hydration of alkene is  
 a) ethyl alcohol b) n-propyl alcohol  
 c) isobutyl alcohol d) methyl alcohol
73.  $\text{R}_2\text{CO} \longrightarrow \text{R}_2\text{CHOH}$ . The conversion is,  
 a) reduction b) oxidation  
 c) hydrolysis d) hydration
74. Propene can be converted into 2-propanol by hydration. Which of the following reagents is ideal to affect the conversion?  
 a) Alkaline  $\text{KMnO}_4$   
 b) Zn dust +  $\text{H}_2\text{O}$   
 c) Conc.  $\text{H}_2\text{SO}_4$   
 d) Conc.  $\text{HCl}$
75. Using  $\text{CH}_3\text{MgBr}$ , which substrate would lead to  $(\text{CH}_3)_3\text{COH}$ ?  
 a) Acetone  
 b) Acetyl chloride  
 c) Acetaldehyde  
 d) Isopropyl alcohol
76. Which of the following is IUPAC name of the compound formed from reduction of 2-butanone?  
 a) 1-butanol b) 2-butanol  
 c) 1-butanal d) 2-butanal
77. Alcohols can be prepared by hydration of,  
 a) alkanes b) alkyl halides  
 c) alkyl amines d) alkenes
78.  $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CO}-\text{CH}_2-\text{CH}(\text{CH}_3)_2$   
 Catalytic hydrogenation of above compound in the presence of nickel catalyst gives  
 a) an optically inactive compound  
 b) an optically active compound  
 c) compound with plane of symmetry  
 d) an tertiary alcohol
79. Alkenes convert into alcohols by  
 a) hydrolysis by dil.  $\text{H}_2\text{SO}_4$   
 b) hydration of alkene by cone.  $\text{H}_2\text{SO}_4$   
 c) hydrolysis by water vapours and conc.  $\text{H}_2\text{SO}_4$   
 d) hydration of alkene by aqueous  $\text{KOH}$
80. Acid catalysed hydration of alkenes except ethene leads to the formation of  
 a) secondary or tertiary alcohol  
 b) primary alcohol  
 c) mixture of secondary and tertiary alcohols  
 d) mixture of primary and secondary alcohols
81. Following compound on reduction gives eth

82. Which of the following is best reducing agent to convert  $-\text{COOH}$  to  $-\text{CH}_2-\text{OH}$
- a)  $\text{Fe} + \text{conc. HCl}$       b)  $\text{LiAlH}_4$   
 c)  $\text{NaBH}_4$       d)  $\text{Zn.Hg} + \text{HCl}$
83. Methanol is obtained by reduction of
- a)  $\text{CH}_3-\text{CHO}$       b)  $\text{CH}_3-\text{COOH}$   
 c)  $\text{H}-\text{CONH}_2$       d)  $\text{H}-\text{COOH}$
84. Product of the following reaction will be

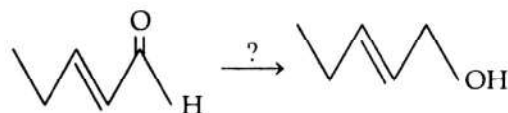


85. Ethanol is obtained by in which of the following reaction



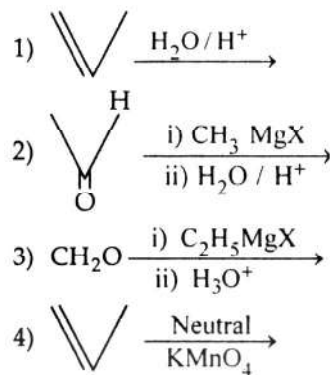
- a) 1, 3      b) 1, 2, 4  
 c) 3, 4      d) 1, 3, 4
86. Which of the following is best reagent used for

following conversion?



- a)  $\text{H}_2/\text{Ni}$       b)  $\text{H}_3\text{O}^+$   
 c)  $\text{NaBH}_4$       d)  $\text{Zn.Hg} + \text{HCl}$

87. Which one of the following will yield propan-2-ol, choose the right answer from a to d ?

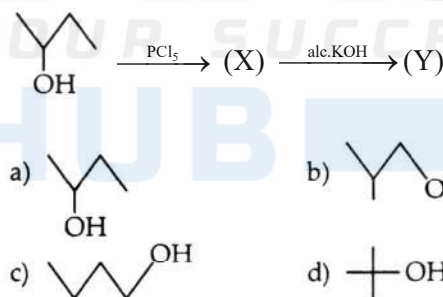


- a) 3, 4      b) 2, 3  
 c) 1, 3      d) 1, 2

88. When  $\text{C}_2\text{H}_5\text{MgI}$  react with acetone and the addition product is hydrolysed we get

- a)  $1^\circ$  alcohol      b)  $2^\circ$  alcohol  
 c)  $3^\circ$  alcohol      d) an aldehyde

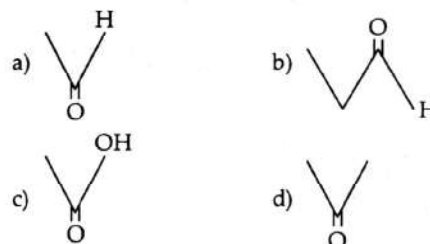
89. Identity (Z) in the following series of reaction.



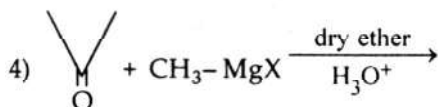
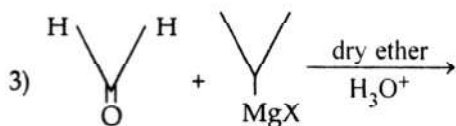
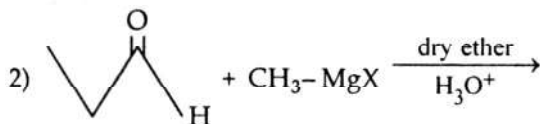
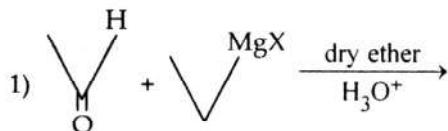
90. Benzyl alcohol is obtained by reduction of

- a) benzoic acid      b) acetophenone  
 c) benzonitrile      d) benzamide

91. To prepare butan-2-ol from methyl magnesium iodide. The compound required is




92. Isobutyl alcohol can not be obtained by the reaction between



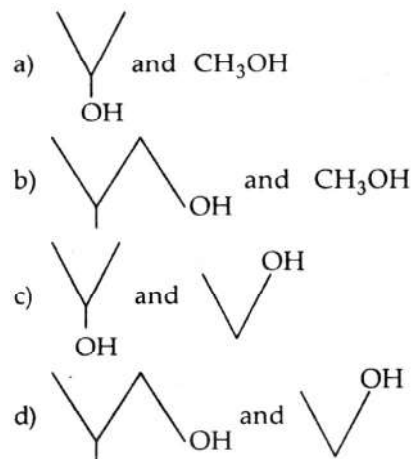
- a) 1, 2, 3                      b) 1, 2, 4  
c) 1, 3, 4                      d) 2, 3, 4
93. Which set of following reagent would you select to convert  $\text{C}_6\text{H}_5\text{COCH}_3$  to following alcohol

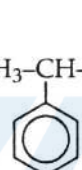


- a)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 \text{MgBr}$  and hydrolysis  
b)   
c)  $(\text{CH}_3)_2 \text{CHMgBr}$  and acid hydrolysis  
d)  $\text{CH}_3 - \text{CHOH} \text{CH}_3$ , Zn
94. Propan-1-ol may be prepared by the reaction of propene with
- a)  $\text{H}_3\text{BO}_3$   
b)  $\text{H}_2\text{SO}_4$  RT /  $\text{H}_2\text{O}$   
c)  $\text{B}_2\text{H}_6$  / THF,  $\text{H}_2\text{O}_2$  and NaOH  
d)  $(\text{CH}_3\text{COO})_2 \text{Hg} / \text{NaBH}_4$
95. Styrene on hydroboration oxidation gives
- a) 2-phenyl ethan-1-ol  
b) 1-phenyl ethan-1-ol  
c) benzoic acid  
d) benzaldehyde
96. Which of the following produces only one product on reduction with  $\text{LiAlH}_4$

- a)  $\text{CH}_3 \text{COO} \text{C}_2\text{H}_5$   
b)  $\text{C}_2\text{H}_5\text{COOC}_2\text{H}_5$   
c)  $\text{C}_2\text{H}_5\text{COOCH}_3$   
d)  $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{CH}_3$

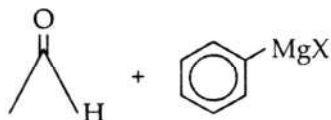
97. Catalytic hydrogenation of methyl 2-methyl propanoate gives



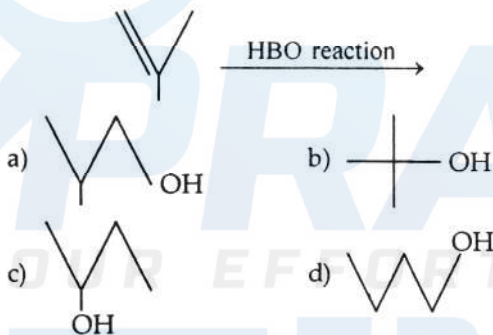
98. , on reduction give,

- a) 1-phenyl propan-1-ol and methanol  
b) 2-phenyl propan-1-ol and ethanol  
c) 2-phenyl propan-1-ol and methanol  
d) 2-phenyl propan-2-ol and methanol
99. Aldehydes and ketone reacts with Grignards reagent gives
- a) mixture of  $1^\circ$ ,  $2^\circ$ ,  $3^\circ$  alcohols  
b)  $1^\circ$  or  $2^\circ$  or  $3^\circ$  alcohols  
c)  $1^\circ$  or  $2^\circ$  alcohols  
d)  $2^\circ$  or  $3^\circ$  alcohols
100. Benzaldehyde and phenyl magnesium halide gives
- a) Benzyl alcohol              b) diphenyl ketone  
c) diphenyl ethanol            d) diphenyl methanol
101. Which reagent can bring about
- $\text{R-COOH} \longrightarrow \text{R-CH}_2\text{-OH}$
- a)  $\text{Sn} + \text{HCl}$                       b)  $\text{Na} + \text{C}_2\text{H}_5\text{OH}$   
c)  $\text{H}_2 + \text{Pt}$                         d)  $\text{LiAlH}_4$
102. When wine is put in air, it become sour due to
- a) oxidation of  $\text{C}_2\text{H}_5\text{-OH}$   
b) reduction of  $\text{C}_2\text{H}_5\text{-OH}$

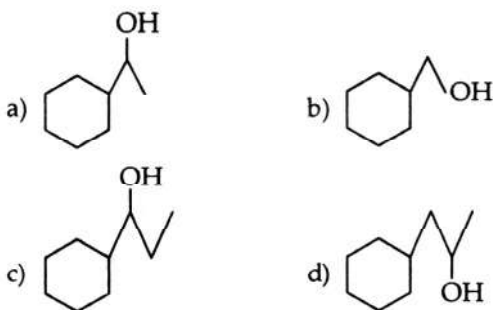
- c) formation of  $C_2H_5-COOH$   
 d) dissolution of  $CO_2$
103. Reaction used to convert acid to 1° alcohol is  
 a) oxidation                      b) reduction  
 c) polymerisation              d) pyrolysis
104. Carboxylic acid on reduction produces  
 a) 1° alcohols                      b) 2° alcohols  
 c) aldehydes                      d) ketones
105. Product of the following reaction is



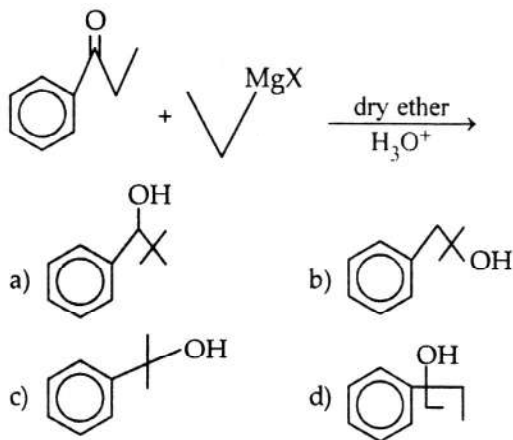
- a) 2-phenyl ethanol              b) 1-phenyl ethanol  
 c) phenyl methanol              d) methyl phenyl ketone
106. Ethene is subjected to hydroboration oxidation reaction followed by treatment with PCC gives  
 a) ethyl alcohol                      b) acetaldehyde  
 c) acetic acid                      d) acetone
107. Product of the following reaction is



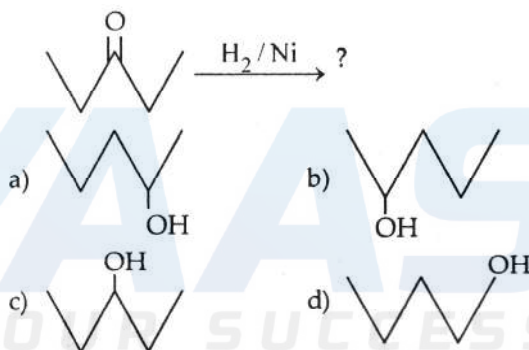
108.  $-CH_2OH$  group is obtained by reduction of  
 a)  $R-CN$                       b)  $R-NO_2$   
 c)  $R-CO-R$                       d)  $R-COOH$
109. Cyclohexane carbaldehyde is reacted with ethyl magnesium halide in the presence of dry ether and product on acid hydrolysis gives



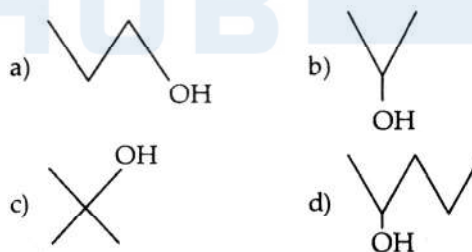
110. Product of the following reaction is



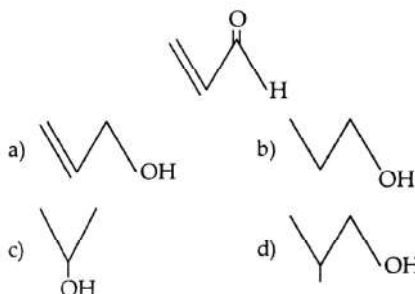
111. Hydroboration oxidation of 3-methyl but-1-ene gives  
 a) 3-methyl butan-2-ol  
 b) 2-methyl butan-2-ol  
 c) 3-methyl butan-1-ol  
 d) 2-methyl butan-1-ol
112. Product of the following reaction.



113. Acrolin on reduction by using  $H_2 / Ni$  gives



114. Following compound is reduced by  $NaBH_4$  or  $LiAlH_4$  gives





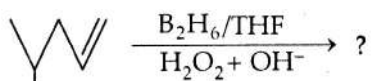
115. 2,2-dimethyl propan-1-ol is obtained from 2,2-dimethyl but-1-ene by using

- dil.  $\text{H}_2\text{SO}_4$
- $\text{B}_2\text{H}_6$ ,  $\text{H}_2\text{O}_2$  and  $\text{NaOH}$
- $(\text{CH}_3\text{COO})_2\text{Hg} + \text{NaBH}_4$
- $\text{H}_2/\text{Ni}$

116. Benzaldehyde on reduction by using  $\text{NaHg} + \text{H}_2\text{O}$  gives

- benzyl alcohol
- phenol
- sodium benzoate
- sodium phenoxide

117. following reaction is

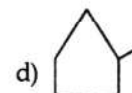
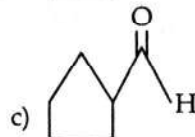
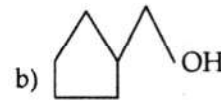
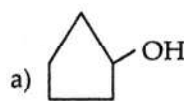
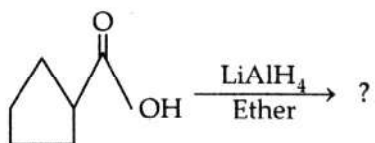


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- 
- 
- 

118. In which of the following reaction carbocation is not formed?

- ?
- ?
- ?
- ?

119. Product of the following reaction is



120. Alcohols are obtained by reduction of

- |                    |                   |
|--------------------|-------------------|
| 1. $\text{R-CHO}$  | 2. $\text{R-COR}$ |
| 3. $\text{R-COOH}$ | 4. $\text{RCOOR}$ |
- 1, 3
  - 1, 3
  - 3, 4
  - 1, 2, 3, 4

121. Ester on reduction by using  $\text{LiAlH}_4$  produces.

- single aldehyde
- single alcohol
- mixture of aldehyde
- mixture of alcohol

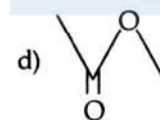
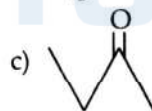
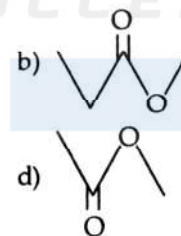
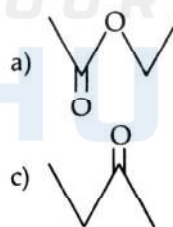
122. Ester are converted in to mixture of alcohol by

- acid hydrolysis
- alkaline hydrolysis
- catalytic hydrogenation
- oxidation

123. Ethyl formate on catalytic hydrogenation gives

- $\text{CH}_3\text{-OH}$
- $\text{CH}_3\text{OH}$  and  $\text{C}_2\text{H}_5\text{OH}$
- $\text{C}_2\text{H}_5\text{-OH}$
- $\text{H-CHO}$  and  $\text{CH}_3\text{-OH}$

124. Mixture of methanol and ethanol is obtained from catalytic hydrogenation of



125. 3-methyl but-1-ene on HBO reaction gives

- 3-methyl butan-2-ol
- 2-methyl butan-2-ol
- 3-methyl butan-1-ol
- 2-methyl butan-1-ol

126. HBO of but-2-ene produces

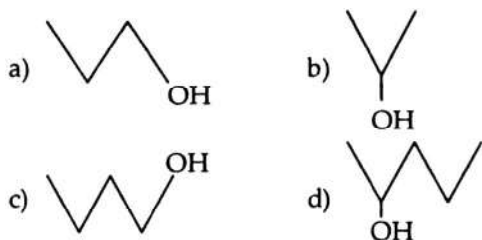
- butan-1-ol
- butan-2-ol
- 2-methyl propan-2-ol
- 2-methyl propan-1-ol

127. Reduction of aldehydes and ketones produces

- $1^\circ$  alcohols
- $2^\circ$  alcohols



- c) 3° alcohols      d) 1° or 2° alcohols  
128. Hydroboration oxidation of propene produces



129. Molar concentration of alkene used up in hydroboration oxidation reaction to form alcohol is  
a) 2      b) 4  
c) 3      d) 5

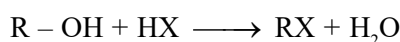
### PROPERTIES AND USES

130. Consider the following species  
1)  $\text{RCH} + \text{CH}_3$       2)  $\text{RCH}_2\text{CH}_2^+$   
3)  $\text{RCH}_2\text{CH}_2\text{O}^+\text{H}_2$   
In the dehydration of straight chain 1° alcohols, the correct sequence of formation of the species involved is  
a) 2, 1      b) 1, 2  
c) 3, 2      d) 2, 3  
131. Which of the following reducing agent is used for following conversion?



- a)  $\text{H}_2 + \text{Ni}$       b)  $\text{LiAlH}_4$   
c)  $\text{NaBH}_4$       d)  $\text{Na.Hg} + \text{H}_2\text{O}$   
132. The correct order of increasing boiling points is  
a) n-butane < 1-butanol < n-butyl chloride < isobutane  
b) n-butane < isobutane < n-butyl chloride < 1-butanol  
c) isobutane < n-butyl chloride < n-butane < 1-butanol  
d) isobutane < n-butane < n-butyl chloride < 1-butanol.  
133. List the class of alcohols in decreasing order of reactivity towards HX  
a)  $3^\circ > 1^\circ > 2^\circ > \text{MeOH}$   
b)  $3^\circ > 2^\circ > 1^\circ > \text{MeOH}$   
c)  $\text{MeOH} > 1^\circ > 2^\circ > 3^\circ$   
d)  $2^\circ > 3^\circ > 1^\circ > \text{MeOH}$   
134. List the hydrogen halide acids in decreasing order

of reactivity in the following reaction



- a)  $\text{HBr} > \text{HI} > \text{HCl} > \text{HF}$   
b)  $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$   
c)  $\text{HI} > \text{HF} > \text{HBr} > \text{HCl}$   
d)  $\text{HI} > \text{HCl} > \text{HBr} > \text{HF}$   
135. Which one of following is more reactive than the rest towards a Lucas reagent?  
a) 1-butanol      b) 2-butanol  
c) methanol      d) 2-methyl 2-propanol  
136. Sodium reacts with alcohol as given below  
$$2\text{R-OH} + 2\text{Na} \longrightarrow 2\text{R-ONa} + \text{H}_2$$
  
Place the type of alcohol into decreasing order of reactivity towards sodium.  
a)  $3^\circ > 2^\circ > 1^\circ$       b)  $1^\circ > 3^\circ > 2^\circ$   
c)  $2^\circ > 3^\circ > 1^\circ$       d)  $1^\circ > 2^\circ > 3^\circ$   
137. The main product of the reaction of  $(\text{C}_2\text{H}_5)_2\text{CHCHOHCH}_3$  with conc.  $\text{H}_2\text{SO}_4$  is  
a)  $(\text{CH}_3\text{CH}_2)_2\text{CH-CH}=\text{CH}_2$   
b)  $\text{CH}_3\text{-CH}(\text{C}_2\text{H}_5)\text{CH}=\text{CH-CH}_3$   
c)  $(\text{C}_2\text{H}_5)_2\text{C}=\text{CH-CH}_3$   
d) both 'a' and 'b'  
138. Place the following alcohols in decreasing order of rate of dehydration with conc.  $\text{H}_2\text{SO}_4$ ,  
1)  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_3$   
2)  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_3$   
3)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{-OH}$   
4)  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}(\text{CH}_3)_2$   
a)  $4 > 2 > 1 > 3$       b)  $1 > 2 > 3 > 4$   
c)  $4 > 3 > 2 > 1$       d)  $4 > 3 > 1 > 2$   
139. An alcohol  $\text{C}_4\text{H}_9\text{OH}$  on dehydration gives an alkene, which on oxidation yield a acetone. The alcohol is  
a)  $(\text{CH}_3)_3\text{COH}$   
b)  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$   
c)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
d)  $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$   
140. The most stable carbonium ion is  
a) methyl carbonium ion  
b) primary carbonium ion  
c) secondary carbonium ion  
d) tertiary carbonium ion.  
141. The compound with highest boiling point is  
a)  $\text{CH}_4$       b)  $\text{CH}_3\text{OH}$   
c)  $\text{CH}_3\text{Cl}$       d)  $\text{CH}_3\text{Br}$

142. Hydrogen bonding is maximum in  
a) ethanol                      b) diethyl ether  
c) ethyl chloride              d) triethylamine.
143. 1-butanol is treated with PCC gives,  
a)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$   
b)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$   
c)  $\text{CH}_3\text{COCH}_2\text{CH}_3$   
d)  $\text{CH}_3\text{COOH}$
144. Lucas reagent is used to distinguish among primary, secondary and tertiary  
a) alkyl halides              b) alcohols  
c) aliphatic amines          d) aromatic amines.
145. The compound which reacts faster with Lucas reagent at room temperature is  
a) butan-1-ol  
b) butan-2-ol  
c) 2-methyl propan-1-ol  
d) 2-methyl propan-2-ol
146. t-butyl alcohol is heated with  $\text{Al}_2\text{O}_3$  gives  
a)  $\text{CH}_3\text{CH}=\text{CHCH}_3$       b)  $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$   
c)  $(\text{CH}_3)_2\text{C}=\text{CH}_2$       d) all of these
147. The compound which gives the most stable carbonium ion on dehydration is  
a)  $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CH}_2\text{OH}$   
b)  $(\text{CH}_3)_2\text{C}-\text{OH}$   
c)  $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2\text{OH}$   
d)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$
148. Maximum number of active hydrogens are present in  
a) ethanoic acid              b) ethyl alcohol  
c) ethylene glycol          d) glycerol
149. When t-butyl alcohol is heated with Cu at 573 K, it forms  
a) butanal                      b) prop anal  
c) ethyl methyl ketone      d) 2-methyl prop-1-ene
150. 1-butanol is oxidised by acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  give,  
a) butanal                      b) butanoic acid  
c) butene                        d) butane
151. Alcohols gives alkyl halides, treatment with  
a)  $\text{PX}_3$                         b)  $\text{PX}_5$   
c)  $\text{HX}$                          d) all of these
152. When 2-methyl 2-butanol is a dehydrated to give an alkene, the preferred product is  
a) 2-methyl 2-butene  
b) 2-methyl 1-butene  
c) 2-methyl 1-propene  
d) n-hexene
153. Consider the following compounds  
1)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$   
2)  $\text{CH}_3\text{CH}_2\text{CHOHCH}_3$   
3)  $(\text{CH}_3)_2\text{COH}$   
These compounds are dehydrated by treatment with  $\text{H}_2\text{SO}_4$ . The correct sequence of increasing order of the reactivity of three compounds towards dehydration is  
a)  $3 < 1 < 2$                       b)  $1 < 2 < 3$   
c)  $2 < 1 < 3$                       d)  $1 < 3 < 2$
154. Which of the following alkene on acid catalysed hydration form propan-2-ol,  
a)  $\text{CH}_3\text{CH}=\text{CH}_2$               b)  $(\text{CH}_3)_2\text{C}=\text{CH}_2$   
c)  $\text{CH}_3\text{CH}=\text{CHCH}_3$       d)  $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
155. In isomeric alcohols correct order of boiling point is,  
a)  $2^\circ > 3^\circ > 1^\circ$                       b)  $3^\circ > 2^\circ > 1^\circ$   
c)  $1^\circ > 2^\circ > 3^\circ$                       d)  $2^\circ > 1^\circ > 3^\circ$
156. Which one of the following compound would not be oxidised by acidified  $\text{K}_2\text{Cr}_2\text{O}_7$ ?  
a)  $\text{CH}_3\text{OH}$                         b)  $(\text{CH}_3)_2\text{CHOH}$   
c)  $(\text{CH}_3)_2\text{COH}$                       d)  $\text{C}_2\text{H}_5\text{OH}$
157. Which of the following is expected to have highest boiling point?  
a)  $(\text{CH}_3)_2\text{CHCl}$                       b)  $(\text{CH}_3)_2\text{CHOH}$   
c)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$                       d)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$
158. Final product by the treatment of isobutyl alcohol with alumina is,  
a) 2-methyl propene  
b) 2-methyl but-1-ene  
c) ethyl t-butyl ether  
d) acetone and acetic acid
159. Ethyl alcohol is heated with  $\text{SOCl}_2$  gives,  
a)  $\text{C}_2\text{H}_5\text{Cl} + \text{HCl}$   
b)  $\text{C}_2\text{H}_5\text{Cl} + \text{SO}_2$   
c)  $\text{C}_2\text{H}_5\text{Cl} + \text{HCl} + \text{SO}_2$   
d)  $\text{CH}_3\text{OH} + \text{CH}_3\text{Cl} + \text{SO}_2$
160. Isopropyl alcohol is oxidised by  $\text{CrO}_3$  gives,  
a)  $\text{CH}_3\text{COCH}_3$                       b)  $\text{CH}_3\text{COOH}$   
c)  $\text{CH}_3\text{CH}=\text{CH}_2$                       d)  $\text{CH}_3\text{CHO}$
161. Which of the following is most acidic?  
a)  $\text{H}_2\text{O}$                               b)  $\text{CH}_3\text{OCH}_3$   
c)  $\text{CH}_3\text{OH}$                               d)  $\text{C}_6\text{H}_5\text{OH}$
162. Which of the following is oxidised to form ethyl methyl ketone?  
a) 2-propanol                      b) 2-butanol  
c) 1-butanol                        d) 1-propanol

163. Which of the following alcohol is least soluble in water?

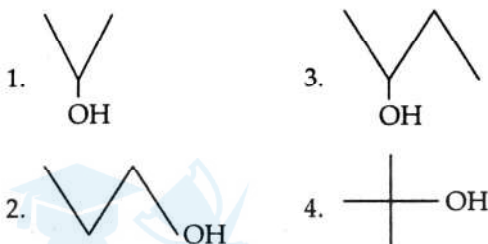
- a)  $\text{CH}_3\text{OH}$                       b)  $\text{C}_3\text{H}_7\text{OH}$   
 c)  $\text{C}_6\text{H}_{13}\text{OH}$                   d)  $\text{C}_{10}\text{H}_{21}\text{OH}$

164. Which of the following is more acidic alcohol?

- a)  $\text{C}_2\text{H}_5\text{OH}$   
 b)  $\text{CH}_3 - \underset{\text{OH}}{\text{CH}} - \text{CH}_3$

- c)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{OH}$   
 d)  $(\text{CH}_3)_3 - \text{OH}$

165. Decreasing order of acidity of following alcohol is



- a)  $1 > 2 > 4 > 3$                       b)  $3 > 1 > 4 > 2$   
 c)  $2 > 3 > 1 > 4$                       d)  $2 > 1 > 3 > 4$

166. Which of the following is most acidic

- a)  $\text{H}_2\text{O}$                               b)  $\text{CH}_3 - \text{OH}$   
 c)  $\text{C}_2\text{H}_5 - \text{OH}$                       d)  $\text{C}_3\text{H}_7 - \text{OH}$

167. Which of the following is strong base

- a)  $\text{CH}_3\text{ONa}$                       b)  $\text{NaOH}$   
 c)  $\text{KOH}$                               d)  $\text{Na}_2\text{CO}_3$

168. Reactivity of alcohol in breaking O-H bond is

- a)  $1^\circ > 2^\circ > 3^\circ$                       b)  $3^\circ > 2^\circ > 1^\circ$   
 c)  $2^\circ > 1^\circ > 3^\circ$                       d)  $1^\circ > 3^\circ > 2^\circ$

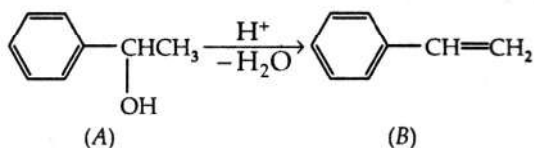
169. Reactivity of alcohol in breaking of C-O bond is

- a)  $1^\circ > 2^\circ > 3^\circ$                       b)  $3^\circ > 2^\circ > 1^\circ$   
 c)  $3^\circ > 1^\circ > 2^\circ$                       d)  $1^\circ > 3^\circ > 2^\circ$

170. Boiling points of alcohols are generally high. This is due to

- a) hydrogen-bonding intermolecular attractions  
 b) dipole-dipole attractions  
 c) both of the above  
 d) none of the above

171. In the following dehydration of alcohol (A) leading to the formation of styrene (B)



- a) intermediate is carbocation  
 b) carbocation is resonance-stabilised  
 c) initial attack is  $\text{H}^+$   
 d) all are correct statements

172. Which of the following functional groups can not be reduced by  $\text{H}_2 / \text{Ni}$

- a)  $\text{R}-\text{CHO}$                       b)  $\text{R}-\text{COOH}$   
 c)  $\text{R}-\text{COO}-\text{R}$                   d)  $\text{R}-\text{CO}-\text{R}$

173. 3-ethyl pentan-3-ol is obtained by  $\text{C}_2\text{H}_5\text{MgBr}$  and what?

- a) pentan-2-one  
 b) pentan-3-one  
 c) pentanal  
 d) 3-methyl butan-2-one

174. Acidic character of alcohols depends up on

- a) number of alkyl groups  
 b) polarity of  $-\text{OH}$  groups  
 c) types of alkyl groups  
 d) all of these

175. Order of acidity of alcohol is

- a)  $1^\circ > 2^\circ > 3^\circ$                       b)  $3^\circ > 2^\circ > 1^\circ$   
 c)  $1^\circ > 3^\circ > 2^\circ$                       d)  $3^\circ > 1^\circ > 2^\circ$

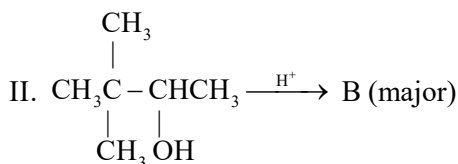
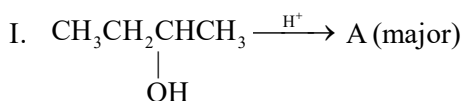
176. The B.P. of alcohols are much higher than the ethers of comparable molecular masses due to

- a) intermolecular H-bonding  
 b) intermolecular H-bonding  
 c) dipole-dipole attraction  
 d) Hitler-London forces

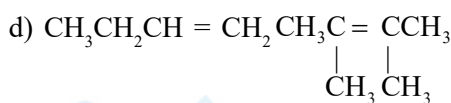
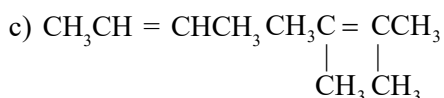
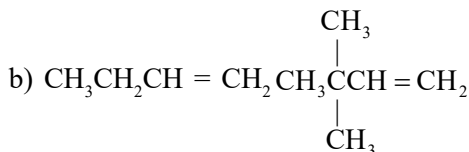
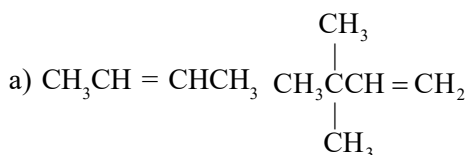
177. Which one is not characteristic of alcohols?

- a) They are lighter than water  
 b) Their B.P. rise uniformly with increasing molecular mass  
 c) Lower members are insoluble in water but solubility increases regularly  
 d) Lower members have pleasant odour and burning test

178. Consider following reactions,



A and B (both alkenes) are respectively:



179. Glycerol is more viscous than propan-1-ol due to

- a) many hydrogen bonding per molecule
- b) high B.P.
- c) high molecular weight
- d) more Lewis basic character

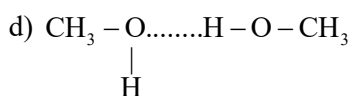
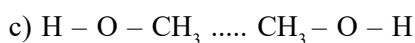
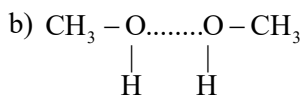
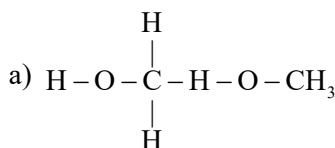
180.  $\text{C}_2\text{H}_5\text{OH}$  has higher B.P. than,  $\text{C}_2\text{H}_5\text{-SH}$  due to

- a) association
- b) dissociation
- c) low molecular mass
- d) two lone pair of electron on oxygen

181. When 1 mol of ethanol reacts with sodium metal liberate how many gram of hydrogen?

- a) 1 gm of hydrogen
- b)  $\frac{1}{2}$  gm of hydrogen
- c) 1.5 gm of hydrogen
- d) 2 gm of hydrogen

182. The dimer of methyl alcohol will have structure



183. Which of following has highest B.P.

- a)  $\text{CH}_3-\text{O}-\text{CH}_3$
- b)  $\text{C}_2\text{H}_5-\text{OH}$
- c)  $\text{C}_2\text{H}_5-\text{Cl}$
- d)  $\text{CH}_3-\text{CHO}$

184. Which of following is the most viscous liquid?

- a)  $\text{C}_2\text{H}_5\text{OH}$
- b)  $\begin{array}{c} \text{CH}_2-\text{CH}_2 \\ | \quad | \\ \text{OH} \quad \text{OH} \end{array}$
- c)  $\begin{array}{c} \text{CH}_2-\text{CH}-\text{CH}_2 \\ | \quad | \quad | \\ \text{OH} \quad \text{OH} \quad \text{OH} \end{array}$

- d)  $\text{HO}-\text{CH}_2(\text{CHOH})_4\text{CH}_2-\text{OH}$

185. Which of the following exhibit highest B. P. ?

186. Which of the following is most soluble in water

- a)  $\text{CH}_3-\text{OH}$
- b)  $\text{C}_2\text{H}_5-\text{Cl}$
- c)  $\text{CH}_3-\text{O}-\text{CH}_3$
- d)  $\text{C}_2\text{H}_5-\text{OH}$

187. Reason for excessive solubility of alcohol in water is due to

- a) covalent bonding
- b) H-bonding with  $\text{H}_2\text{O}$
- c) ionic bonding
- d) Lewis base character

188. Alcohols of high molecular masses are

- a) high B.P. and excessible solubility
- b) low B.P. and excessive solubility
- c) high B.P. and low solubility
- d) low B.P. and low solubility

189. Compound with molecular formula  $\text{C}_3\text{H}_8\text{O}$  on vigorous oxidation produces an acid  $\text{C}_3\text{H}_6\text{O}_2$ . It is,

- a) 3° alcohol
- b) 2° alcohol
- c) 1° alcohol
- d) not necessary

190. Which of the following reacts less easily with sodium metal?

- a) t-butyl alcohol
- b) isopropyl alcohol
- c) methyl alcohol
- d) ethyl alcohol

191. Acetic acid and n-propyl alcohols has same molecular mass (60). Out of these two, which have higher B.P.

- a) Acetic acid
- b) n-propyl alcohol
- c) either
- d) neither

192.  $\text{ZnCl}_2$  in Lucas reagent is

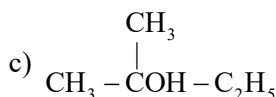
- a) Lewis acid
- b) Lewis base
- c) both 'a' and 'b'
- d) none of these

193. Oxidation of 2-pentanone mainly produces

- a) butyric acid and  $\text{CO}_2 + \text{H}_2\text{O}$
- b) acetic acid and propionic acid
- c) propionic acid +  $\text{CO}_2 + \text{H}_2\text{O}$

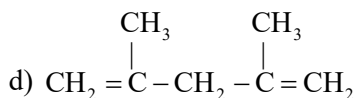
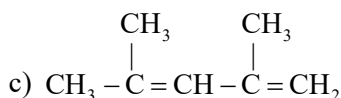
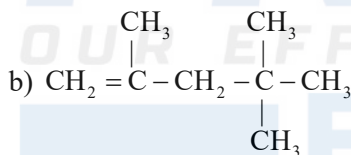
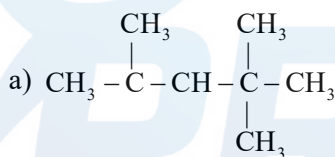
- d) acetic acid and butyric acid
194. The correct increasing order of acidic strength is
- $\text{CH}_3\text{OH} > \text{H}_2\text{O} > (\text{CH}_3)_2\text{CH OH}$
  - $\text{H}_2\text{O} > \text{CH}_3\text{OH} > (\text{CH}_3)_2\text{CHOH}$
  - $(\text{CH}_3)_2\text{CH OH} > \text{CH}_3\text{OH} > \text{H}_2\text{O}$
  - $\text{H}_2\text{O} > (\text{CH}_3)_2\text{CH OH} > \text{CH}_3\text{OH}$

195. An alkyl halide  $\text{CH}_3 - \overset{\text{CH}_3}{\underset{|}{\text{CCl}}} - \text{C}_2\text{H}_5$  can be obtained by the action of HCl on which alcohol
- $(\text{CH}_3)_2\text{CH}-\text{CH}(\text{OH})\text{CH}_3$
  - $(\text{CH}_3)_2\text{CH}-\text{CH}_2-\text{CH}_2-\text{OH}$

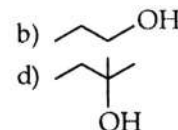
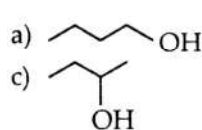


d) all of these

196.  $(\text{CH}_3)_2 - \underset{\text{OH}}{\text{C}} - \text{CH}_2 - \text{C}(\text{CH}_3)_3 \xrightarrow[\text{dichromate}]{\text{acidic}}$   
the main product is



197. Ethanol is soluble in water due to
- ethyl group
  - hydrogen bonding
  - its neutral
  - dissociation in water
198. The final product of the oxidation of ethyl alcohol is
- ethane
  - acetone
  - acetaldehyde
  - acetic acid
199. Which has maximum  $pK_a$  value?

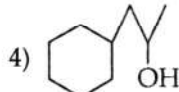
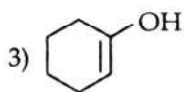
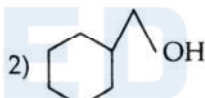
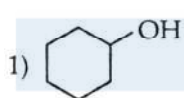


200. In this diol

- OH at  $\text{C}_2$  is more basic than that of at  $\text{C}_5$
  - OH at  $\text{C}_2$  is more acidic than at  $\text{C}_5$
  - both behave as a base
  - both behave as an acid
201. When ethyl alcohol is oxidised by copper, then which of the following aldehyde is formed?
- Formaldehyde
  - Acetylaldehyde
  - Benzaldehyde
  - Crotonaldehyde
202. The boiling point of a compound is raised by
- volatility of compound
  - non-polarity in the molecules
  - intermolecular hydrogen bonding
  - intramolecular hydrogen bonding
203. The alcohol, that is used as a beverage, is
- propanol
  - butanol
  - ethanol
  - methanol
204. Wood spirit is known as
- methanol
  - ethanol
  - acetone
  - benzene
205. Solubility of alcohols in water depends upon
- acidic nature
  - basic nature
  - neutral nature
  - tendency to form hydrogen bonding
206. Consider the following substances
- 2-propanol,
  - propanone,
  - methyl amine
- The correct sequence of increasing order of boiling point is
- $2 < 3 < 1$
  - $1 < 2 < 3$
  - $2 < 1 < 3$
  - $3 < 2 < 1$
207. Alcohols are miscible with  $\text{H}_2\text{O}$  because of their
- acidic character
  - H-bonding
  - alkyl group
  - dissociation
208. The reaction
- $$\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[453\text{K}]{95\% \text{H}_2\text{SO}_4} \text{CH}_2 = \text{CH}_2 + \text{H}_2\text{O}$$
- is an example of
- dehydration
  - dehydrogenation

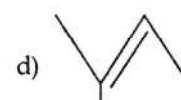
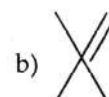


- c) hydration d) decarboxylation
209. Tonics, generally contains,  
a) ether b) methanol  
c) ethanol d) rectified spirit
210. Dehydration is most easy for  
a) primary alcohols b) tertiary alcohols  
c) secondary alcohols d) ethanol
211. The alcohol,  $C_4H_9OH$ , when shaken with a mixture of anhydrous  $ZnCl_2$  and cone.  $HCl$  give an immediate oil layer product. The alcohol is  
a)  $H_3C-(CH_2)_3-OH$   
b)  $H_3C-CH(OH)CH_2CH_3$   
c)  $(CH_3)_2CHCH_2-OH$   
d)  $(CH_3)_2C-OH$
212. On oxidation of alcohol gives an acid having the same number of carbon atoms. The alcohol is,  
a)  $1^\circ$  alcohol b)  $2^\circ$  alcohol  
c)  $3^\circ$  alcohol d) not necessary
213. Secondary butyl alcohol is dehydrated according to  
a) Saytzeff rule  
b) Markownikoff rule  
c) Anti-Markownikoff rule  
d) none of these
214. Olefins are obtained from alcohols by heating with  
a)  $Al_2O_3$  b)  $LiAlH_4$   
c)  $B_2H_6$  d)  $NaBH_4$
215. Cyclohexene is obtained from dehydration of

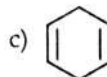
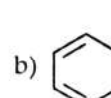
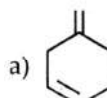
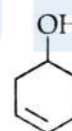


- a) 1 b) 1, 2  
c) 1, 3 d) 4
216.  $1^\circ$ ,  $2^\circ$  and  $3^\circ$  alcohols are identified by  
a) Lucas test b) oxidation test  
c) haloform test d) all of these

217. Following alcohol on dehydration gives



218. 3, 3-dimethyl butan-2-ol on dehydration gives  
a) 3, 3-dimethyl but-2-ene  
b) 2, 3-dimethyl but-2-ene  
c) 2, 3-dimethyl but-1-ene  
d) 3, 3-dimethyl but-1-ene
219. The compound on oxidation gives ketone, the original compound is  
a)  $1^\circ$  alcohol b)  $2^\circ$  alcohol  
c)  $3^\circ$  alcohol d) carboxylic acid
220. A organic compound (A) has pleasant odour, on boiling (A) with conc.  $H_2SO_4$  at 443K produces colourless gas, which decolourises bromine water and Bayer's reagent. The original organic compound (A) is  
a)  $C_2H_5-Cl$  b)  $C_2H_5-COOCH_3$   
c)  $C_2H_5-OH$  d)  $C_2H_5-COOH$
221. The most suitable reagent to convert primary alcohol to aldehyde  
a) acidified  $K_2Cr_2O_7$   
b) alkaline  $KMnO_4$   
c)  $CrO_3$   
d) pyridinium chlorochromate (PCC)
222. Following compound on dehydration gives

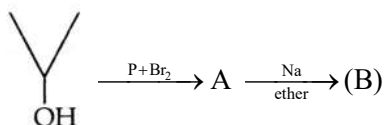


d) none of these

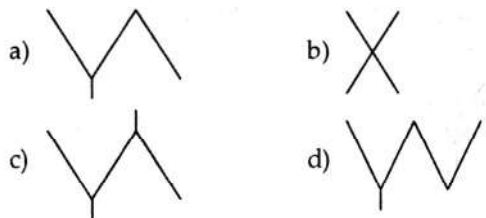
223. When compound (A) is oxidised by acidic  $K_2Cr_2O_7$  gave (B). Compound (B) on reduction with  $LiAlH_4$  gave (A). The compound (A) and (B) are respectively.  
a)  $CH_3-COCH_3$  and  $CH_3-COOH$   
b)  $C_2H_5OH$  and  $CH_3-COCH_3$   
c)  $C_2H_5-OH$  and  $CH_3-COOH$   
d)  $CH_3-CHO$  and  $CH_3COCH_3$



224. The major product formed in following reaction is



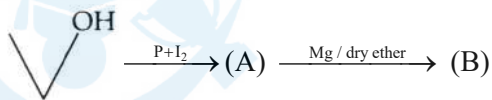
The compound (B) is



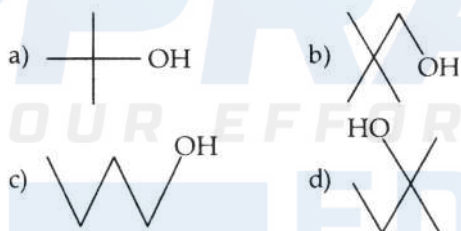
225. Which is best reagent to convert cyclohexanol to cyclohexene

- a) cone. HCl                      b) conc. HBr  
c) cone. H<sub>2</sub>SO<sub>4</sub>                  d) Lucas reagent

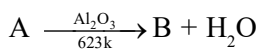
226. In the following sequence of reaction



i) CH<sub>3</sub>COCH  
ii) dry ether  
iii) H<sub>3</sub>O<sup>+</sup> → (C). The compound (C) is



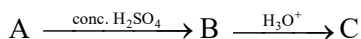
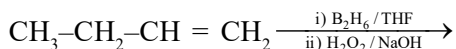
227.  $C_2H_5COOH \xrightarrow{LiAlH_4} A$



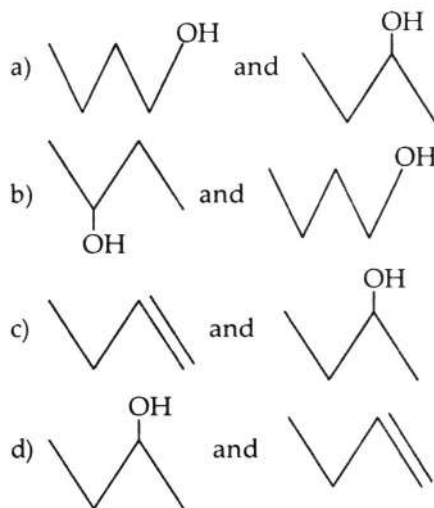
In above reaction A and B are respectively

- a) C<sub>2</sub>H<sub>5</sub>-OH and CH<sub>2</sub> = CH<sub>2</sub>  
b) C<sub>2</sub>H<sub>5</sub> - CHO and C<sub>2</sub>H<sub>5</sub>OH  
c) CH<sub>3</sub> - CH<sub>2</sub> - CH<sub>2</sub> - OH and CH<sub>3</sub> - CH = CH<sub>2</sub>  
d) CH<sub>3</sub> - CH = CH<sub>2</sub> and CH<sub>3</sub> - CH<sub>2</sub> - CH<sub>2</sub> - OH

228. In the sequence of reaction.



In above reaction A and C are respectively



229. Dehydration of 3-phenyl butan-2-ol gives

- a) 2-phenyl but-2-ene  
b) 4-phenyl 2-methyl but-1-ene  
c) 1-phenyl 3-methyl but-1-ene  
d) 3-phenyl but-1-ene

230. In dehydration of alcohol 1st step is

- a) formation of carbonium ion  
b) formation of carbanion  
c) loss of proton from carbonium ion  
d) protonated of alcohol

231. Dehydration of alcohol produces alkene, the reaction intermediate is

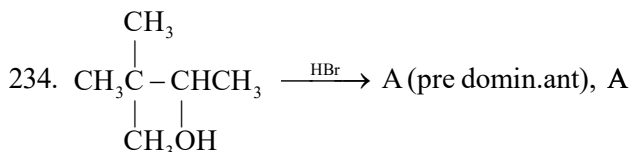
- a) carbonium ion                  b) carbanion  
c) carbon free radical          d) carbene

232. Denatured spirit is mainly used as a

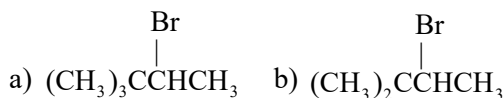
- a) good fuel  
b) drug  
c) solvent in preparing varnishes  
d) material in the preparation of oil




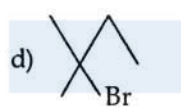
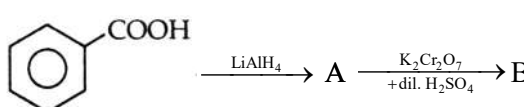
233. Acetylation is a process in which the hydrogen of O-H group is replaced by

- a) -C ≡ C-H                      b) -CH = CH<sub>2</sub>  
c) -COCH<sub>3</sub>                        d) -COC<sub>6</sub>H<sub>5</sub>



is



- c) both 'a' and 'b'      d) none is correct
235.  $B \xleftarrow{\text{NaBH}_4} \text{Cyclohexyl-CH=CHCHO} \xrightarrow{\text{H}_2/\text{Pt}} A$   
A and B are respectively:
- a)  $\text{Cyclohexyl-CH}_2\text{CH}_2\text{CHO}$ ,  
 $\text{Cyclohexyl-CH=CHCH}_2\text{OH}$   
 b)  $\text{Cyclohexyl-CH}_2\text{CH}_2\text{CH}_2\text{OH}$ ,  
 $\text{Cyclohexyl-CH=CHCH}_2\text{OH}$   
 c)  $\text{Cyclohexyl-CH=CHCH}_2\text{OH}$  in both cases  
 d)  $\text{Cyclohexyl-CH}_2\text{CH}_2\text{CH}_2\text{OH}$  in both cases
236. When 2, 3 dimethyl 2-butanol under goes acid catalysed dehydration the minor product is,  
 a) 2, 3 dimethyl 1-butene  
 b) 2, 3 dimethyl 2-butene  
 c) 3, 3 dimethyl 1-butene  
 d) none of these
237. Lucas reagent is  
 a) anhydrous  $\text{ZnCl}_2$  dissolved in cone.  $\text{HNO}_3$   
 b) hydrous  $\text{ZnCl}_2$  dissolved in conc.  $\text{HCl}$   
 c) anhydrous  $\text{ZnCl}_2$  dissolved in cone.  $\text{HCl}$   
 d) anhydrous  $\text{ZnCl}_2$  dissolved in dil.  $\text{HCl}$
238. Alcohols of low molecular weight are  
 a) insoluble in all solvents  
 b) insoluble in water  
 c) soluble in water at room temperature  
 d) soluble in water on heating
239. 6 mole of ethyl alcohol reacts with sodium metal. How many moles of hydrogen are liberated?  
 a) 2                                  b) 3  
 c) 4                                  d) 6
240. Catalytic oxidation of benzyl alcohol gives  
 a) benzaldehyde                  b) benzoic acid  
 c) toluene                          d) phenol
241. The ease of dehydration of alcohol is in the order  
 a)  $1^\circ > 2^\circ > 3^\circ$                   b)  $1^\circ > 3^\circ > 2^\circ$   
 c)  $3^\circ > 2^\circ > 1^\circ$                   d)  $2^\circ > 1^\circ > 3^\circ$
242. Alkenes are obtained from alcohols by  
 a) oxidation  
 b) hydration  
 c) intermolecular dehydration  
 d) intramolecular dehydration
243. Methanol and ethanol are miscible in water due to  
 a) dissociation in water  
 b) their acidic nature  
 c) hydrogen bond with water  
 d) alkyl groups
244. When ethanol is treated with acidified  $\text{K}_2\text{Cr}_2\text{O}_7$ , it forms acetic acid. It is an example of  
 a) hydrolysis                          b) oxidation  
 c) reduction                          d) rearrangement
245. Which of the following compound react fastest with sodium metal.  
 a)  $\text{H}_2\text{O}$                                   b)  $\text{CH}_3\text{-OH}$   
 c)  $\text{C}_2\text{H}_5\text{-OH}$                           d)  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$
246. Cyclohexanol is reacted with Lucas reagent gives  
 a) 1-cyclohexyl chloromethane  
 b) chlorocyclohexane  
 c) 1-chlorocyclohexene  
 d) 1-chlorocyclohexyne
247. Following compound is reacted with conc.  $\text{H}_2\text{SO}_4$  at 363K gives
- a)       b)   
 c)       d) 
248. 1, 1-diphenyl methanol is reacted with, HI give  
 a) 1, 1-diphenyl iodomethane  
 b) 1, 1-diphenyl iodoethane  
 c) diphenyl  
 d) none of these
249. Which of the following is not dehydrating agent?  
 a)  $\text{H}_2\text{SO}_4$                           b)  $\text{H}_3\text{BO}_3$   
 c)  $\text{ThO}_2$                                   d)  $\text{NaBH}_4$
250. Ethyl alcohol on heating with HI yield  
 a) ethane                                  b) ethylene  
 c) methane                                  d) ethyl iodide
251. Product of the following reaction is
- 

- a) benzaldehyde      b) benzyl alcohol  
c) toluene      d) benzoic acid
252. The decreasing order of basicity of alcohols are  
a)  $3^\circ > 2^\circ > 1^\circ$       b)  $3^\circ > 1^\circ > 2^\circ$   
c)  $2^\circ > 3^\circ > 1^\circ$       d)  $1^\circ > 2^\circ > 3^\circ$
253. Which of the following alcohol reacts with HI by  $SN^1$  reaction?  
a) t-butyl alcohol      b) methyl alcohol  
c) n-propyl alcohol      d) ethyl alcohol
254. Dehydration of neophentyl alcohol gives  
a) 2-methyl but-1-ene  
b) 3-methyl but-1-ene  
c) 2-methyl but-2-ene  
d) no product will be formed
255. Which of the following can be used as dehydrating agent for alcohols?  
a)  $H_3PO_4$       b)  $H_2SO_4$   
c)  $Al_2O_3$       d) all of these
256. Which of the following compound will lose a molecule of water of treating with conc.  $H_2SO_4$ ?  
a)  $CH_3COCH_3$       b)  $CH_3COOH$   
c)  $CH_3CH_2OH$       d)  $CH_3OCH_3$
257. Which of the following is an example of elimination reaction?  
a) Dehydration of alcohol  
b) Chlorination of  $CH_4$   
c) Hydroxylation of  $C_2H_4$   
d) Nitration of benzene
258. 23 g of sodium reacts with 1 mole methyl alcohol to give  
a) half mole of  $H_2$       b) one mole of  $O_2$   
c) one mole of  $H_2$       d) either 'b' or 'c'
259. Which of the following compound will give ketone on oxidation?  
a)  $CH_3CH_2CH_2OH$   
b)  $CH_3CH_2CH(OH)CH_3$   
c)  $(CH_3)_2COH$   
d)  $(CH_3)_2CH_2CH_2OH$
260. Which of the following is most acidic?  
a)  $RCH_2OH$       b)  $R_2CHOH$   
c)  $R_2C(OH)_2$       d)  $CH_3OH$
261. Lucas test is positive with  
a)  $CH_3-O-CH_3$       b)  $C_2H_5-OH$   
c)  $CH_3-Cl$       d)  $CH_3-CHO$
262. The first product of oxidation of primary alcohol is  
a) carboxylic acid      b) ketone  
c) ester      d) aldehyde
263. Sodium metal reacts readily with  
a)  $R-CHO$       b)  $R-CH_2OH$   
c) ester      d)  $R-NH_2$
264.  $KMnO_4$  acts as oxidising agent in  
a) acidic medium      b) neutral medium  
c) alkaline medium      d) all of the above
265. The group obtained by the removal of H-atom of the  $-OH$  group of ROH is called  
a) alkyl group      b) alkene  
c) alkoxy group      d) all of these
266. Alcohols are  
a) neutral      b) strongly acidic  
c) basic      d) amphoteric
267. Which one of the following on oxidation gives a ketone?  
a) Primary alcohol      b) Secondary alcohol  
c) Tertiary alcohol      d) All of these
268. Correct order of increasing boiling points is  
a) propane < n-butane < ethanol < water  
b) propane < ethanol < n-butane < water  
c) water < ethanol < propane < n-butane  
d) water < propane < n-butane < ethanol
269. The order of reactivity of following alcohols towards HCl is,  
1.  $CH_3OH$       2.  $CH_3CH_2CH_2OH$   
3.  $(CH_3)_2CHOH$       4.  $(CH_3)_3COH$   
a)  $1 > 2 > 3 > 4$       b)  $4 > 3 > 2 > 1$   
c)  $3 > 4 > 2 > 1$       d)  $2 > 4 > 1 > 3$
270. Tertiary alcohols are resistant to oxidation because  
a) they do not have  $\alpha$ -hydrogen atom  
b) due to large +I effect of alkyl group  
c) due to greater steric hindrance  
d) all of these
271. Which of the following reactions shows acidic nature of alcohol?  
a)  $ROH + HOOCR \rightarrow RCOOR + H_2O$   
b)  $2ROH + 2Na \rightarrow 2RONa + H_2$   
c)  $ROH + ClOCR \rightarrow RCOOR + HCl$   
d)  $ROH + HCl \rightarrow RCl + H_2O$
272. Boiling point of alcohol is more than that of ether of corresponding molecular weight, because  
a) alcohol being more soluble in water  
b) ethers are non-polar solvent

- c) hydrogen bonding exist between alcohol  
d) none of these
273. Use of methanol may causes  
a) blindness and death due to its oxidation to  $\text{CO}_2$   
b) blindness and death due to  $\text{HCOOH}$   
c) deficiency of calcium due to formation of salt  
d) disorder of blood hormones
274. Which of the following compound does not react with Lucas reagent?  
a)  $(\text{CH}_3)_2\text{C}-\text{CHO}$     b)  $(\text{CH}_3)_2\text{C}-\text{OH}$   
c)  $(\text{CH}_3)_2\text{CH}-\text{OH}$     d)  $\text{CH}_3-\text{OH}$
275. The final subsidiary product in the following reaction is,  $\text{R}-\text{OH} + \text{PX}_3 \xrightarrow{\Delta} \text{R}-\text{X} + ?$   
a)  $\text{H}_3\text{PO}_3$     b)  $\text{HX}$   
c)  $\text{H}_3\text{PO}_4$     d)  $\text{HPO}_4$
276. Which one of the following process is used to distinguish between the three types of alcohols?  
a) Reduction    b) Hydrolysis  
c) Oxidation    d) Hydrogenation
277. Ketone is the first oxidative product of,  
a)  $1^\circ$  alcohol    b)  $3^\circ$  alcohol  
c)  $2^\circ$  alcohol    d) acid
278. The compound which liberates  $\text{H}_2$  gas with sodium metal is,  
a) aldehyde    b) ethanol  
c) ether    d) ketone
279. 1-propenol is converted into propene, which of the following agent is used?  
a) ale.  $\text{KOH}$     b) dil.  $\text{NaOH}$   
c) dil.  $\text{HCl}$     d) cone.  $\text{H}_2\text{SO}_4$
280. Optical isomer of molecular formula  $\text{C}_4\text{H}_{10}\text{O}$  on  $\alpha$ -elimination gives  
a) butanal    b) 2-methyl propanal  
c) 2-butanone    d) 2-methyl propene
281. Which of the following is associated liquids?  
a)  $\text{ROH}$     b)  $\text{H}_2\text{O}$   
c)  $\text{RNH}_2$     d) All of these
282. Methyl alcohol on oxidation with acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  gives  
a)  $\text{CH}_3\text{CHO}$     b)  $\text{HCOOH}$   
c)  $\text{CH}_3\text{COCH}_3$     d)  $\text{CH}_3\text{COOH}$
283. 2-butanol on dehydration mainly gives,  
a)  $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$   
b)  $\text{CH}_3\text{CH}=\text{CHCH}_3$   
c)  $(\text{CH}_3)_2\text{C}=\text{CH}_2$     d)  $\text{CH}_3\text{CH}=\text{CH}_2$
284. 1-propanol can be converted into 1-chloro propane by  $\text{HCl}$  in the presence of catalyst,  
a) hydrous  $\text{ZnCl}_2$     b) anhydrous  $\text{ZnCl}_2$   
c)  $\text{H}_3\text{PO}_4$     d)  $\text{P}_2\text{O}_5$
285. Oxidation means,  
a) addition of oxygen  
b) increase in oxidation state  
c) loss of electron  
d) all of these
286. Which statement is not correct about the alcohols?  
a) Alcohols involves H-bonding  
b) Alcohols evaporates quickly than water  
c) Alcohols of less number of carbon atoms are less soluble than more number of carbon atoms  
d) All of these
287. Product 'B' of the following reaction is  
$$\text{CH}_3-\text{Cl} + \text{CH}_3-\text{COOAg} \longrightarrow \text{A} \xrightarrow{\text{H}_2+\text{Ni}} \text{B}$$
  
a)  $\text{CH}_3-\text{OH}$  and  $\text{C}_2\text{H}_5-\text{OH}$   
b)  $\text{CH}_3-\text{CHO}$  and  $\text{CH}_3-\text{OH}$   
c)  $\text{CH}_3-\text{CHO}$  and  $\text{CH}_3-\text{CHO}$   
d)  $\text{C}_2\text{H}_5-\text{OH}$  and  $\text{C}_2\text{H}_5-\text{OH}$
288. Find out correct reducing agent in following conversion.  
$$\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{COOH} \longrightarrow \text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$$
  
a)  $\text{H}_2 + \text{Ni}$     b)  $\text{NaBH}_4$   
c)  $\text{NaHg} + \text{H}_2\text{O}$     d)  $\text{LiAlH}_4$
289. Compound A (ester) reacts with  $\text{LiAlH}_4$  gives B and C. Compound B on oxidation gives acetic acid and compound C on oxidation gives formic acid. The compound 'A' is  
a)  $\text{C}_2\text{H}_5-\text{COOCH}_3$     b)  $\text{CH}_3\text{COOC}_2\text{H}_5$   
c)  $\text{CH}_3-\text{COOCH}_3$     d)  $\text{CH}_3-\text{CH}_2-\text{COOH}$
290. Which of the following compound have covalent and ionic bond?  
a)  $\text{R}-\text{OH}$     b)  $\text{H}-\text{O}-\text{H}$   
c)  $\text{R}-\text{X}$     d)  $\text{R}-\text{ONa}$
291. 
$$\begin{array}{c} \text{OH} \\ | \\ (\text{CH}_3)_2\text{CH}-\text{CH}-\text{CH}_3 \end{array} \xrightarrow{\text{Al}_2\text{O}_3} \text{X}$$
  
Give the IUPAC name of major product formed in the reaction  
a) 3-methyl 2-butene    b) isobutylene  
c) 2-methyl 2-butene    d) 2-methyl 1-propene
293. Which of the following is / are correct?  
a) Absolute alcohol is 100 % ethanol

305.  $A \xrightarrow[\text{dil. H}_2\text{SO}_4]{\text{K}_2\text{C}_2\text{O}_7} B \xrightarrow[\text{H}_2\text{O}]{\text{CH}_3\text{MgI}} \text{CH}_3 - \overset{\overset{\text{CH}_3}{|}}{\underset{\underset{\text{OH}}{|}}{\text{C}}} - \text{CH}_3$

a)  $\text{CH}_3\text{CHOHCH}_3$   
c)  $\text{C}_2\text{H}_5\text{OH}$   
b)  $\text{CH}_3\text{COCH}_3$   
d)  $\text{CH}_3\text{COOH}$

306.  $\text{ZnXF}$  or the reaction  $\text{C}_2\text{H}_5\text{OH} + \text{HX} \xrightarrow{\text{ZnX}_2}$   
 $\text{C}_2\text{H}_5\text{X}$ .  
 The order of reactivity is  
 a)  $\text{HBr} > \text{HI} > \text{HCl}$     b)  $\text{HI} > \text{HCl} > \text{HBr}$   
 c)  $\text{HI} > \text{HBr} > \text{HCl}$     d)  $\text{HCl} > \text{HBr} > \text{HI}$



307. Ethanol is converted into ethyl chloride by reacting with
- $\text{POCl}_3$
  - $\text{SOCl}_2$
  - $\text{KCl}$
  - $\text{NaCl}$
308. Which of following reducing agent is used to convert carboxylic acid into alcohol?
- $\text{Na.Hg} + \text{H}_2\text{O}$
  - $\text{LiAlH}_4$
  - $\text{NaBH}_4$
  - $\text{Sn} + \text{HCl}$
309. Primary, secondary and tertiary alcohols may be distinguished by employing
- Hoffmann's test
  - Fehling solution test
  - Lucas test
  - None of the above
310. Oxidation of ethanol by chromic acid forms
- ethanal
  - methanol
  - 2-propanone
  - ethanoic acid
311. Conc.  $\text{H}_2\text{SO}_4$  reacts with  $\text{C}_2\text{H}_5\text{OH}$  at 443K to form
- $\text{CH}_3\text{COCH}_3$
  - $\text{CH}_3\text{COOH}$
  - $\text{CH}_3\text{CHO}$
  - $\text{C}_2\text{H}_4$
312. Distinction between primary, secondary and tertiary alcohol is done by
- oxidation method
  - Lucas test
  - silver mirror test
  - both 'a' and 'b'
313. Low molecular weight alcohols are
- soluble in water
  - soluble on heating
  - insoluble in water
  - insoluble in all solvent
314. Isopropyl alcohol on oxidation forms
- acetone
  - ether
  - ethylene
  - acetaldehyde
315. Among the following compounds which can be dehydrated very easily is
- $$\text{CH}_3 - \text{CH}_2 - \overset{\text{CH}_3}{\underset{\text{OH}}{\text{C}}} - \text{CH}_2 - \text{CH}_3$$
  - $$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \overset{\text{OH}}{\text{CH}} - \text{CH}_3$$
  - $$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{OH}$$
  - $$\text{CH}_3 - \text{CH}_2 - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_2 - \text{CH}_2 - \text{OH}$$
316. Which of the following is not characteristic of alcohols?
- Lower alcohols are stronger and have bitter taste
  - Higher alcohols are stronger and have bitter taste
  - The boiling points of alcohols increase with increasing molecular mass
  - The lower alcohol are soluble in water
317. In reaction of alcohols with alkali metal which of the following alcohols will react fastest
- secondary
  - tertiary
  - primary
  - all equal
318. The  $-\text{OH}$  group of methyl alcohol cannot be replaced by chlorine by the action of
- chlorine
  - hydrogen chloride
  - phosphorus trichloride
  - phosphorus pentachloride
319. When ethanol is passed over red hot copper at 573K, the product formed is
- $\text{CH}_3\text{CHO}$
  - $\text{CH}_3\text{COCH}_3$
  - $\text{C}_2\text{H}_4$
  - $\text{CH}_3\text{COOH}$
320. A mixture of methanol vapours and air is passed over heated copper. The products are
- carbon monoxide and hydrogen
  - formaldehyde and  $\text{H}_2$  gas
  - formic acid and water vapour
  - carbon monoxide and water vapour
321. When ethyl alcohol reacts with thionyl chloride in the presence of pyridine, the product obtained is
- $\text{CH}_3\text{CH}_2\text{Cl} + \text{HCl}$
  - $\text{C}_2\text{H}_5\text{Cl} + \text{HCl} + \text{SO}_2$
  - $\text{CH}_3\text{CH}_2\text{Cl} + \text{H}_2\text{O} + \text{SO}_2$
  - $\text{H}_3\text{CH}_2\text{Cl} + \text{Cl}_2 + \text{SO}_2$
322. Primary alcohols on dehydration give
- alkenes
  - ether
  - alkane
  - ester
323. Primary and secondary alcohols on action of reduced copper give
- aldehydes and ketones respectively
  - ketones and aldehydes respectively
  - only aldehydes
  - only ketones
324. Methyl alcohol on oxidation with acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  gives
- $\text{CH}_3\text{COCH}_3$
  - $\text{CH}_3\text{CHO}$



- c)  $\text{HCOOH}$                       d)  $\text{CH}_3\text{COOH}$
325. Ethyl alcohol on oxidation with  $\text{K}_2\text{Cr}_2\text{O}_7$  gives  
 a) acetic acid                      b) acetaldehyde  
 c) formaldehyde                  d) formic acid
326. On heating ethanol with excess of cone.  $\text{H}_2\text{SO}_4$  at 443K, product obtained is  
 a) ethene                              b) ethane  
 c) ethyne                              d) ethoxy ethane
327. When 3, 3-dimethyl 2-butanol is heated with  $\text{H}_2\text{SO}_4$  the major product obtained is  
 a) 2, 3-dimethyl 1-butene  
 b) 3, 3-dimethyl 1-butene  
 c) 2, 3-dimethyl 2-butene  
 d) cis and trans isomers of 2, 3-dimethyl 2-butene
328. Which of the following will give benzoic acid on oxidation?  
 a) Benzyl alcohol                  b) Benzaldehyde  
 c) Acetophenone                  d) All of these
329. n-propyl alcohol and isopropyl alcohol can be chemically distinguished by which reagent  
 a)  $\text{PCl}_5$   
 b) reduction  
 c) oxidation with potassium dichromate  
 d)  $\text{PCl}_3$
330. Which of the following pairs of alcohols are distinguished by oxidation test, Lucas test and haloform test?  
 a) Methanol and ethanol  
 b) Ethanol and 3-pentanol  
 c) Ethanol and 2-propanol  
 d) 1-propanol and 3-pentanol
331. Consumption of alcohol by vehicle drivers is detected by  
 a) blow of mouth air in test tube containing acidic  $\text{K}_2\text{Cr}_2\text{O}_7$   
 b) blow of mouth air in test tube containing alcoholic KOH  
 c) blow of mouth air in test tube containing  $\text{Cu}_2\text{O}$   
 d) blow of mouth air in test tube containing Schiff's reagent
332. Which of the following is pyridinium chlorochromate ?  
 a)  $\text{C}_6\text{H}_5\text{NH} + \text{CrO}_3\text{Cl}$  b)  $\text{C}_5\text{H}_5\text{NH} + \text{CrO}_3\text{Cl}$   
 c)  $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$                   d)  $\text{C}_5\text{H}_5\text{SO}_2\text{Cl}$
333. Separation of two layers are seen when Lucas reagent is treated with  
 a)  $\text{CH}_3\text{OH}$                               b)  $\text{CH}_3\text{Cl}$   
 c)  $(\text{CH}_3)_2\text{C}-\text{OH}$                   d)  $(\text{CH}_3)_2\text{C}-\text{Cl}$
334. Aluminium metal reacts with alcohol gives  
 a)  $\text{ROAl}$                                 b)  $(\text{RO})_2\text{Al}$   
 c)  $(\text{RO})_2\text{Al}$                           d)  $\text{RCOAl}$
335. When six mole of alcohol reacts with aluminium metal. How many gram of hydrogen is liberated?  
 a) 2                                        b) 4  
 c) 5                                        d) 6
336. Ethyl alcohol is reacted with acetyl chloride gives  
 a) ethyl acetate                      b) ethyl formate  
 c) ethyl propanoate                  d) ethyl methyl ketone
337. Methyl acetate is formed from methyl alcohol and what?  
 a) Acetic acid                          b) Acetic unhydride  
 c) Acetyl chloride                    d) All of these
338.  $\text{C}_2\text{H}_5\text{OH} + \text{A} \xrightleftharpoons{\text{H}^+} \text{C}_2\text{H}_5\text{COOC}_2\text{H}_5 + \text{C}_2\text{H}_5\text{COOH}$   
 The compound 'A' is  
 a)  $\text{C}_2\text{H}_5\text{COCl}$                       b)  $(\text{C}_2\text{H}_5\text{CO})_2\text{O}$   
 c)  $\text{C}_2\text{H}_5\text{COOH}$                     d)  $\text{C}_2\text{H}_5\text{CHO}$

○○○



**SECTION - I : ALCOHOLS**

1. a)	2. b)	3. b)	4. b)	5. c)	6. b)	7. d)	8. d)	9. a)	10. c)
11. c)	12. b)	13. c)	14. b)	15. b)	16. d)	17. b)	18. c)	19. b)	20. b)
21. b)	22. b)	23. c)	24. d)	25. c)	26. b)	27. a)	28. a)	29. c)	30. a)
31. b)	32. d)	33. b)	34. c)	35. c)	36. a)	37. d)	38. b)	39. b)	40. c)
41. b)	42. b)	43. d)	44. c)	45. d)	46. b)	47. c)	48. d)	49. a)	50. d)
51. d)	52. c)	53. a)	54. c)	55. d)	56. d)	57. c)	58. b)	59. c)	60. d)
61. a)	62. b)	63. b)	64. a)	65. d)	66. b)	67. c)	68. a)	69. b)	70. a)
71. d)	72. a)	73. a)	74. c)	75. a)	76. b)	77. d)	78. b)	79. b)	80. a)
81. d)	82. b)	83. d)	84. b)	85. d)	86. c)	87. d)	88. c)	89. a)	90. a)
91. b)	92. b)	93. c)	94. c)	95. a)	96. a)	97. b)	98. c)	99. b)	100. d)
101. d)	102. a)	103. b)	104. a)	105. b)	106. b)	107. a)	108. d)	109. c)	110. d)
111. c)	112. c)	113. a)	114. a)	115. b)	116. a)	117. c)	118. b)	119. b)	120. d)
121. d)	122. c)	123. b)	124. d)	125. c)	126. b)	127. d)	128. a)	129. b)	130. c)
131. a)	132. d)	133. b)	134. b)	135. d)	136. d)	137. c)	138. a)	139. a)	140. d)
141. b)	142. a)	143. b)	144. b)	145. d)	146. c)	147. b)	148. d)	149. d)	150. b)
151. d)	152. a)	153. b)	154. a)	155. c)	156. c)	157. c)	158. a)	159. c)	160. a)
161. d)	162. b)	163. d)	164. a)	165. d)	166. a)	167. a)	168. a)	169. b)	170. c)
171. d)	172. b)	173. b)	174. d)	175. a)	176. b)	177. c)	178. c)	179. a)	180. a)
181. b)	182. d)	183. b)	184. d)	185. b)	186. a)	187. b)	188. c)	189. c)	190. a)
191. a)	192. a)	193. b)	194. b)	195. d)	196. a)	197. b)	198. d)	199. d)	200. a)
201. b)	202. c)	203. c)	204. a)	205. d)	206. a)	207. b)	208. a)	209. c)	210. b)
211. d)	212. a)	213. a)	214. a)	215. a)	216. d)	217. d)	218. b)	219. b)	220. c)
221. d)	222. b)	223. c)	224. c)	225. c)	226. d)	227. c)	228. a)	229. a)	230. d)
231. a)	232. c)	233. c)	234. b)	235. b)	236. a)	237. c)	238. c)	239. b)	240. a)
241. c)	242. d)	243. c)	244. b)	245. a)	246. b)	247. c)	248. a)	249. d)	250. d)
251. d)	252. a)	253. a)	254. c)	255. d)	256. c)	257. a)	258. a)	259. b)	260. d)
261. b)	262. d)	263. b)	264. d)	265. c)	266. a)	267. b)	268. a)	269. b)	270. a)
271. b)	272. c)	273. b)	274. a)	275. a)	276. c)	277. c)	278. b)	279. d)	280. c)
281. d)	282. b)	283. b)	284. b)	285. d)	286. c)	287. a)	288. d)	289. c)	290. d)
291. c)	292. d)	293. c)	294. d)	295. b)	296. b)	297. b)	298. b)	299. d)	300. d)
301. b)	302. a)	303. c)	304. b)	305. a)	306. c)	307. b)	308. b)	309. c)	310. d)
311. d)	312. d)	323. a)	314. a)	315. a)	316. b)	317. c)	318. a)	319. a)	320. b)
321. b)	322. a)	323. a)	324. c)	325. a)	326. a)	327. c)	328. d)	329. c)	330. b)
331. a)	332. b)	333. c)	334. c)	335. d)	336. a)	337. d)	338. b)		

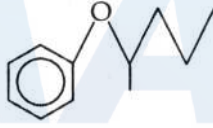





## MULTIPLE CHOICE QUESTIONS

INTRODUCTION, NOMENCLATURE,  
CLASSIFICATION, ISOMERISM

- An ether is
  - $R-O-R'$
  - $RCHO$
  - $RCOR$
  - $RCOOR$
- The monovalent RO group is called
  - alkyl group
  - alkoxy group
  - alkenyl group
  - all of these
- Which of the following is a simple ether?
  - $CH_3OC_2H_5$
  - $C_2H_5-OC_2H_5$
  - $C_2H_5OC_3H_7$
  - $CH_3CH_2OCH(CH_3)_2$
- Which of the following is an unsymmetrical ether?
  - $CH_3-O-C_3H_7$
  - $CH_3-O-CH_3$
  - $C_2H_5-O-C_2H_5$
  - All of these
- An example of a compound with the functional group  $-O-$  is
  - acetic acid
  - methyl alcohol
  - diethyl ether
  - acetone
- In  $R'-O-R$ , the  $R'$  is a higher alkyl group, it is come from
  - alkane
  - alcohol
  - both 'a' and 'b'
  - not predicted
- The IUPAC name of  $C_2H_5OCH_2CH(CH_3)_2$  is,
  - 3-ethoxy 2-methyl propane
  - 1-ethoxy 2-methyl propane
  - 1-ethoxy butane
  - 2-ethoxy butane
- IUPAC name of the following compound  $(CH_3)_2CHOC(CH_3)_2$  is,
  - t-butyl isopropyl ether
  - 2, (2-propoxy) 2-methyl propane
  - 2-methyl 1-ethoxy 2-propane
  - 1-methyl 2-propoxy 2-propane
- IUPAC name of ether is
  - alkyl alkanoate
  - alkoxy alkane
  - alkanamine
  - alkyl acetate
- IUPAC name of  $CH_3-O-C_2H_5$  is
  - ethoxy methane
  - methoxy methane
  - methoxy ethane
  - ethyl methyl ether
- IUPAC name of methyl n-propyl ether is
  - propoxy methyl
  - 2-methoxy propane
  - 1-methoxy propane
  - methyl propaonate
- According to Lewis concept of acids and bases, ether is
  - acidic
  - basic
  - neutral
  - amphoteric
- What is IUPAC name of compound when divalent oxygen atom is attached to n-propyl group and iso-propyl group?
  - Propoxy 2-propane
  - Propoxy ethane
  - 1 (2-propoxy) propane
  - 1-ethoxy butane
- Ethers have angular V-shaped geometry like
  - $NH_3$
  - $H_2O$
  - $CH_4$
  - $CH_3^+$
- The IUPAC name of  $CH_3OCH(CH_3)_2$  is,
  - 2-methoxy propane
  - 2-epoxy propane
  - 2-methoxy propane
  - 1-epoxy propane
- IUPAC name of the following compound is
 

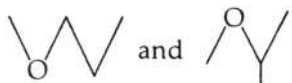


  - 2-pentoxy benzene
  - phenetol
  - 2-phenoxy pentane
  - isopentyl phenyl ether
- IUPAC name of the following compound is
 



  - 1-heptoxy benzene
  - heptyl phenyl ether
  - 1-phenoxy heptane
  - 2-phenoxy heptane
- Ethers are
  - Lewis acid
  - acid
  - Lewis base
  - base
- IUPAC name of  $CH_3-O-C(C_2H_5)_2$  is
  - 3-methoxy 2-ethyl pentane
  - 2-methoxy 2-ethyl pentane

- c) 3-methoxy 3-ethyl pentane  
d) 2-methoxy 3-ethyl pentane
20. How many metamers are possible for molecular formula  $C_4H_{10}O$  ?  
a) 3                                      b) 7  
c) 5                                      d) 2
21. Following compounds are



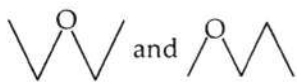
- a) chain isomer                      b) linkage isomers  
c) position isomer                  d) functional isomers
22. IUPAC name of following compound is  $(CH_3)_3C-O-CH_2CH(CH_3)_2$   
a) 2 (2-methyl 1-propoxy) 2-methyl propane  
b) 1 (2-methyl 2-propoxy) 2-methyl propane  
c) 1 (2-propoxy) 2-methyl propane  
d) 2 (2-propoxy) 2-methyl propane
23. IUPAC name of ethyl t-butyl ether is  
a) 2-ethoxy propane  
b) 2-ethoxy 2-methyl propane  
c) 2-ethoxy 2, 2-dimethyl ethane  
d) 2-ethoxy 1-methyl propane
24. The compounds  $CH_3-O-C_3H_7$  and  $C_2H_5-O-C_2H_5$  exhibit  
a) metamerism                      b) chain isomerism  
c) optical isomerism              d) cis-trans isomerism
25. Molecular formula  $C_4H_{10}O$  has ..... isomeric ethers,  
a) 4                                      b) 3  
c) 7                                      d) 5
26. The compound which is not isomeric with diethyl ether is  
a) butan-1-ol  
b) 2-methyl propan-2-ol  
c) butanone  
d) n-propyl methyl ether
27. Diethyl ether exhibits metamerism with  
a)  $CH_3OCH_2CH_2CH_3$       b)  $CH_3OCH(CH_3)_2$   
c) both 'a' and 'b'                  d)  $CH_3COC_2H_5$
28. Ethers are isomeric with  
a) aldehydes                          b) alcohols  
c) acids                                  d) ketones
29.  $CH_3CH_2CH_2OH$  is functional isomer of  
a) ethyl methyl ether  
b) ethyl n-propyl ether

- c) methyl n-propyl ether  
d) 2-propanol
30. The compound which is functional isomer of diethyl ether is,  
a) 1-methoxy propane  
b) 1-butanol  
c) 2-methoxy propane  
d) both 'a' and 'c'
31. The compound is not isomeric with diethyl ether  
a) 1-butanol  
b) 2-propanol  
c) 2-methyl 2-propanol  
d) 2-butanol
32. 1-methoxy propane and 2-methoxy propane are  
a) position isomers                  b) chain isomers  
c) metamers                          d) functional isomers
33. Dimethyl ether is associated with which one of the isomer?  
a) Ethanol                              b) Methanol  
c) Formic acid                          d) Methyl formate
34. Molecular formula  $C_4H_{10}O$  exhibits  
a) chain isomerism                  b) position isomerism  
c) metamerism                          d) all of these
35. Which of the following compound shows metamerism ?  
a)  $CH_3OCH_3$                           b)  $CH_3OC_3H_7$   
c)  $CH_3OC_2H_5$                           d)  $CH_3COC_2H_5$
36. Molecular formula  $C_2H_6O$  shows  
a) functional isomerism  
b) metamerism  
c) position isomerism  
d) optical isomerism
37. Diethyl ether can be distinguished from butan-1-ol by  
a) aq.  $FeCl_3$                           b) Na metal  
c) Tollens reagent                      d) Fehling reagent
38.  $C_6H_5-O-CH_3$  can be named as  
a) phenoxy methane                  b) phenetole  
c) methoxy phenyl                      d) methoxy benzene
39. Ethers and alcohols are  
a) metamers                              b) functional isomers  
c) tautomers                              d) position isomers
40. Which isomerism is not possible in ethers?  
a) Tautomerism                          b) Chain isomerism  
c) Metamerism                          d) Position isomerism
41. Which of the following compound show



metamerism ?

- a)  $\text{CH}_3\text{--O--CH}_3$       b)  $\text{CH}_3\text{--CO--CH}_3$   
 c)  $\text{CH}_3\text{NHCH}_3$       d)  $\text{CH}_3\text{--O--C}_3\text{H}_7$
42. Metamerism is advance type of  
 a) optical isomerism  
 b) geometrical isomerism  
 c) chain and position isomerism  
 d) only chain isomerism
43. Geometry of ether is  
 a) linear  
 b) pyramidal  
 c) trigonal planar  
 d) octahedral
44. Following compounds are

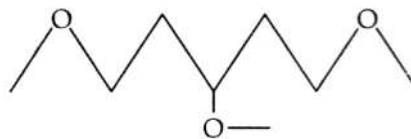


- a) functional isomers    b) metamers  
 c) chain isomers      d) position isomers
45. Metamerism is possible in  
 a) same polyvalent functional group  
 b) same monovalent functional group  
 c) different polyvalent functional group  
 d) different monovalent functional group
46. Which of the following compound does not show metamerism ?  
 a)  $\text{CH}_3\text{--O--CH}_3$       b)  $\text{CH}_3\text{--O--C}_4\text{H}_9$   
 c)  $\text{CH}_3\text{--O--C}_3\text{H}_7$       d)  $\text{CH}_3\text{--O--C}_5\text{H}_{11}$
47. Following compound can be named as  $\text{CH}_3\text{--O--(CH}_2)_4\text{CH}_3$   
 a) 3-methoxy pentane    b) 2-methoxy pentane  
 c) 4-methoxy pentane    d) 1-methoxy pentane
48. Following compounds are



- a) metamers      b) position isomers  
 c) chain isomers    d) functional isomers
49. How many metamers are possible for molecular formula  $\text{C}_5\text{H}_{12}\text{O}$   
 a) 4      b) 6  
 c) 8      d) 10
50. How many ethers are possible for formula  $\text{C}_5\text{H}_{12}\text{O}$   
 a) 12      b) 14  
 c) 8      d) 6

51. IUPAC name of following compound is





- a) 1, 3, 5-trimethoxy pentane  
 b) 2, 4, 8 trioxa nonane  
 c) 1, 3, 5 trimethoxy heptane  
 d) 1, 3, 5 trimethoxy hexane
52. Hydride of ether is  
 a) aldehyde      b) alcohol  
 c) ketone      d) carboxylic acid

### PREPARATION METHODS

53. The reaction of  $\text{CH}_3\text{CH}_2\text{Br}$  and  $(\text{CH}_3)_2\text{CONa}$  to form ether is called  
 a) Williamson reaction  
 b) Wurtz reaction  
 c) Cannizzaros reaction  
 d) Hoffmans reaction
54. Which of the following reaction does not form ether?  
 a)  $\text{RX} + \text{aq. KOH}$   
 b)  $\text{RX} + \text{RONa}$   
 c)  $\text{CH}_2\text{N}_2 + \text{ROH}$   
 d)  $\text{ROH} + \text{H}_2\text{SO}_4$  at 413 K
55. Reaction between sodium ethoxide and bromoethane forms  
 a) ethyl methyl ether    b) diethyl ether  
 c) dimethyl ether      d) acetic acid
56. Williamson's reaction is  
 a)  $\text{SN}^1$  reaction of  $\text{R-X}$   
 b)  $\text{SN}^2$  reaction of  $\text{R-X}$   
 c)  $\text{SN}^2$  reaction of alkoxide  
 d) dehydration of  $\text{R-X}$
57. In Williamson reaction intermediate formed is  
 a) carbocation      b) free radical  
 c) carbanion      d) T.S
58. Select incorrect statement about following reaction of ether synthesis:  
 $\text{R-X} + \text{R}'\text{ONa} \longrightarrow \text{ROR}' + \text{NaX}$   
 a) It follows  $\text{S}_{\text{N}}2$  mechanism  
 b) Alkyl halide ( $\text{RX}$ ) should be  $2^\circ$  or  $3^\circ$  while alkoxide ( $\text{RO-Na}^+$ ) should be  $1^\circ$   
 c) Alkyl halide should be  $1^\circ$  while alkoxide should be  $2^\circ$  or  $3^\circ$ .



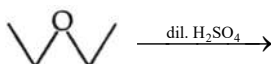
- d) 2° and 3° alkyl halide may undergo E2 elimination in the presence of a strong base to form alkenes.
59. Consider following reactions:
- I.  + CH<sub>3</sub>I →
- II.  + CH<sub>3</sub>ONa →
- III. (CH<sub>3</sub>)<sub>3</sub>C-Cl + CH<sub>3</sub>ONa →
- IV. (CH<sub>3</sub>)<sub>3</sub>C-ONa + CH<sub>3</sub>Cl →
- Which of the above methods cannot be used in the synthesis of ether?
- a) I, IV                      b) I, III  
c) II, IV                    d) II, III
60. Catalytic dehydration of ethanol at 413 K gives
- a) ethene                    b) ethoxy ethane  
c) ethane                    d) epoxy ethane
61. Preparation of ether from ethanol by continuous etherification process is
- a) S<sub>N</sub><sup>1</sup> reaction              b) S<sub>N</sub><sup>2</sup> reaction  
c) E<sup>1</sup> reaction                d) E<sup>2</sup> reaction
62. Williamson's reaction of 3° alkyl halide is
- a) S<sub>N</sub><sup>1</sup> reaction              b) Elimination reaction  
c) S<sub>N</sub><sup>2</sup> reaction                d) Reduction
63. Density of ether is
- a) higher than water      b) equal to water  
c) lower than water      d) can't be predicted
64. Sodium phenoxide is reacted with ethyl chloride gives
- a) o-ethyl sodium phenoxide  
b) p-ethyl sodium phenoxide  
c) ethoxy benzene  
d) m-ethyl sodium phenoxide
65. Methoxy benzene is prepared from CH<sub>3</sub>-Cl and what?
- a) phenol                    b) sodium benzoate  
c) sodium phenoxide      d) benzyl chloride
66. Which is the leaving group in the following reaction?
- $$\text{CH}_3\text{OH} + \text{CH}_2\text{N}_2 \xrightarrow{\text{HBF}_4}$$
- a) H<sub>2</sub>O                      b) N<sub>2</sub>  
c)  $\text{C}^+\text{H}_3$                     d) H<sup>+</sup>
67. In the preparation of ether, one of the reactant is R-X another is
- a) ale. R-ONa              b) moist Ag<sub>2</sub>O  
c) CH<sub>2</sub>N<sub>2</sub>                    d) RCOONa
68. Select correct statement(s) about following reaction:
- $$2\text{R-OH} \xrightarrow{\text{H}^+} \text{R-O-R} + \text{H}_2\text{O}$$
- a) It is an example of S<sub>N</sub> reaction in which protonated alcohol is the substrate and second molecule of alcohol is the nucleophile.  
b) It is intermolecular dehydration of alcohols  
c) This reaction can be S<sub>N</sub>2 if alcohol is 1°  
d) All of the above statements are correct.
69. Continuous etherification process based upon
- a) oxidation  
b) intermolecular dehydration  
c) intramolecular dehydration  
d) reduction
70. In continuous etherification process 1st step is
- a) formation of carbocation  
b) protonation of alcohol  
c) loss of proton from oxocation  
d) cleavage of O-H bond in alcohol
71. Consider the following alkyl halides
- 1) (CH<sub>3</sub>)<sub>3</sub>CBr                2) CH<sub>3</sub>Br  
3) C<sub>2</sub>H<sub>5</sub>Br                    4) CH<sub>3</sub>CHBrCH<sub>3</sub>
- Arrange these alkyl halides in decreasing order of reactivity in Williamson reaction.
- a) 1 > 4 > 3 > 2              b) 1 > 2 > 3 > 4  
c) 4 > 3 > 2 > 1              d) 2 > 3 > 4 > 1
72. When ethyl hydrogen sulphate is heated with ethanol at 413 K, the product formed is
- a) ethyne                    b) ethene  
c) diethyl ether              d) diethyl sulphate
73. Diethyl ether is conveniently prepared in laboratory from
- a) diazomethane  
b) continuous etherification process  
c) Williamson's synthesis  
d) all of these
74. In Williamson's synthesis t-alkyl halide can not be used for preparation of alkyl t-butyl ether, because
- a) it is difficult to remove halogen atom  
b) the reaction becomes reversible  
c) it is not reactive

- d) it readily decompose to give olefin
75. Which of the following pair is used to prepare 2-ethoxy 2-methyl propane?
- $(\text{CH}_3)_3\text{CCl} + \text{C}_2\text{H}_5\text{ONa}$
  - $(\text{CH}_3)_3\text{CONa} + \text{C}_2\text{H}_5\text{Cl}$
  - $\text{CH}_3\text{CH}_2\text{ONa} + \text{C}_2\text{H}_5\text{Cl}$
  - $\text{CH}_3\text{CH}_2\text{CH}_2\text{ONa} + \text{C}_2\text{H}_5\text{Cl}$
76. Ethyl iodide on treatment with sodium methoxide gives
- $\text{CH}_3\text{—O—CH}_3$
  - $\text{C}_2\text{H}_5\text{OCH}_3$
  - $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$
  - $\text{C}_2\text{H}_6$
77. In the preparation of aromatic ether one of the reactant is sodium phenoxide, another is
- $\text{R—OH}$
  - $\text{R—Cl}$
  - $\text{R—CHO}$
  - $\text{R—COONa}$
78. In Williamson's synthesis
- sodium alkoxide is treated with alkyl halide
  - sodium metal is treated with alkyl halide
  - an excess of alcohol is treated with conc.  $\text{H}_2\text{SO}_4$  at 413 K
  - vapours of alcohol are passed over heated  $\text{Al}_2\text{O}_3$  at 633 K
79. Excess of ethanol is heated with cone.  $\text{H}_2\text{SO}_4$  at 413 K. the compound that distills is
- diethyl sulphate
  - diethyl ether
  - ethylene hydrogen sulphate
  - ethylene
80. 1-butanol is reacted with diazomethane to give,
- 1-methoxy butane
  - 2-methoxy butane
  - 1-ethoxy butane
  - 2-ethoxy butane
81. Which of the following statement(s) is/are true about Williamsons synthesis?
- It is desirable to use primary  $\text{R—X}$
  - This method is particularly used for preparation of mixed ether
  - It is best to use the alkoxide of  $2^\circ$  and  $3^\circ$  alcohols
  - All of these
82. 2-ethoxy propane is effectively prepared from
- isobutyl iodide
  - isopropyl iodide
  - ethyl iodide
  - n-propyl iodide
83. The reaction between  $\text{C}_2\text{H}_5\text{ONa} + \text{C}_2\text{H}_5\text{I}$  to give  $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$  is called
- Wurtz reaction
  - Kobles synthesis
  - Williamson synthesis
  - Hoffman reaction
84. The reaction of alkali alcoholate and monohalo alkane is called as,
- Wurtz reaction
  - Cannizzaros reaction
  - Williamsons synthesis
  - Aldol condensation
85. Williamson's synthesis is used to prepare
- diethyl ether
  - amine
  - ethanol
  - ethanal
86. The intermediate product obtained during continuous etherification process is,
- alkyl hydrogen sulphite
  - alkyl hydrogen sulphate
  - alkyl sulphate
  - alkyl sulphite
87. Reaction of t-butyl bromide with sodium methoxide produces
- sodium tertiary butoxide
  - tertiary butyl methyl ether
  - isobutane
  - isobutylene
88. Excess of isopropyl alcohol is heated with cone,  $\text{H}_2\text{SO}_4$  at 413 K, gives
- $(\text{CH}_3)_2\text{CHOCH}(\text{CH}_3)_2$
  - $\text{CH}_3\text{CH}=\text{CH}_2$
  - both 'a' and 'b'
  - none of these
89. From Williamsons synthesis, which one of the following is most desirable to prepare ether?
- $3^\circ \text{R—X}$  and alkoxide of  $1^\circ$  alcohol
  - $3^\circ \text{R—X}$  and alkoxide of  $2^\circ$  alcohol
  - $2^\circ \text{R—X}$  and alkoxide of  $1^\circ$  alcohol
  - $1^\circ \text{R—X}$  and alkoxide of  $3^\circ$  alcohol
90. Methoxy ethane is obtained by  $\text{C}_2\text{H}_5\text{OH}$  and what?
- $\text{CH}_3\text{Cl}$
  - $\text{CH}_3\text{ONa}$
  - $\text{CH}_2\text{N}_2$
  - $\text{CH}_2\text{Cl}_2$
91. Intermolecular dehydration of alcohol gives
- Alkenes
  - Ethers
  - Alkynes
  - Aldehydes
92. In the formation of ether, one of the compound is alcohol another is
- $\text{R—ONa}$
  - $\text{CH}_2\text{N}_2$
  - $\text{R—OAg}$
  - $\text{R—OK}$
93. The reaction given below is known as
- $$\text{C}_2\text{H}_5\text{ONa} + \text{IC}_2\text{H}_5 \rightarrow \text{C}_2\text{H}_5\text{OC}_2\text{H}_5 + \text{NaI}$$

- a) Kolbe's synthesis  
b) Wurtz's synthesis  
c) Williamson's synthesis  
d) Grignard's synthesis
94. Ether is prepared by  
a) Williamson's synthesis  
b) Wurtz's reaction  
c) Fridel–Craft's reaction  
d) Hoffman bromide reaction
95. When an alkyl halide is allowed to react with a sodium alkoxide the product most likely?  
a) An aldehyde                      b) A ketone  
c) An ether                              d) A carboxylic acid

### PROPERTIES AND USES

96. When ethyl methyl ether is reacted with cold cone. HI gives ethanol and methyl iodide. The reaction proceeding through  
a)  $SN^1$                                   b)  $SN^2$   
c)  $E^1$                                     d)  $E^2$
97. When t-butyl methyl ether is reacted with cold cone. HI to gives t-butyl iodide and methyl alcohol. The reaction proceeding through  
a)  $SN^1$                                   b)  $SN^2$   
c)  $E^1$                                     d)  $E^2$
98. Halogenation of anisole is carried in the presence of catalyst  
a)  $FeCl_3$                                 b)  $AlCl_3$   
c)  $BF_3$                                  d)  $CH_3COOH$
99. Bromination of anisole gives major product  
a) o-bromoanisole  
b) p-bromoanisole  
c) m-bromoanisole  
d) di-orthobromoanisole
100. Nitration of phenyl alkyl ether gives  
a) o-nitro alkyl phenyl ether  
b) p-nitro alkyl phenyl ether  
c) mixture of ortho and para nitro phenyl alkyl ether  
d) m-nitro alkyl phenyl ether
101. Product of following reaction is



- a)  $C_2H_5OH$                               b)  $CH_3CHOHCH_3$   
c)  $C_2H_5OSO_3H$                       d)  $CH_3CH_2CH_2OH$
102. Which of the following ether produces methyl alcohol when reacts with cold HBr

- a) 2-Methyl 2-methoxy propane  
b) 2-methoxy propane  
c) 1-methoxy propane  
d) methoxy ethane
103. Two mole of alkyl iodide is formed when ether react with  
a) Hot  $I_2$                                 b) Cold HI  
c) Cold  $I_2$                                 d) Hot HI
104. C–O bond in ether is not cleaved by  
a) HCl                                      b) Dil.  $H_2SO_4$   
c) HBr                                      d) HI
105. Acidic hydrolysis of ether gives  
a) Two mole of aldehyde  
b) One mole of alcohol  
c) One mole of aldehyde  
d) Two mole of alcohol
106. Reaction of dimethyl ether with cold HI is  
a)  $E^2$  reaction                              b)  $SN^1$  reaction  
c)  $E^1$  reaction                              d)  $SN^2$  reaction
107. Molecular formula  $(A)C_4H_{10}O$  on acid hydrolysis gives two mole of same alcohol. The compound A is  
a) 2-methoxy propane  
b) 1-methoxy propane  
c) t-butyl alcohol  
d) Oiethyl ether
108. Ethers are reacted with cold HI gives  
a) One mole alcohol and one mole of alkyl iodide  
b) Two mole alcohol  
c) Two mole of alkyl iodide  
d) Two mole alcohol and one mole of alkyl iodide
109. The reaction  $CH_3OC_2H_5$  with cold HI gives  
a)  $CH_3OH + C_2H_5I$                       b)  $CH_3I + C_2H_5OH$   
c)  $CH_3I + C_2H_5I$                       d)  $CH_3OH + C_2H_5OH$
110. Diethyl ether on heating with cone. HI gives two moles of  
a) ethanol                                  b) iodoform  
c) ethyl iodide                              d) methyl iodide.
111. Natalite is a mixtu re of,  
a) diethyl ether and methanol  
b) diethyl ether and ethanol  
c) dimethyl ether and methanol  
d) dimethyl ether and ethanol
112. Ethers are inactive because they do not contain  
a) active atom                              b) active group  
c) multiple bond                              d) all of these

113. Diethyl ether with cold HI yields,

- a)  $C_2H_5I$   
 b)  $C_2H_5OH$   
 c)  $C_2H_5I$  and  $C_2H_5OH$   
 d) none of these

114. An hypothetical compound does not react with sodium metal. Which type of compound behave like this?

- a) Alcohol                      b) Phenols  
 c) Ethers                        d) Acid

115. The ethers heated with excess of HI gives three different products. The ether will be,

- a) simple  
 b) mixed  
 c) either simple or mixed  
 d) unpredictable in nature

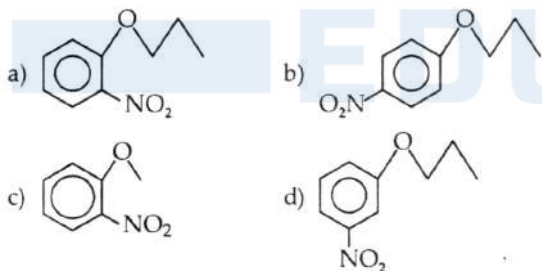
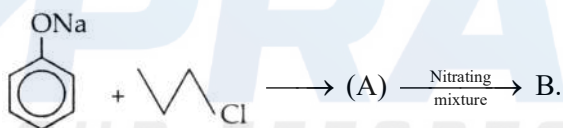
116. The compound which is mixed with alcohol to get a substitute for petrol is

- a) ethanol                      b) diethyl ether  
 c) acetaldehyde              d) propanol

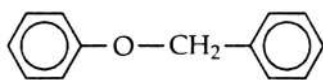
117. Oethyl ether does not react with

- a)  $\text{dil. } H_2SO_4$               b) HI  
 c)  $CH_3COOH$                 d)  $PCl_5$

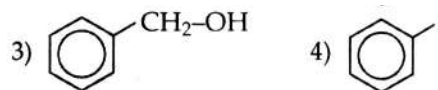
118. Find out major final product in following reaction.



119. The ether



when reacted with cold HI gives



- a) mixture of 3 and 4    b) mixture of 1 and 2  
 c) mixture of 2 and 3    d) mixture of 1 and 4

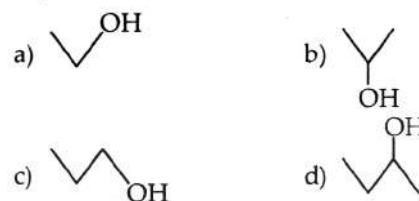
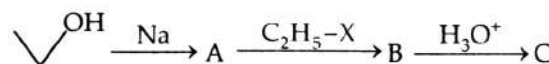
120. Diethyl ether can be regarded as unhydride of

- a)  $CH_3-OH$                       b)  $C_2H_5-OH$   
 c)  $C_2H_5-COOH$                 d)  $CH_3COOH$

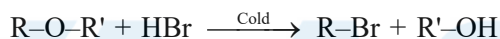
121. Dimethyl ether can be decomposed by heating with

- a)  $H_2O$                               b) NaOH  
 c)  $KMnO_4$                         d) HI

122. The product (C) in the following reaction is



123. Following reaction is of the type



If  $R'$  is  $3^\circ$  alkyl group and  $R$  is  $1^\circ$  alkyl group, then

- a)  $SN^1$  with tertiary alkyl group  
 b)  $SN^2$  with primary alkyl group  
 c) both of the above types  
 d) none of the above types

124. The mixture of ethanol and  $H_2SO_4$  is distilled in distillation flask at  $140^\circ C$ . The flask would then contain

- a)  $H_2SO_4$  and  $C_2H_5-O-C_2H_5$  only  
 b)  $H_2O$ ,  $H_2SO_4$  and  $C_2H_5OSO_3H$  only  
 c)  $H_2O$ ,  $C_2H_5OSO_3H$ ,  $C_2H_5$   
 d)  $C_2H_5-O-C_2H_5$ ,  $C_2H_5OSO_3H$ ,  $H_2SO_4$  and  $H_2O$

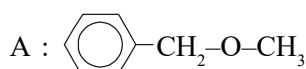
125. Methoxy ethane does not react with





- a) HI                                      b) HBr  
 c)  $\text{dil. } H_2SO_4$                         d) Na

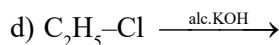
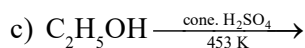
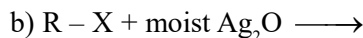
126. Which of the following will not form ether?

- a)  $R-X + C_6H_5ONa \longrightarrow$   
 b)  $R-X \xrightarrow{\text{moist } Ag_2O}$   
 c)  $R-X + R-ONa \longrightarrow$   
 d)  $CH_3N_2 + R-OH \xrightarrow{HBF_3}$

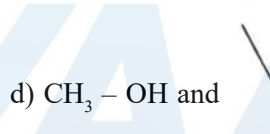
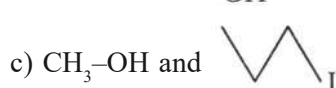
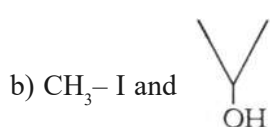
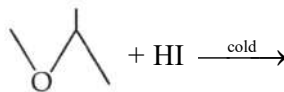
127. Anisole is reacted with cold HI gives  
 a) Benzyl iodide and methanol  
 b) Phenol and methanol  
 c) Iodobenzene and iodomethane  
 d) Phenol and iodomethane
128. Reaction of  $\text{CH}_3\text{OCH}_2\text{CH}_3$  is maximum with  
 a) HF  
 b) HCl  
 c) HBr  
 d) HI
129. Ethyl phenyl ether is reacted with cold cone. HBr gives  
 a) phenol and ethane  
 b) bromobenzene and ethane  
 c) bromobenzene and bromoethane  
 d) phenol and bromoethane
130. HI cleaves ether (A) forming



- a)   $\text{CH}_2\text{OH}$  and  $\text{CH}_3\text{I}$   
 b)   $\text{CH}_2\text{I}$  and  $\text{CH}_3\text{OH}$   
 c)   $\text{CH}_3\text{I}$  and  $\text{CH}_3\text{I}$   
 d)   $\text{CH}_2\text{OH}$  and  $\text{CH}_3\text{OH}$
131. Anisole on treatment with  $\text{Br}_2 / \text{CS}_2$  gives  
 a) bromobenzene  
 b) methyl 2-bromophenyl ether  
 c) o and p-bromoanisole  
 d) phenol
132. Which of the following is not cleaved by HI even at 525 K  
 a)  $\text{C}_6\text{H}_5\text{-O-CH}_3$   
 b)  $\text{CH}_3\text{-O-C}_2\text{H}_5$   
 c)  $\text{C}_6\text{H}_5\text{-O-C}_3\text{H}_7$   
 d)  $\text{C}_6\text{H}_5\text{-O-C}_6\text{H}_5$
133. Which is the most stable ion is formed in the protonation of  $(\text{CH}_3)_3\text{C-O-CH}_2\text{CH}_3$   
 a)  $(\text{CH}_3)_3\text{C-O}^+\text{H-CH}_2\text{CH}_3$   
 b)  $(\text{CH}_3)_3\text{C}^+$   
 c)  $\text{CH}_3\text{-CH}_2^+$   
 d) None of these
134. Which of the following reaction is not possible  
 a)  $\text{C}_2\text{H}_5\text{-O-C}_2\text{H}_5 \xrightarrow{\text{Na}}$

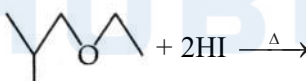


135. Methyl phenyl ether can be obtained by reacting  
 a) phenolate ions and methyl iodide  
 b) methoxide ion and bromobenzene  
 c) methanol and phenol  
 d) bromobenzene and methyl bromide
136. The major organic product in following reaction is

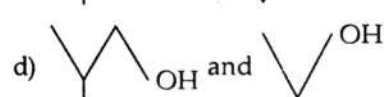
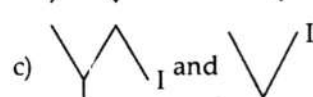
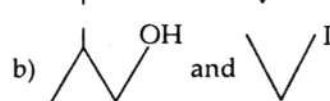
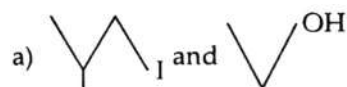


137. Formation ether from ethanol based on  
 a) dehydration  
 b) hydrogenation  
 c) dehydrogenation  
 d) hydration

138. In the reaction



which of the following compound will be formed?

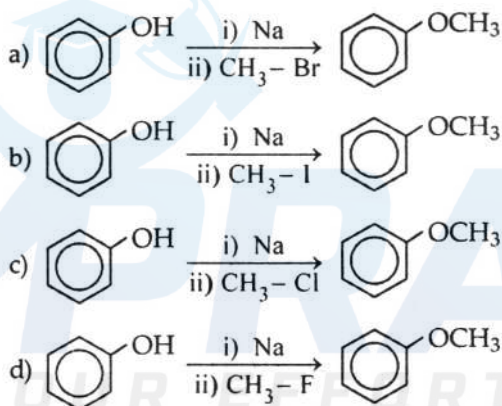


139. Compound 'A' react with  $\text{CH}_3\text{-Cl}$  gives B. B react with dil.  $\text{H}_2\text{SO}_4$  gives ethyl alcohol and  $\text{CH}_3\text{-OH}$ .

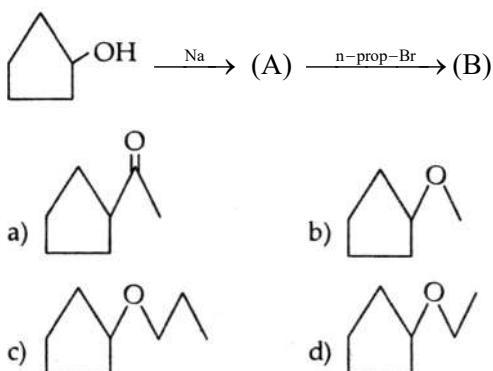


The compound A is

- a)  $C_2H_5-OH$                       b)  $CH_2=CH_2$   
 c)  $CH \equiv CH$                       d)  $C_2H_5-ONa$
140. In which of the following reaction product is t-butyl methyl ether
- a)  $C_2H_5-OH + C_2H_5-OH \xrightarrow{\text{conc. } H_2SO_4}$   
 b)  $(CH_3)_3C-Br + CH_3ONa \longrightarrow$   
 c)  $CH_3-Br + (CH_3)_3C-ONa \longrightarrow$   
 d)  $(CH_3)_3C-Br + CH_3-OH \longrightarrow$
141. Which of the following compound when heated with HI gives two mole of different alkyl iodide?
- a)  $C_2H_5-OH$                       b)  $C_2H_5-O-C_2H_5$   
 c)  $CH_3-O-C_2H_5$                   d)  $CH_3-O-CH_3$
142. Which of the following will gives good yield of ether?



143. Ethers can be prepared by
- 1) heating alkyl halide with R-OH
  - 2) boiling alkyl halide with alc.KOH
  - 3) heating alkyl halide with sodium alkoxide
  - 4) reacting alcohol with diazomethane
- a) 2,3,4                                  b) 1,2,3  
 c) 3,4                                    d) 1,2
144. Product of following reaction will be



145. What is the function of diethyl ether in Grignards reagent preparation
- 1) to act as a catalyst
  - 2) to act as a solvent
  - 3) to provide lone pair electron to co-ordination
  - 4) to act as an acid

- a) 1, 2                                  b) 2, 3  
 c) 3, 4                                  d) 2, 4

146. Phenetole react with cold HI gives

- a)  $C_6H_5-I + C_2H_5-OH$   
 b)  $C_2H_5-I + C_6H_5-OH$   
 c)  $C_6H_5CH_2-OH + C_2H_5-I$   
 d)  $C_6H_5-OH + CH_3-CH_2-CH_2OH$

147. Select the incorrect statement among the following

- a) C-O-C bond angle in ether is  $110^\circ$   
 b) ethoxy ethane is reacted with excess of HI gives ethyl iodide  
 c) ethers and alcohols are functional isomers  
 d) ethers are Lewis base hence do not react with Bronsted acid like  $H_2SO_4$

148. Which of the following statement about ethers is/are incorrect ?

- 1) Ethers are very reactive
- 2) Ethers are weakly acidic
- 3) Ethers are Lewis base
- 4) Ether form stable complex with Lewis acid

- a) 1, 2, 3                                  b) 1, 2  
 c) 2, 3, 4                                  d) 2, 4

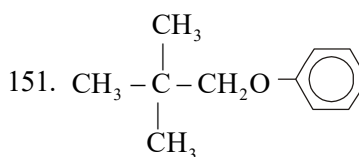
149.  $CH_3-O-C(CH_3)_3$  on reaction with dil.  $H_2SO_4$  under pressure gives (A) and (B). These are reacted with cold HI gives.

The compound A and B are respectively

- a)  $(CH_3)_3C-I$  and  $CH_3-I$   
 b)  $(CH_3)_3C-OH$  and  $CH_3-I$   
 c)  $(CH_3)_3C-I$  and  $CH_3-OH$   
 d)  $(CH_3)_3C-OH$  and  $CH_3-OH$

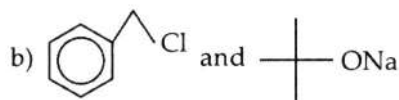
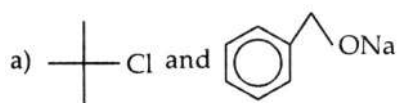
150. Conversion of alcohol to ether in the presence of conc.  $H_2SO_4$  is an example of

- a)  $SN^1$  reaction                      b)  $SN^2$  reaction  
 c)  $E^1$  reaction                        d)  $E^2$  reaction



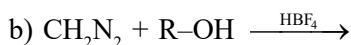
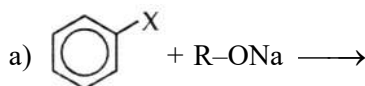


prepared from Williamson reaction using

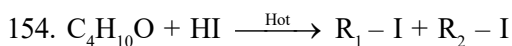
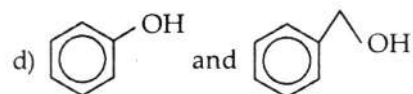
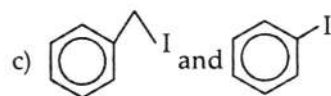
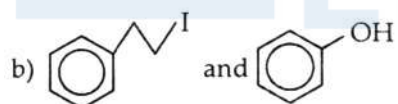
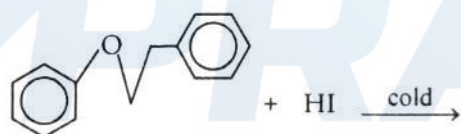


d) both b and c

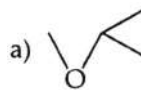
152. Which of the following is not useful for the synthesis of ether?



153. Product of following reaction is



$\text{R}_1\text{-I}$  and  $\text{R}_2\text{-I}$  on alkaline hydrolysis gives alcohols A and B respectively. The compound A and B gives haloform test. The original compounds is



155. Which of the following can not be made by Williamson's reaction?

- ethoxy ethane
- methoxy ethane
- 1-methoxy propane
- 2-(1,1-dimethylethoxy) propane

156. Some statements are given below about ethers,

- oxygen atom is  $\text{sp}^3$ -hybridised
- they are liquids at room temperature
- they have higher boiling point than alcohols
- they are very active

Among the above, correct statement(s) is/are

- only 1
- only 3 and 4
- only 1 and 2
- all of these

157. Which one of the following is incorrect about dimethyl ether?

- It has boiling point lower than alcohol
- It is symmetrical ether
- Its boiling point is more than ethanol
- On treating with hot HI give single product

158. Diethyl ether finds its use in medicine as

- anaesthetic
- antiseptic
- hypnotic
- pain killer

159. Ethers form co-ordination complexes with

- $\text{BF}_3$
- $\text{AlCl}_3$
- $\text{ZnCl}_2$
- all of these

160. Ethers on hydrolysis yield

- ketone
- acid
- alcohol
- aldehyde

161. Ethers are basic in nature owing to the presence of

- unshared electron pairs on oxygen
- alkyl group
- turn blue limus red
- all of these

162. Ethers with cone. HI at low temperature form

- alkyl iodide
- alcohol
- Both a and b
- oxonium salt

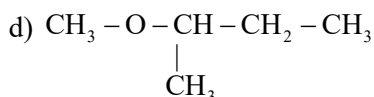
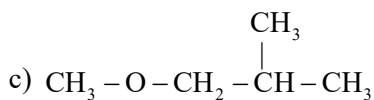
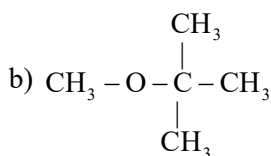
163. When ethyl isopropyl ether is reacted with HI in cold gives,

- $\text{C}_2\text{H}_5\text{I}$  and  $(\text{CH}_3)_2\text{CHOH}$
- $\text{C}_2\text{H}_5\text{I}$  and  $(\text{CH}_3)_2\text{CHI}$

- c)  $C_2H_5OH$  and  $(CH_3)_2CHI$   
 d)  $C_2H_5OH$  and  $(CH_3)_2CHOH$
164. Some statements are given below about ethers,  
 1. with strong acid, forms oxonium salt  
 2. mixture of diethyl ether and ethanol called as nata lite  
 3. t-butyl halide and sodium ethoxide give ethyl t-butyl ether  
 4. these are acids  
 Among the above, false statement(s) is/are  
 a) only 1 and 3                      b) only 2 and 4  
 c) only 3 and 4                      d) only 4
165. The compound that does not react with sodium is  
 a)  $CH_3OCH_3$                       b)  $CH_3COOH$   
 c)  $CH_3CHOHCH_3$                 d)  $C_2H_5OH$
166. Which of the following ether will give two successive members of homologous series, on acid hydrolysis?  
 a) Diethyl ether  
 b) Dimethyl ether  
 c) Ethyl methyl ether  
 d) Methyl n-propyl ether
167. The reaction of ether with HI is preferred than HBr because  
 a) HI is a stronger acid than HBr  
 b) HI gives a higher concentration of oxonium ion  
 c)  $I^-$  is a better nucleophile in  $SN_2$  reaction than the  $Br^-$  ion  
 d) all of these
168. Find out process involved in the following reaction,  

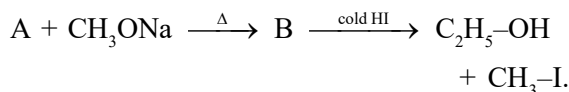
$$R-O-R + H_2O \xrightarrow[\text{under press}]{\text{dil. } H_2SO_4, \Delta} ROH + ROH$$
  
 a) hydrolysis                      b) oxidation  
 c) hydration                      d) reduction
169. The central oxygen atom in ether is  
 a)  $sp^2$ -hybridised                b)  $sp^3$ -hybridised  
 c)  $sp$ -hybridised                  d)  $dsp^2$ -hybridised
170. Which of the following statements is false in case of ethoxy ethane?  
 a) It is inflammable  
 b) It is simple ether  
 c) It react with Na metal  
 d) It is used as anaesthetic
171. Ether does not react with,  
 a) sodium metal  
 b) sodium hydroxide  
 c) phosphorus trichloride  
 d) all of these
172. Isobutyl n-butyl ether is reacted with cold conc. HI gives,  
 a)  $CH_3CH_2CH_2CH_2I + (CH_3)_2CHCH_2OH$   
 b)  $CH_3CH_2CH_2CH_2OH + (CH_3)_2CHCH_2I$   
 c)  $CH_3CH_2CH_2CH_2I + (CH_3)_2CHCH_2I$   
 d)  $CH_3CH_2CH_2CH_2OH + (CH_3)_2CHCH_2OH$
173. The reaction of  $CH_3OCH_2CH_3$  with hot excess HI gives  
 a)  $CH_3OH + CH_3CH_2I$   
 b)  $CH_3I + CH_3CH_2OH$   
 c)  $CH_3OH + CH_3CH_2OH$   
 d)  $CH_3I + CH_3CH_2I$
174. Ethers are mainly used as,  
 a) solvent                              b) cooling agent  
 c) anaesthetic                      d) substitute of petrol
175. A temperature of  $-110^\circ C$  can be obtained by using,  
 a) ether and  $CO_2$   
 b) ether and solid  $CO_2$   
 c) acetone and  $CO_2$   
 d) acetone and solid  $CO_2$
176. The cleavage of an ethyl methyl ether with cold hydrogen iodide will give  
 a) a molecule each of an methyl iodide and water  
 b) a molecule each of an ethyl iodide and water  
 c) a molecule each of ethanol and an methyl iodide  
 d) a molecule each of an ethyl iodide, methyl iodide and water
177. Which of the following is a gas at room temperature?  
 a)  $CH_3OCH_3$                       b)  $HCHO$   
 c) Both 'a' and 'b'                d)  $CH_3COCH_3$
178. Some statements are given below about ethers,  
 1. they are Lewis bases  
 2. their boiling point increases with increasing molecular weight  
 3. all are volatile liquids at room temperature  
 4. with water dimethyl ether form hydrogen bond  
 Among the above, false statement(s) is/are  
 a) only 4                              b) only 3 and 4  
 c) only 3                              d) none of these
179. Ether  $\xrightarrow[H_2O]{\text{dil. } H_2SO_4}$  two products.  
 One of the product on oxidation give acetic acid, while the other on oxidation give acetone. The ether is,

- a) ethyl n-propyl ether  
b) ethyl methyl ether  
c) ethyl isopropyl ether  
d) methyl isopropyl ether
180. Some statements are given below about diethyl ether,
- its boiling point lower than J-butanol
  - it is used as anaesthetic
  - with dilute  $\text{H}_2\text{SO}_4$ , it give two homologue
  - with cold HI give iodoethane
- Among the above, correct statement(s) is/are
- a) only 1                      b) only 1 and 2  
c) only 2                      d) only 1, 2 and 4
181. The number of bond pair and lone pair on oxygen atom in ether are respectively
- a) 1 and 2                      b) 2 and 1  
c) 2 and 2                      d) 1 and 3
182. Diethyl ether can be decomposed by heating with
- a) NaOH                      b)  $\text{KMnO}_4$  solution  
c) Water                      d) HI
183. Which of the following is most suitable reagent to distinguish ether from alcohol?
- a) Na metal                      b) HI  
c) HBr                      d) All of these
184. Which of the following is used in the preparation of  $\text{RMgX}$ ?
- a) Dimethyl ether                      b) Diethyl ether  
c) Ethyl methyl ether                      d) Ethanol
185. Which of the following give methyl alcohol with cold HBr
- a)  $\text{CH}_3\text{-O-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_3$



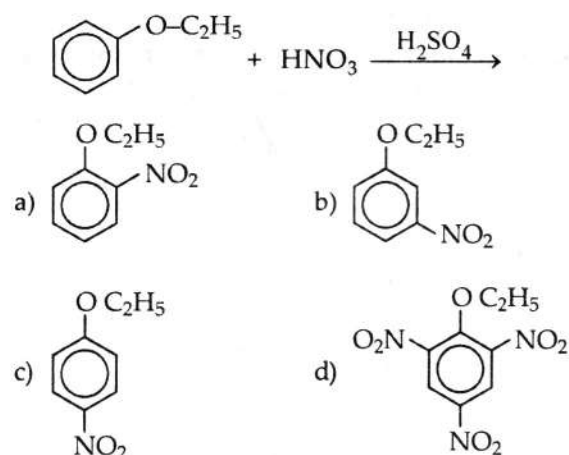
186. On heating diethyl ether with conc. HI, 2 moles of which of the following is formed?
- a) Ethanol                      b) Iodoform  
c) Ethyl iodide                      d) Methyl iodide

187. By the action of  $\text{CH}_3\text{I}$  on sodium ethoxide, we get
- a)  $\text{CH}_3\text{COOCH}_3$                       b)  $\text{CH}_3\text{COC}_2\text{H}_5$   
c)  $\text{CH}_3\text{OC}_2\text{H}_5$                       d) Ethyl acetate
188. Ethyl chloride is converted into diethyl ether by
- a) Wurtz synthesis  
b) Grignard reaction  
c) Perkin's reaction  
d) Willaimson's synthesis
189. Consider the following reaction



The compound A is

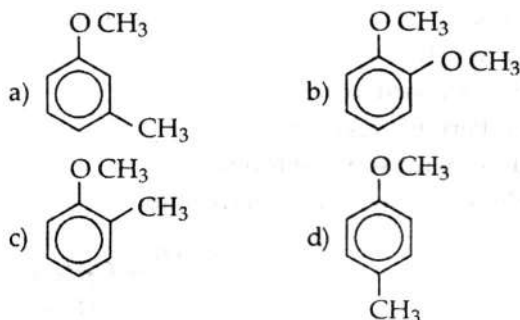
- a)  $\text{C}_2\text{H}_5\text{-OH}$                       b)  $\text{C}_2\text{H}_5\text{-CHO}$   
c)  $\text{C}_2\text{H}_5\text{-Br}$                       d)  $\text{C}_2\text{H}_5$
190. Which one of the following statement is not true regarding ether?
- a) These are Lewis bases  
b) They are highly inflammable.  
c) They on acid hydrolysis gives alcohol.  
d) These are Lewis acid
191. What are the product of following reaction?
- $$\text{C}_2\text{H}_5\text{OCH}_3 \xrightarrow{\text{Cold HI}}$$
- a)  $\text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{I}$   
b)  $\text{C}_2\text{H}_5\text{I} + \text{CH}_3\text{OH}$   
c)  $\text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{OH}$   
d)  $\text{C}_2\text{H}_5\text{I} + \text{CH}_3\text{I}$
192. IUPAC name of ethyl isopropyl ether
- a) 2-ethoxy propane  
b) 1-ethoxy propane  
c) 2-methyl 2-ethoxy propane  
d) 1-methyl 2-ethoxy propane
193. Major product of following reaction is



194. 4-alkoxy alkyl benzene is obtained from

- Friedel – Craft reaction
- Ulmann reaction
- Wurtz – fittig reaction
- Fittig reaction

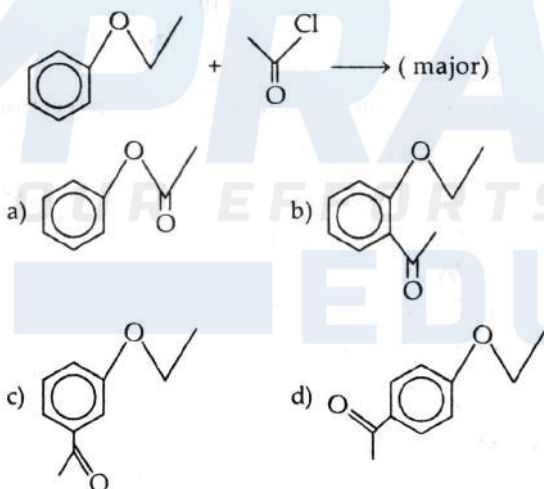
195. Minor product obtained when anisole on methylation



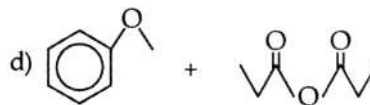
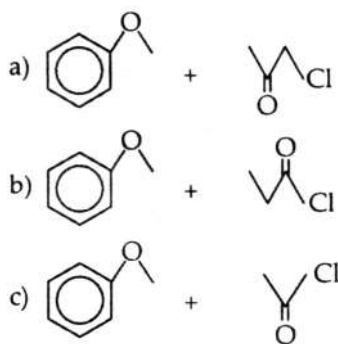
196. Acylation of alkyl phenyl ether gives

- 2-alkoxy alkyl phenyl ketone (major)
- 4-alkoxy alkyl phenyl ketone (minor)
- 4-alkoxy alkyl phenyl ketone (major)
- 3-alkoxy alkyl phenyl ketone (major)

197. Product of following reaction is



198. 4-methoxy acetophenone is obtained from



199. Actually 18-crown-6 ether means,

- 18-oxygen and 6 carbon
- 12-carbon and 6-oxygen
- 12-carbon and 12-oxygen
- 6-oxygen and 6-carbon

200. 18-crown-6 ether is able to trap

- $K^+$
- $Na^+$
- $Li^+$
- all of these

201. Which crown ether is used to extract cerium?

- 15-crown-5
- 18-crown-6
- 12-crown-4
- 10-crown-3

202. Diethyl ether is safe anesthetic agent. On administration it affects quickly to the central nerve system because

- it is more soluble in fatty acid than water
- it is more soluble in water than fatty acid
- it is not soluble in fatty acid
- it is highly inflammable

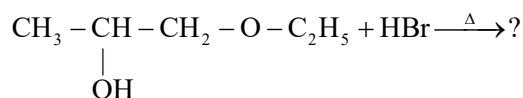
203. Which of the following is not used as anesthetic agent?

- Diethyl ether
- Nitrous oxide
- Haloethane
- Methanol

204. Lower molecular weight optically active ether is reacted with cold HI gives

- butan-1-ol and iodomethane
- butan-2-ol and iodomethane
- propan-1-ol and iodoethane
- propan-2-ol and iodoethane

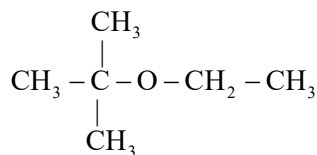
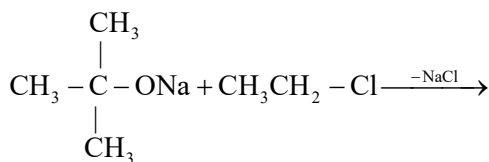
205. Product of the following reaction is



- $\text{C}_2\text{H}_5\text{Br}$  and  $\text{CH}_3\text{CHBrCH}_3$
- $\text{C}_2\text{H}_5\text{Br}$  and  $\text{CH}_3\text{CHBrCH}_2\text{Br}$
- $\text{C}_2\text{H}_5\text{Br}$  and  $\text{CH}_3\text{CHOHCH}_2\text{Br}$
- $\text{C}_2\text{H}_5\text{OH}$  and  $\text{CH}_3\text{CHBrCH}_2\text{Br}$

206. The reaction





is called.

- a) Williamson's Synthesis
- b) Williamson continuous etherification process
- c) Etard reaction
- d) Gatterman-Koch reaction

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## ANSWERS - MCQ'S

### SECTION - II : ETHERS

1. a)	2. b)	3. b)	4. a)	5. c)	6. a)	7. b)	8. b)	9. b)	10. c)
11. c)	12. b)	13. c)	14. b)	15. c)	16. a)	17. c)	18. c)	19. c)	20. a)
21. c)	22. b)	23. b)	24. a)	25. b)	26. c)	27. c)	28. b)	29. a)	30. b)
31. b)	32. c)	33. a)	34. d)	35. b)	36. a)	37. b)	38. d)	39. b)	40. a)
41. d)	42. c)	43. b)	44. b)	45. a)	46. a)	47. d)	48. d)	49. b)	50. d)
51. a)	52. b)	53. a)	54. a)	55. b)	56. b)	57. d)	58. b)	59. d)	60. b)
61. b)	62. b)	63. c)	64. c)	65. c)	66. b)	67. a)	68. d)	69. b)	70. b)
71. d)	72. c)	73. b)	74. d)	75. b)	76. b)	77. b)	78. a)	79. b)	80. a)
81. d)	82. c)	83. c)	84. c)	85. a)	86. b)	87. d)	88. b)	89. d)	90. c)
91. b)	92. b)	93. c)	94. a)	95. c)	96. b)	97. a)	98. d)	99. b)	100. c)
101. a)	102. a)	103. d)	104. a)	105. d)	106. d)	107. d)	108. a)	109. b)	110. c)
111. b)	112. d)	113. c)	114. c)	115. b)	116. b)	117. c)	118. b)	119. b)	120. b)
121. d)	122. a)	123. c)	124. d)	125. d)	126. b)	127. d)	128. d)	129. d)	130. a)
131. c)	132. d)	133. b)	134. a)	135. a)	136. b)	137. a)	138. c)	139. d)	140. c)
141. c)	142. b)	143. c)	144. c)	145. b)	146. b)	147. d)	148. b)	149. a)	150. b)
151. b)	152. a)	153. b)	154. b)	155. d)	156. a)	157. c)	158. a)	159. d)	160. c)
161. a)	162. c)	163. a)	164. c)	165. a)	166. c)	167. d)	168. a)	169. b)	170. c)
171. d)	172. b)	173. d)	174. a)	175. b)	176. c)	177. c)	178. c)	179. c)	180. b)
181. c)	182. d)	183. a)	184. b)	185. b)	186. c)	187. c)	188. d)	189. c)	190. d)
191. a)	192. a)	193. c)	194. a)	195. c)	196. c)	197. d)	198. c)	199. b)	200. a)
201. b)	202. a)	203. d)	204. b)	205. b)	206. a)				





## MULTIPLE CHOICE QUESTIONS

## Section - II : ETHERS

- Fluoroboric acid is used as catalyst in preparation of ether from
  - sodium alkoxide
  - diazomethane
  - alkyl halide
  - acetone
- Sodium iso-propoxide + A  $\xrightarrow{\Delta}$  2-ethoxy propane + NaCl  
The compound A is
  - $C_2H_5ONa$
  - $C_2H_5COCl$
  - $C_2H_5Cl$
  - $CH_3ONa$
- Which of the following ether is not produced from methylation of alcohol?
  - $CH_3-O-CH_3$
  - $CH_3OC_2H_5$
  - $CH_3-OCH(CH_3)_2$
  - $C_2H_5OC_2H_5$
- 2-ethoxy propane is formed from ethyl bromide and what?
  - Sodium ethoxide
  - Sodium iso-propoxide
  - Iso-butyraldehyde
  - Iso-propyl alcohol
- $CH_2N_2$  and 2-propanol gives
  - $(CH_3)_3CHOCH_3$
  - $(CH_3)_2CHCOOH$
  - $(CH_3)_2NCH_3$
  - $(CH_3)_2CH-H-CH_3$
- Which one of the following ether produces in higher yield by continuous etherification process?
  - $C_2H_5OCH_3$
  - $C_2H_5OC_2H_5$
  - $CH_3OCH(CH_3)_3$
  - $C_2H_5OCH_2CH_2CH_3$
- Williamson's reaction is used in the preparation of
  - alcohols
  - ethers
  - aldehydes
  - ketones
- $R-O-R' + HI \xrightarrow{\text{cold}} ROH + R' - I$   
If R contains three carbon atoms then how many carbon atoms are in R' ?
  - 2
  - 4
  - 5
  - 6
- The reaction between alcohol and conc.  $H_2SO_4$  at 413 K gives
  - diethyl ether
  - isopropyl alcohol
  - diethyl alcohol
  - ethene

○○○

## ANSWERS - QUESTIONS ASKED IN MHT-CET

## SECTION - II : ETHERS

- |       |       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. b) | 2. c) | 3. d) | 4. b) | 5. a) | 6. b) | 7. b) | 8. a) | 9. a) |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|



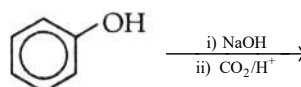
# MULTIPLE CHOICE QUESTIONS

## Section – III : PHENOLS

- In industry phenol is prepared from
  - Raschig's method
  - Dow's method
  - Oxidation of cumene
  - Oxidation of hexane
  - 1, 2
  - 2, 3
  - 3, 4
  - 1, 2, 3
- Replacement of  $\text{N}_2^+ \text{X}^-$  can be done by
  - $\text{H}_3\text{O}^+$
  - aq. NaOH
  - alc. KOH
  - moist  $\text{Ag}_2\text{O}$
- Carbolic acid is obtained from oxidation of
  - sodium salicylate
  - salicylic acid
  - toluene
  - cumene
- Cumene on air oxidation give
  - carbonic acid
  - carbolic acid
  - carboxylic acid
  - oxalic acid
- Phenol reacts with NaOH and followed by treatment with  $\text{CH}_3\text{-X}$  gives
  - phenetole
  - phenyl acetate
  - anisole
  - toluene
- Select incorrect statement
  - Reaction with  $\text{Br}_2$  and water gives 2, 4, 6-tribromo phenol.
  - Reaction with dilute  $\text{HNO}_3$  gives mixture of o-nitrophenol (minor) and p-nitrophenol (major).
  - Reaction with nitrating mixture gives picric acid.
  - Reaction with conc.  $\text{H}_2\text{SO}_4$  at 300 K gives o-phenol sui phonic acid.
- Consider the following species
  - o-nitrophenol
  - p-nitrophenol
  - o-bromo phenol
 Intramolecular hydrogen bonding can takes place in
  - only 3
  - 1 and 3
  - only 1
  - 2 and 3
- Which is steam volatile?
  - o-nitrophenol
  - m-nitrophenol
  - p-nitrophenol
  - picric acid
- When bromine is dissolved in  $\text{CS}_2$  and treated with phenol gives major product
  - o-bromophenol

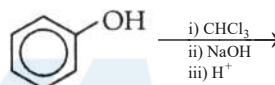
- p-bromophenol
- mixture of 'a' and 'b'
- 2, 4, 6-tribromophenol

- Kolbes – Schmidt reaction is used to prepare
  - salicylic acid
  - salicylaldehyde
  - phenyl acetate
  - o-xylene
- Reimer and Tiemann reaction is used to prepare
  - salicylic acid
  - salicylaldehyde
  - phenyl benzoate
  - picric acid
- Product of the following reaction is



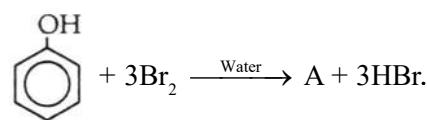
- 2-hydroxy benzoic acid
- 2-hydroxy benzaldehyde
- sodium benzoate
- sodium phenoxide

- Product of the following reaction is



- 2-hydroxy benzaldehyde
- 2-hydroxy benzoic acid
- benzoic acid
- benzaldehyde

- Benzene diazonium chloride is converted into phenol by
  - oxidation
  - reduction
  - neutralisation
  - hydrolysis
- Cresols have
  - 2-OH groups
  - 4-OH groups
  - 1-OH group
  - 5-OH groups
- Find out A in the following reaction



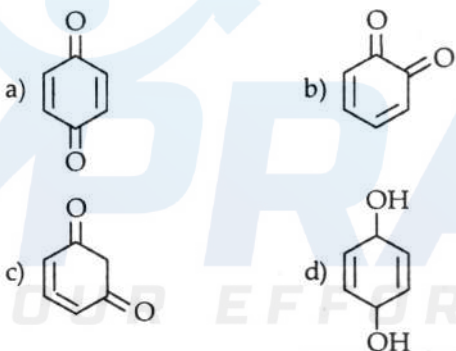
- The compound A is
- o-bromo phenol
  - 2,4,6-tribromo phenol
  - p-bromo phenol
  - m-bromo phenol

- Benzene sulphonic acid is reacted with NaOH gives

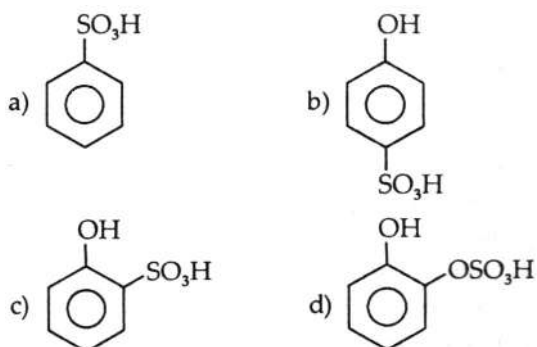
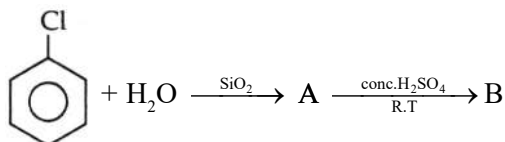
- a) sodium phenoxide  
b) cumene  
c) cumene hydroperoxide  
d) sodium benzene sulphonate
18. Product obtained when steam is passed over chlorobenzene  
a) sodium phenoxide  
b) sodium benzene sulphonate  
c) carboic acid  
d) benzene diazonium salt
19. Find out A and B in the following reaction respectively



- a) NaOH and HCl      b)  $\text{H}_2\text{O}$  and HCl  
c) HCl and NaOH      d) HCl and  $\text{H}_2\text{O}$
20. Phenol is  
a) neutral                      b) amphoteric  
c) basic                        d) acidic
21. Phenol on oxidation by chromic acid gives



22. P-benzoquinone is obtained from phenol by  
a) reduction                      b) oxidation  
c) acidic hydrolysis      d) alkaline hydrolysis
23. Find out 'B' in the following reaction



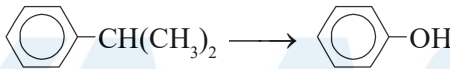
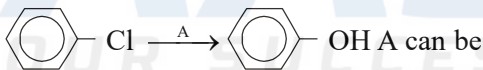
24. Which of the following is/are steam volatile?  
1. p-nitrophenol  
2. o-nitrophenol  
3. o-hydroxy acetophenone  
4. p-hydroxy acetophenone  
a) 1, 4                      b) 2, 3  
c) 1, 3                      d) 3, 4
25. The formation of salicylic acid from phenol using NaOH and  $\text{CO}_2$  is known as  
a) Friedel – Craft reaction  
b) Kolbe's–Schmidt reaction  
c) Reimer and Tiemann reaction  
d) Fittig reaction
26. Phenol  $\xrightarrow[\Delta]{\text{Zn}}$  (A)  $\xrightarrow[\text{conc. H}_2\text{SO}_4 \text{ at } 27^\circ\text{C}]{\text{conc. HNO}_3}$  (B)  
 $\xrightarrow{\text{Fe} + \text{HCl}}$  (C)

In above reaction, compound A, B, C are

- a) benzene, benzene sulphoric acid, aniline  
b) benzene, trinitrobenzene, aniline  
c) benzene dinitrobenzene, aniline  
d) benzene, nitrobenzene, aniline
27. In diazotisation reaction, carboic acid is prepared from  
a) cumene                      b) chlorobenzene  
c) aniline                        d) sod. phenoxide
28. Cumene is converted in phenol by  
a) reduction and decomposition by acid  
b) oxidation and decomposition by acid  
c) reduction and decomposition by alkali  
d) oxidation and decomposition by alkali
29. Phenol on standing in air develop a red colour, due to formation of  
a) cyclohexane                      b) phenoquinone  
c) resorcinol                        d) quinol
30. Benzene is obtained from phenol by using  
a) Na metal                      b) Ca metal  
c) Zn metal                        d) NaOH
31. When phenol is reacted with  $\text{CHCl}_3$  and NaOH, followed by treatment with  $\text{LiAlH}_4$  gives  
a) m-hydroxy methyl phenol  
b) p-hydroxy methyl phenol  
c) o-hydroxy methyl phenol  
d) o-hydroxy methyl phenol
32. Reagent used in Reimer – Tiemann reaction are  
a)  $\text{CH}_3\text{Cl}$  and aq. NaOH  
b)  $\text{CH}_3\text{Cl}$  and  $\text{POCl}_3$

- c)  $\text{CHCl}_3$  and aq. NaOH  
d)  $\text{CHCl}_3$  and alc. NaOH
33.  $K_a$  value of phenol is  
a) More than carboxylic acid  
b) Less than alcohol  
c) More than alcohol  
d) Less than water
34. Salicylic acid is prepared from phenol by the reaction known as  
a) Wurtz reaction  
b) Williamson reaction  
c) Kolbes-Schmidt reaction  
d) esterification
35. C-O bond length in phenol is less than C-O bond length in methyl alcohol because  
a) partial double bond character due to resonance  
b) partial double bond character due to inductive effect  
c) more electronegativity of oxygen  
d) oxygen contain two lone pair of electrons
36. The most suitable method of separation of ortho and para-nitrophenol mixed in the ratio of 1 : 1 is  
a) steam distillation    b) vapourisation  
c) crystallisation    d) colour spectrum
37. The reaction of phenol with air. The product is  
a) Anthraquinone    b) Benzophenone  
c) Benzoquinone    d) Propiophenone
38. Picric acid contain  
a) 2-nitro groups    b) 3-nitro groups  
c) 2-nitrite groups    d) 3-nitrite groups
39. Phenol is  
a) a base weaker than ammonia  
b) an acid stronger than carboxylic acid  
c) an acid weaker than carboxylic acid  
d) a neutral compound.
40. The synthesis of PhOH from PhCl is called  
a) Cumene process  
b) Dow's process  
c) Williamson's synthesis  
d) Wurtz synthesis
41. Phenol reacts with bromine in  $\text{CS}_2$  at low temperature to give  
a) m-bromophenol  
b) p-bromophenol  
c) o-and p-bromophenols  
d) 2, 4, 6-tribromophenol
42. When phenol is treated with excess bromine water, it gives  
a) m-bromophenol  
b) o and p-bromophenols  
c) 2, 4-dibromophenol  
d) 2, 4, 6-tribromophenol
43. Which of the following reagents cannot be used to distinguish between phenol and alcohol?  
a)  $\text{Br}_2/\text{CCl}_4$     b) NaOH  
c)  $\text{NaHCO}_3$     d) neutral  $\text{FeCl}_3$
44. An organic compound with molecular formula  $\text{C}_6\text{H}_6\text{O}$  dissolves in NaOH and gives characteristic colour with neutral  $\text{FeCl}_3$ . On treatment with bromine water, it gives tribromoderivative. The compound is,  
a) alcohols    b) ketones  
c) ethers    d) phenol
45. In the nitration of phenol with a mixture of conc.  $\text{HNO}_3$  and conc.  $\text{H}_2\text{SO}_4$ , the active species involved is  
a) nitrite ion    b) nitronium ion  
c) nitrate ion    d) nitrogen peroxide
46. Carboic acid is  
a)  $\text{C}_6\text{H}_5\text{CHO}$     b)  $\text{C}_6\text{H}_6$   
c)  $\text{C}_6\text{H}_5\text{COOH}$     d)  $\text{C}_6\text{H}_5\text{OH}$
47. Under different conditions nitration of phenol yields  
a) o-nitrophenol  
b) p-nitrophenol  
c) 2, 4, 6-trinitro phenol  
d) all of these
48. Picric acid is  
a) a volatile liquid  
b) trinitroaniline  
c) 2, 4, 6-trinitrophenol  
d) butyric acid
49. The end product in the following reaction is,  

$$\text{PhCl} \xrightarrow{\text{H}_2\text{O} + \text{CuCl}_2} \text{A} \xrightarrow{\text{conc. HNO}_3} \text{B}$$
a) PhOH    b) PhBr  
c)  $\text{PhNO}_2$     d) picric acid
50. Phenol is heated with conc.  $\text{H}_2\text{SO}_4$  at high temperature gives,  
a) o-phenol sulphonic acid  
b) p-phenol sulphonic acid  
c) m-phenol sulphonic acid  
d) all of these

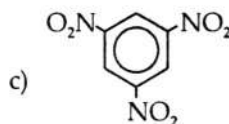
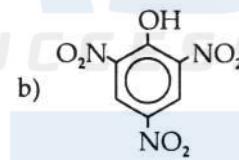
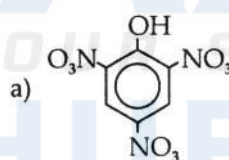
51. Phenol gives violet colour with  
 a) neutral  $\text{FeCl}_3$       b) neutral  $\text{FeSO}_4$   
 c) acidic  $\text{FeCl}_3$       d) acidic  $\text{FeSO}_4$
52. Picric acid is obtained by the nitration of  
 a) cumene      b) phenol  
 c) methanol      d) ethanol
53. Acidic nature of phenol is due to  
 a) phenolic group  
 b) benzene group  
 c) hydrogen bonding  
 d) resonance stabilisation of phenoxide ion
54. Carboic acid is reacted with conc.  $\text{H}_2\text{SO}_4$  at 300K gives,  
 a) 2-phenol sulphonic acid  
 b) 3-phenol sulphonic acid  
 c) 4-phenol sulphonic acid  
 d) 2 and 4-phenol sulphonic acid
55. Phenol reacts with  $\text{Br}_2$  in  $\text{CCl}_4$  at low temperature to give  
 a) o- and p- bromophenol  
 b) m-bromophenol  
 c) p-bromophenol  
 d) 2, 4, 6-tribromophenol
56. Which of the following is explosive?  
 a) Picric acid      b) Methyl amine  
 c) Cumene      d) Ethanol
57. Nitrating mixture consists of  
 a) conc.  $\text{HNO}_3$  + conc.  $\text{HCl}$   
 b) conc.  $\text{HNO}_3$  + conc.  $\text{H}_2\text{SO}_4$   
 c) conc.  $\text{H}_2\text{SO}_4$  + conc.  $\text{H}_3\text{PO}_4$   
 d) conc.  $\text{HCl}$  + conc.  $\text{H}_2\text{SO}_4$
58. Cumene, is  
 a) phenyl n-propane      b) 2-propyl benzene  
 c) chlorobenzene      d) benzene
59. Sodium salt of benzene sulphonic acid on fusion with caustic soda and followed by treatment with  $\text{HCl}$  gives  
 a) acetic acid      b) cumene  
 c) phenol      d) picric acid
60. Nitration of phenol is  
 a) nucleophilic substitution  
 b) electrophilic substitution  
 c) elimination  
 d) none of these
61. Phenol is ortho and para directing due to electron donating OH group, electron density increases at,  
 a) ortho position      b) para position  
 c) meta position      d) both 'a' and 'b'
62. 4-bromophenol is mainly formed, when phenol is reacted with,  
 a)  $\text{Br}_2$ /water      b)  $\text{Br}_2$ /inert solvent  
 c)  $\text{HBr}$ /water      d)  $\text{HBr}$ /inert solvent
63. The number of  $\sigma$  and  $\pi$ -bonds present in the molecule of carboic acid are respectively  
 a) 7, 3      b) 2, 3  
 c) 4, 3      d) 13, 3
64. During preparation of phenol from cumene, side product obtained is  
 a) acetone      b) alcohol  
 c) aldehyde      d) acid
65. Sulphonation of phenol with conc.  $\text{H}_2\text{SO}_4$  at 288–293 K gives  
 a) o-phenol sulphonic acid  
 b) p-phenol sulphonic acid  
 c) m-phenol sulphonic acid  
 d) all of these
66.   $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)_2 \longrightarrow \text{C}_6\text{H}_5\text{OH}$   
 This change can be carried out by using  
 a) reduction      b) nascent oxygen  
 c) air oxidation      d) hydrolysis
67.   $\text{C}_6\text{H}_5\text{Cl} \xrightarrow{\text{A}} \text{C}_6\text{H}_5\text{OH}$  A can be  
 a)  $\text{SiO}_2$       b)  $\text{SiO}_2$  / steam  
 c) steam      d) aq.  $\text{KOH}$
68. For preparing monohalogen derivative of phenol, halogenation is carried out  
 a) at high temperature  
 b) at low temperature  
 c) in presence of non-polar solvents  
 d) both 'b' and 'c'
69. 2-propyl benzene on air oxidation and followed by decomposition by dilute acid gives  
 a) phenol and propanal  
 b) phenol and propanone  
 c) phenol and propanol  
 d) phenol and propionic acid
70. The reaction  
 $\text{Ph-OH} + \text{dilute HNO}_3 \longrightarrow ?$   
 Gives predominately



- a) 2-nitrocarbolic acid  
b) 4-nitrocarbolic acid  
c) 2-4-6 trinitro-carbolic acid  
d) 3-nitro carbolic acid
71. Some statements are given below about, carbolic acid
1. it react with Na metal
  2. it gives violet colour with neutral  $\text{FeCl}_3$
  3. it forms only one monobrominated product
  4. it is acidic in nature.
- Among the above, true statement(s) is / are
- a) only 4                      b) only 2 and 4  
c) only 1, 2 and 4        d) all of these
72. During sulphonation, cone,  $\text{H}_2\text{SO}_4$  is used for
- a) the introduction of  $-\text{SO}_3\text{H}$  group in benzene  
b) the introduction of  $-\text{SO}_4\text{H}$  group in benzene  
c) the introduction of  $-\text{SO}_2\text{H}$  group in benzene  
d) all of these
73. At different condition nitration of phenol gives
- a) o-nitrophenol        b) p-nitrophenol  
c) Picric acid            d) All of these
74. How many O-H groups are present in phloroglucinol?
- a) 3                          b) 2  
c) 4                          d) 5
75. Diazotisation reaction is used to prepare
- a) alcohol                b) phenol  
c) aldehyde              d) ketone
76. The reaction of cone,  $\text{HNO}_3$  and phenol forms
- a) benzoic acid  
b) salicylic acid  
c) o- and p-nitrophenol  
d) picric acid
77. At low temperature phenol reacts with  $\text{Br}_2$  in  $\text{CS}_2$  to form
- a) m-bromophenol  
b) o- and p-bromophenol  
c) p-bromophenol  
d) 2, 4, 6-tribromophenol
78. Picric acid is
- a) trinitroaniline        b) trinitrotoluene  
c) a volatile liquid      d) 2, 4, 6-trinitrophenol
79. Chlorobenzene on fusing with solid  $\text{NaOH}$  gives
- a) benzene                b) benzoic acid  
c) phenol                 d) benzyl chloride
80. Bakelite plastic is formed, when phenol reacts

with

- a)  $\text{CH}_3\text{CHO}$               b)  $\text{HCHO}$   
c) acetone                d)  $\text{HCOOH}$
81. Aromatic primary amine when treated with cold  $\text{HNO}_2$  and  $\text{HCl}$  forms
- a) benzene                b) diazonium salt  
c) nitrobenzene        d) benzyl alcohol
82. Phenol is treated with bromine water and shaken well. The white precipitate of which of the is formed
- a) m-bromophenol  
b) 2-4 dibromophenol  
c) 2, 4, 6-tribromophenol  
d) a mixture of o- and p-bromophenols
83. The bakelite is prepared by the reaction between
- a) urea and formaldehyde  
b) ethylene glycol  
c) phenol and formaldehyde  
d) tetramethylene glycol
84. Phenols are more acidic than aliphatic alcohols because
- a) phenoxide ion is stabilised by resonance  
b) phenols are more soluble in polar solvents  
c) phenoxide ion do not have resonance  
d) alcohols do not loose H-atom at all
85. Which of the following is explosive?



d) none of these

**ACIDIC NATURE**

86. Phenol is less acidic than
- a) p-nitro phenol        b) cresol  
c) ethanol                d) benzyl alcohol
87. Which of the following statement is correct?
1. electron withdrawing groups stabilize the phenoxide ion and increase the acidic strength
  2. electron donating groups destabilise the phenoxide ion and decrease the acidic strength.
  3.  $-\text{OH}$  group in phenol is ortho and para

directing.

4. Intermolecular H-bonding is present in phenol

- a) 1, 3                      b) 1,2  
c) 3, 4                      d) 1,2,3,4

88. Phenol is

- a) strong acidic              b) weak acidic  
c) strong basic              d) neutral

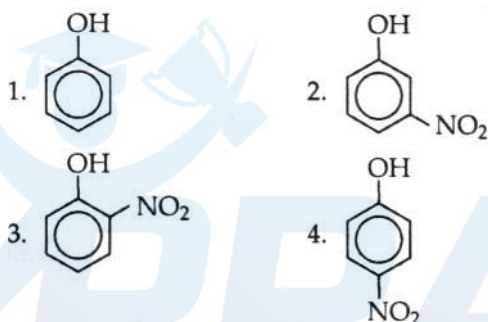
89. Which of the following group stabilise the phenoxide ion?

- a)  $\text{CH}_3$                       b)  $\text{OH}$   
c)  $\text{OR}$                       d)  $\text{NO}_2$

90. Which of the following group destabilise the phenoxide ion?

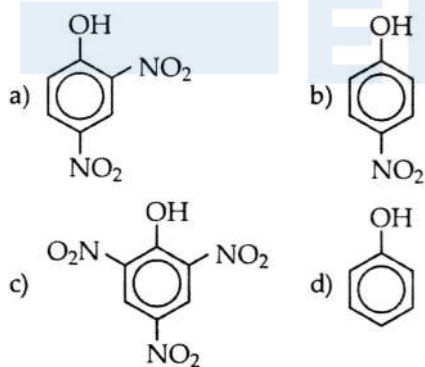
- a)  $\text{NO}_2$                       b)  $-\text{CHO}$   
c)  $\text{COR}$                       d)  $\text{OH}$

91. Decreasing acidic nature of following compound is

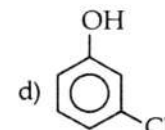
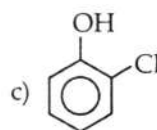


- a)  $1 > 2 > 3 > 4$               b)  $4 > 3 > 2 > 1$   
c)  $4 > 2 > 3 > 1$               d)  $4 > 1 > 2 > 3$

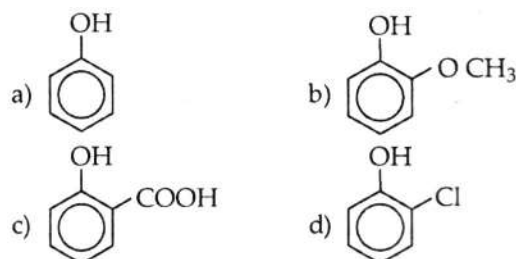
92. Which of the following is more acidic in nature?



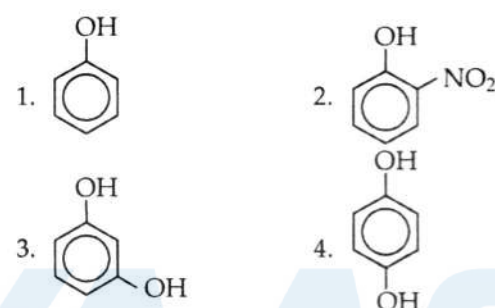
93. Which of the following has more  $\text{pK}_a$  value?



94. Which of the following has more  $\text{K}_a$  value?

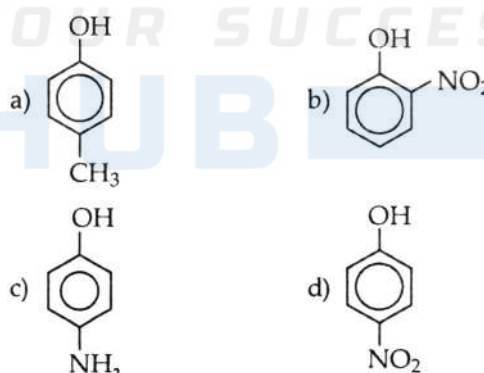


95. Decreasing order of acidic nature of following compound is

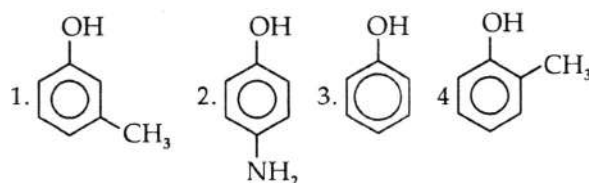


- a)  $1 > 2 > 4 > 3$               b)  $1 > 4 > 3 > 2$   
c)  $2 > 1 > 3 > 4$               d)  $2 > 4 > 3 > 1$

96. Which of the following is lowest  $\text{K}_a$  value?

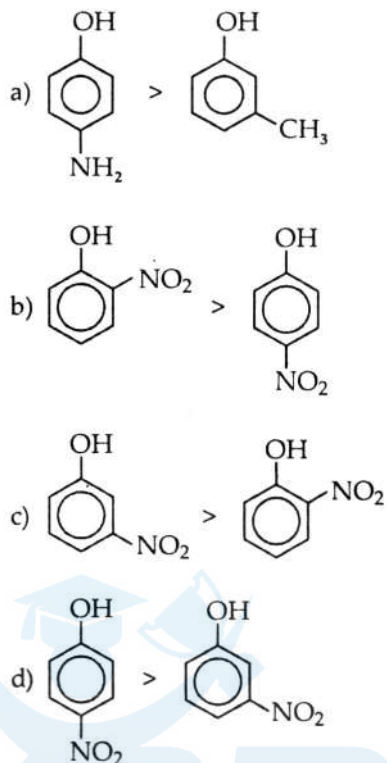


97. Decreasing order of acidity of substituted phenol is

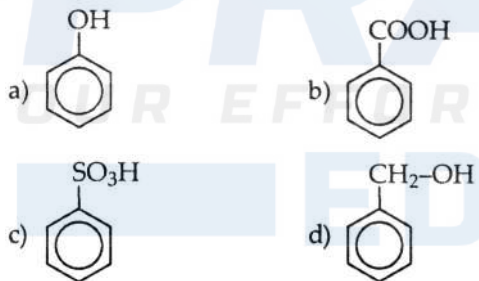


- a)  $3 > 1 > 4 > 2$               b)  $4 > 3 > 1 > 2$   
c)  $4 > 3 > 2 > 1$               d)  $3 > 1 > 2 > 4$

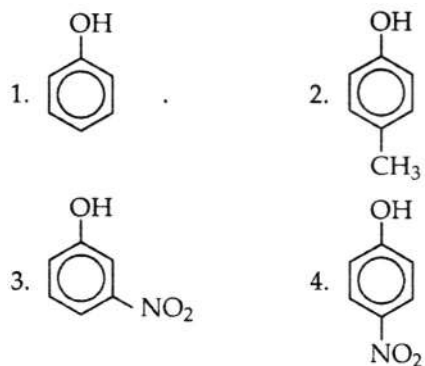
98. In which of the following first is more acidic than second?



99. Which of the following is most acidic ?

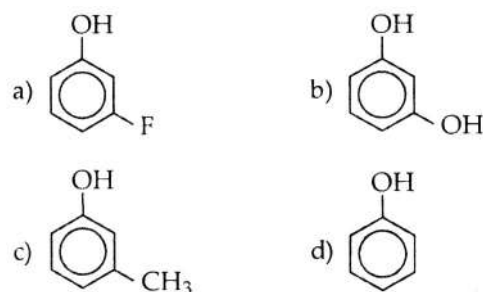


100. In the following compound order of acidity is

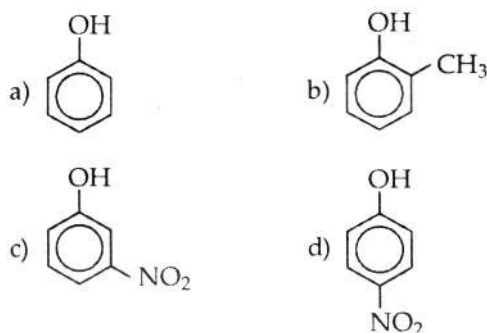


- a)  $4 > 2 > 3 > 1$  b)  $4 > 3 > 1 > 2$   
c)  $4 > 3 > 2 > 1$  d)  $4 > 1 > 2 > 3$

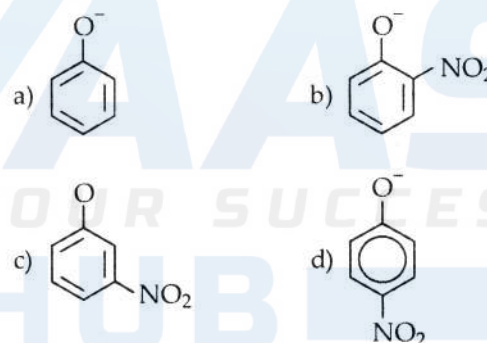
101. Which of the following is most acidic?



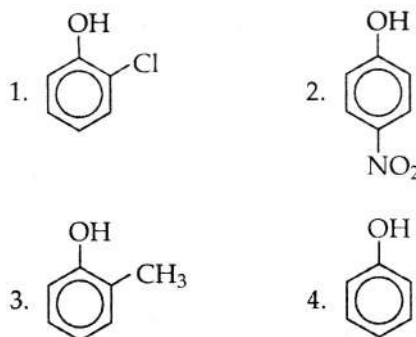
102. Which of the following is less acidic?



103. Which of the anion is most stable due to delocalisation ?

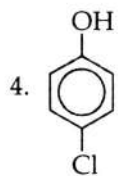
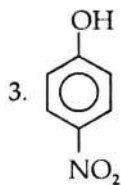
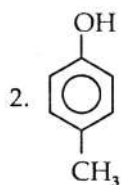
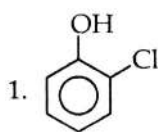


104. Which is the correct decreasing order of acidic strength of substituted phenol?



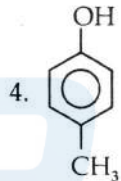
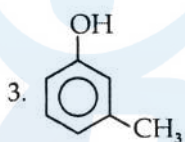
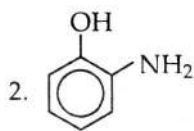
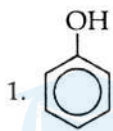
- a)  $2 > 1 > 3 > 4$  b)  $3 > 1 > 2 > 4$   
c)  $2 > 1 > 4 > 3$  d)  $3 > 2 > 4 > 1$

105. The correct acidic strength order of phenol is



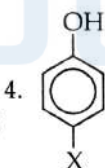
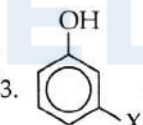
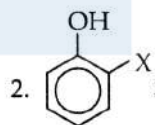
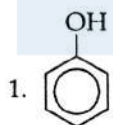
- a)  $1 > 2 > 4 > 3$       b)  $3 > 1 > 4 > 2$   
 c)  $1 > 2 > 3 > 4$       d)  $3 > 1 > 2 > 4$

106. Correct order of acidic nature is



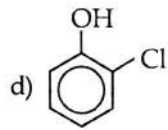
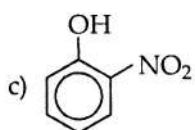
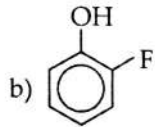
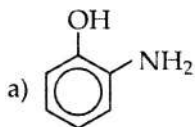
- a)  $1 > 3 > 2 > 4$       b)  $3 > 4 > 2 > 1$   
 c)  $1 > 3 > 4 > 2$       d)  $3 > 4 > 1 > 2$

107. Correct order of acidity of halogenated phenol is where X = F, Cl, Br, I

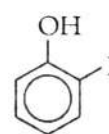
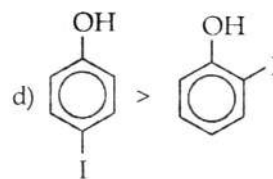
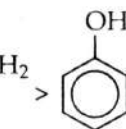
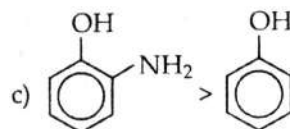
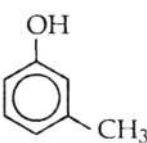
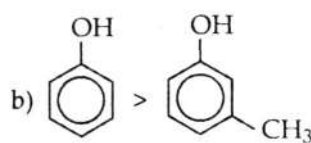
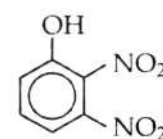
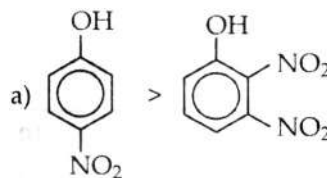


- a)  $1 > 2 > 3 > 4$       b)  $4 > 3 > 2 > 1$   
 c)  $2 > 3 > 4 > 1$       d)  $2 > 4 > 3 > 1$

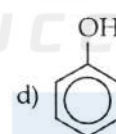
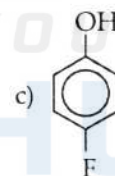
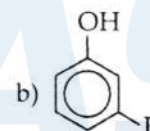
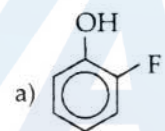
108. Which of the following is more acidic?



109. In which of the following first is more acidic than second?



110. Which of the following is less acidic in nature?



○○○

**ANSWERS - MCQ'S****SECTION - III : PHENOLS**

1. d)	2. a)	3. d)	4. b)	5. c)	6. b)	7. c)	8. a)	9. b)	10. a)
11. b)	12. a)	13. a)	14. d)	15. c)	16. b)	17. d)	18. c)	19. a)	20. d)
21. a)	22. b)	23. c)	24. b)	25. b)	26. d)	27. c)	28. b)	29. b)	30. c)
31. c)	32. c)	33. c)	34. c)	35. a)	36. a)	37. c)	38. b)	39. c)	40. b)
41. c)	42. d)	43. c)	44. d)	45. b)	46. d)	47. d)	48. c)	49. d)	50. b)
51. a)	52. b)	53. d)	54. a)	55. a)	56. a)	57. b)	58. b)	59. c)	60. b)
61. d)	62. b)	63. d)	64. a)	65. a)	66. c)	67. b)	68. d)	69. b)	70. a)
71. c)	72. a)	73. d)	74. a)	75. b)	76. d)	77. b)	78. d)	79. c)	80. b)
81. b)	82. c)	83. c)	84. a)	85. b)	86. a)	87. d)	88. b)	89. d)	90. d)
91. b)	92. c)	93. a)	94. c)	95. c)	96. d)	97. a)	98. d)	99. c)	100. b)
101. a)	102. b)	103. d)	104. c)	105. b)	106. c)	107. c)	108. c)	109. b)	110. d)

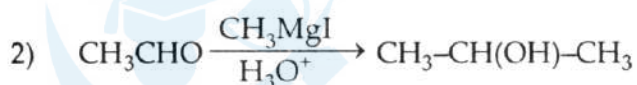
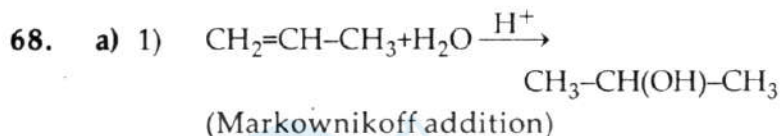






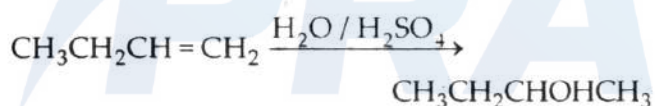
## Section I : Alcohols

3. b)  $\text{HOCH}_2\text{CHOHCH}_2\text{OH}$  is a glycerol and trihydric alcohol.
4. b)  $\text{HOCH}_2\overset{*}{\text{CH}}(\text{OH})\text{CH}_2\text{OH}$  is a glycerine. (\*) mark carbon atom is secondary carbon atom.
37. d) Ethers and alcohol are isomeric compounds. Molecular formula for diethyl ether and butanone are respectively  $\text{C}_4\text{H}_{10}\text{O}$  and  $\text{C}_4\text{H}_8\text{O}$ . Hence, butanone, a ketone, cannot be isomeric with ether.
39. b) Molecular formula  $\text{C}_2\text{H}_6\text{O}$  are ethers and alcohols. i)  $\text{C}_2\text{H}_5\text{OH}$ , ii)  $\text{CH}_3\text{OCH}_3$ .

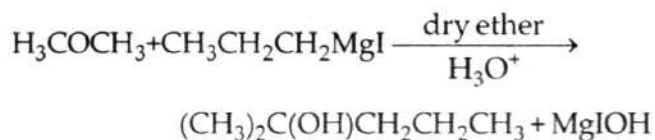


Reactions (1) and (2) give 2-propanol.

69. b) Addition of water occurs according to Markownikoff's rule



70. a)  $\text{CH}_3\text{COCH}_3 + 2\text{H} \xrightarrow{\text{NaHg} + \text{H}_2\text{O}} (\text{CH}_3)_2\text{CHOH}$
71. d) 2-methyl 2-pentanol is  $3^\circ$  alcohol prepared from acetone and n-propyl magnesium iodide.



72. a)  $\text{CH}_2=\text{CH}_2 + \text{H}_2\text{SO}_4 \xrightarrow{\text{cold}} \text{CH}_3\text{CH}_2\text{OSO}_3\text{H}$   
 $\text{CH}_3\text{CH}_2\text{OSO}_3\text{H} + \text{HOH} \xrightarrow{\Delta} \text{CH}_3\text{CH}_2\text{OH} + \text{H}_2\text{SO}_4$

Except ethanol, no other  $1^\circ$  alcohol can be prepared by this method as the addition of  $\text{H}_2\text{SO}_4$  follows Markownikoffs of rule. Generally  $2^\circ$  and  $3^\circ$  alcohols are obtained.

130. c)  $\text{RCH}_2\text{CH}_2\text{OH} \xrightarrow{\text{H}^+} \text{RCH}_2\text{CH}_2\text{O}^+\text{H}_2 \longrightarrow \text{RCH}_2\text{CH}_2^+$   
protonation

132. d) Increase in branching decreases surface area of the molecule and therefore, results in lesser

Van der Waal's forces. Consequently, isobutane has lesser boiling point than n-butane.

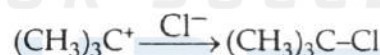
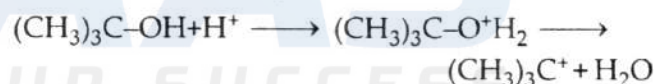
Alkyl chlorides have higher boiling than corresponding alkanes, because they are polar and stronger dipole-dipole force operate between the molecules of alkyl chloride.

Alcohols have higher boiling point than corresponding alkyl chloride, because alcohols molecules are associated through strong H-bonds.

133. b) More basic alcohol reacts faster with HX. Since basic nature decreases as  $3^\circ > 2^\circ > 1^\circ > \text{MeOH}$ . The same will be the decreasing order of reactivity of alcohol towards HX.

134. b) The relative rate follows same order as of acidity ( $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$ ) and the nucleophilicity of their conjugate anion,  $\text{X}^-$  ( $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$ ).

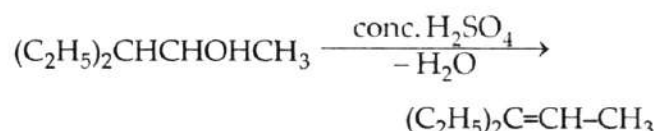
135. d) 2-methyl 2-propanol is tertiary alcohol, which forms tertiary carbocation (most stable carbocation)



136. d) Reactivity of alcohol toward sodium depends upon the acidic nature of the alcohol. More the acidic nature of alcohol, the faster is the reaction between alcohol and sodium.

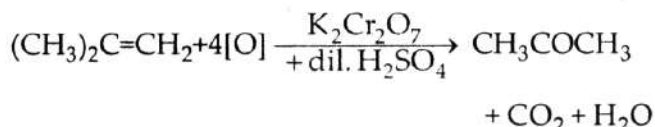
The electron releasing alkyl groups decrease the acidic nature of alcohol. Decreasing order of acidity of alcohol is  $\text{CH}_3\text{OH} > 1^\circ > 2^\circ > 3^\circ$ . The same is the order of reactivity towards sodium metal.

137. c) It is obtained according to Saytzeff rule



138. a) The alcohol 4 and 2 are  $3^\circ$  alcohol but alcohol 4 gives more substituted alkene easily. Alcohol 1 is  $2^\circ$  alcohol and alcohol 3 is  $1^\circ$  alcohol. The rate of dehydration of alcohol with concentrated  $\text{H}_2\text{SO}_4$  follows the order  $3^\circ > 2^\circ > 1^\circ$ .





140. d) The stability of carbonium ion depends on the nature of groups attached to the positively charged carbon atom.

If the alkyl groups are attached to the positively charged carbon, the charge is dispersed by electron-donating inductive effect of alkyl group.

141. b) Alcohols have higher boiling points than non-polar hydrocarbon and polar haloalkane of comparable molecular masses, because alcohol molecules are associated through intermolecular hydrogen bonding.

More the number of alkyl groups attached to the positively charged carbon, more the dispersal of positive charge and therefore, the greater is the stability of the carbonium ion.



142. a) In ethanol, H atoms is attached with oxygen; where as no hydrogen bonding occurs in diethyl ether, ethyl chloride and triethylamine, because no hydrogen is attached with oxygen or nitrogen.

143. b) 1-butanol is treated with alkaline  $\text{KMnO}_4$  undergoes controlled oxidation gives butanal and when it is treated with strong oxidising agent it give directly butanoic acid.

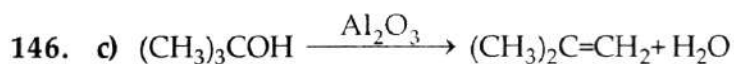
144. b) Lucas reagent is the solution of anhydrous  $\text{ZnCl}_2$  in conc.  $\text{HCl}$ .

$1^\circ$  alcohols gives cloudiness not at all at room temperature

$2^\circ$  alcohols gives cloudiness within five minutes.

$3^\circ$  alcohols gives cloudiness immediately.

145. d) It is a tertiary alcohol and hence, is most basic. Consequently, it reacts faster with  $\text{HCl}$  in presence of  $\text{ZnCl}_2$  (Lucas reagent).

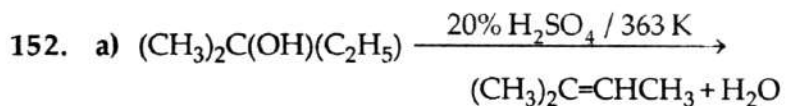
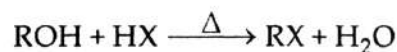
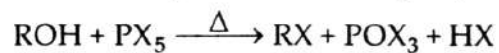
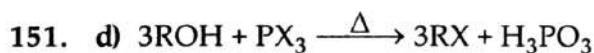


147. b) Tertiary carbonium ion has maximum stability. The decreasing order of stability of carbonium ion is  $3^\circ > 2^\circ > 1^\circ$ .

148. d) Hydrogen attached to oxygen, nitrogen, sulphur, triply bonded-carbon etc. are called active hydrogen.

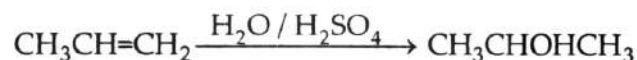
Substance (a) and (b), contains 1 active hydrogen, (c) and (d) contains 2 and 3 active hydrogens respectively.

150. b) 1-butanol is treated with acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  oxidation gives butanoic acid and when treated with mild oxidising agent it give butanal.



153. b) The increasing order of stabilities of carbonium ions is  $1^\circ < 2^\circ < 3^\circ$ . Since carbonium ion is formed as an intermediate in the dehydration of alcohol, so ease of dehydration in the increasing order is  $1^\circ < 2^\circ < 3^\circ$  alcohols.

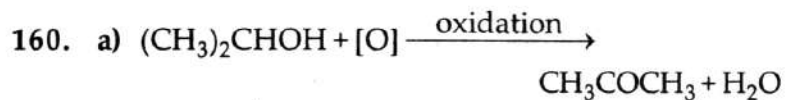
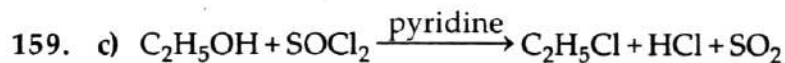
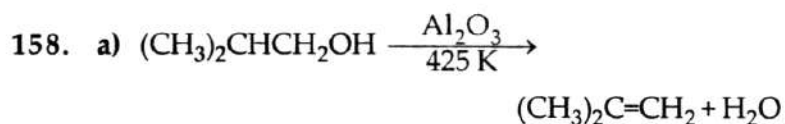
154. a) Addition of water occurs according to Markownikoff's rule



155. (c) Normal alcohols having higher boiling point than corresponding branched isomeric alcohols.

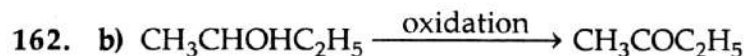
156. c) Because of absence of  $\alpha$ -hydrogen atoms tertiary alcohols are resist oxidation. Compound (C) is t-butyl alcohol.

157. c) Alcohols have highest boiling point because of presence of hydrogen bonding. Normal alcohols have higher boiling point than isomeric branched alcohols. Compound (C) is normal propyl alcohol and compound (B) is branched propyl alcohol.



Isopropyl alcohol first give acetone on oxidation under drastic condition and then acetic acid.

161. d) Phenol is more acidic than all, because phenoxide ion is more stabilise by resonance than phenol.



163. d). Solubility depends upon molecular weight. Solubility decreases with increasing molecular weight.



carbon atoms, hence it is primary alcohol.

190. a) Due to the three methyl groups which are electron donating, the carbon atom bearing OH group acquires partial negative charge, with the result it pushes the electron pair to the O-H bond towards hydrogen and thus, hydrogen atom is firmly attached with the oxygen atom, hence it does not replace easily by sodium metal.

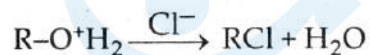
191. a) Acetic acid exist as cyclic dimer due to intermolecular hydrogen bonding which requires high energy than hydrogen bonding present in alcohols.

192. a) 
$$\text{ZnCl}_2 + 2\text{HCl} \longrightarrow \text{H}_2\text{ZnCl}_4 \xrightarrow{\text{ROH}}$$

Lewis acid

193. b) Major mode of C-C bond fission is according to Popoffs rule

194. b) Water is more acidic than alcohols because of minimum positive inductive effect of hydrogen atom.



196. a) It is  $3^\circ$  alcohol on dehydration gives alkene according to Saytzeff rule

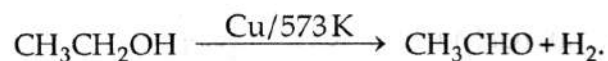
197. b) We know that ethanol is soluble in water due to the hydrogen bonding. Therefore it is miscible with in all proportions.

198. d) We know that,



Thus in this reaction, the final prodcut is acetic acid ( $\text{CH}_3\text{COOH}$ ).

201. b) We know that,



Thus primary alcohol which is ethyl alcohol ( $\text{CH}_3\text{CH}_2\text{OH}$ ) is reduced by copper and forms acetaldehyde ( $\text{CH}_3\text{CHO}$ ).

202. c) We know that, the boiling point of a compound, evidently, is a consequence of strong intermolecular forces due to hydrogen bond. Therefore the boiling point of a compound is raised by intermolecular hydrogen bonding.

203. c) We know that ethanol is used as a beverage. It is known as spirit of wine or grain alcohol.

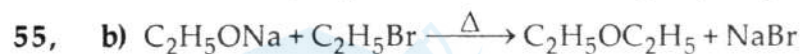
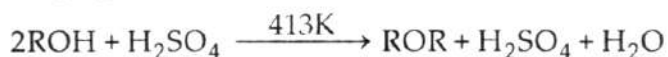
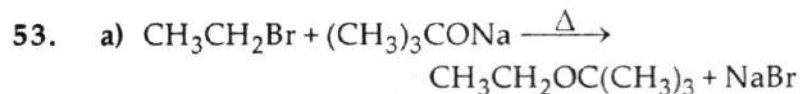
204. a) Methanol is also referred as wood alcohol or wood spirit or wood naphtha as the earliest method for its preparation was by destructive distilation of wood.

to form hydrogen bond with water. More the tendency to form hydrogen bond with water more the solubility. In isomeric alcohols, tendency to form hydrogen bond with water is  $3^\circ > 2^\circ > 1^\circ$ .

206. a) The high boiling point of alcohols and amines is due to intermolecular hydrogen bonding. Alcohols have higher boiling point than amines, because of more electronegativity of oxygen than nitrogen. Carbonyl compounds have no hydrogen bonding. The dipole-dipole forces of carbonyl compounds causes them to have higher boiling points but less than compounds which have intermolecular hydrogen bonding.

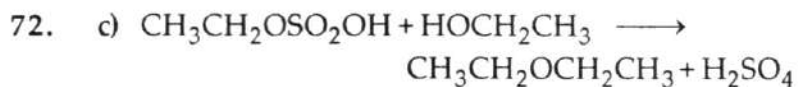
## Section - II : Ethers

24. a) We know that metamerism is a type of isomerism exhibited by members of the same homologous series due to the difference in the nature of alkyl groups such as attached to the polyvalent atom of the functional group.

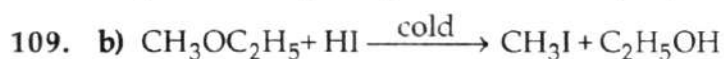


71. d) The Williamson reaction involves nucleophilic substitution of alkoxide ion. It is strictly analogous to the preparation of alcohols by treatment of alkyl halide with aqueous NaOH. Alkyl halides undergoes substitution reaction most readily, t-butyl bromide are inert to nucleophilic substitution

because they show maximum steric hindrance to the approaching nucleophile. Thus, reactivity of alkyl halides towards Williamson reaction is,



73. b) Using diazomethane only methyl ethers are prepared, while using Williamson's synthesis simple and mixed ethers are prepared. However by using continuous etherification process only simple ether can be prepared.



The nucleophile  $\text{I}^-$  attacks  $-\text{CH}_3$  group and not  $-\text{CH}_2$  group of ethyl group, because the positive charge on  $-\text{CH}_2$  is reduced by electron-donating effect of  $-\text{CH}_3$  in ethyl group. Consequently, positive charge on  $-\text{CH}_3$  is more than on  $-\text{CH}_2$  of ethyl group.

