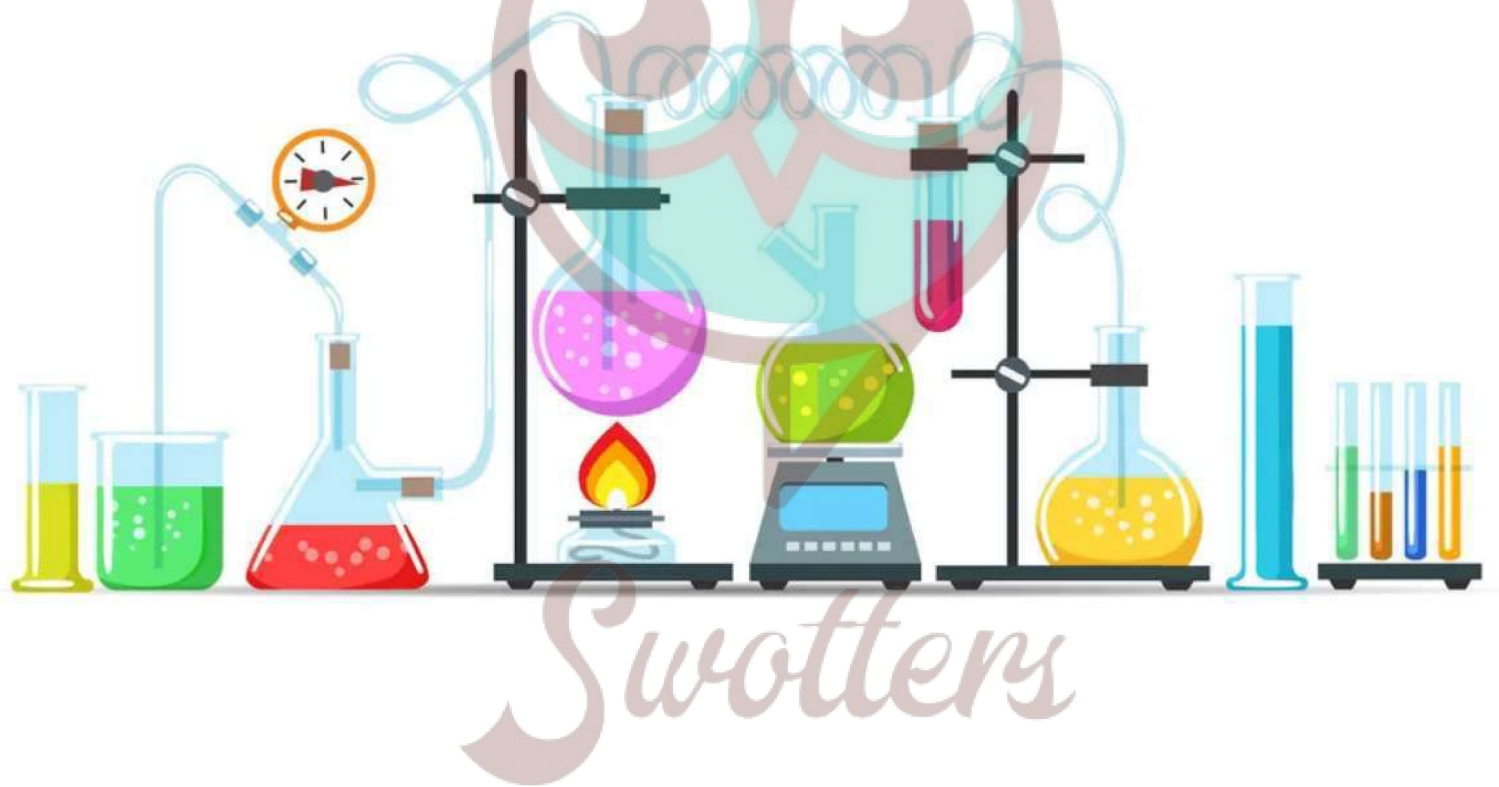


# CHEMISTRY



## Important Questions

### Multiple Choice questions-

Question 1. Among the following compounds, strongest acid is

- (a)  $\text{H-C}=\text{C-H}$
- (b)  $\text{C}_6\text{H}_6$
- (c)  $\text{C}_2\text{H}_6$
- (d)  $\text{CH}_3\text{OH}$

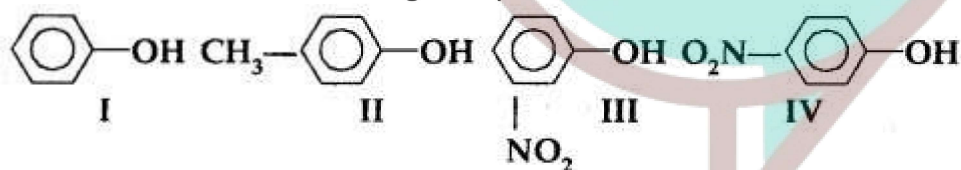
Question 2. 1-Propanol and 2-propanol can be best distinguished by

- (a) Oxidation with  $\text{KMnO}_4$  followed by reaction with Fehling solution?
- (b) Oxidation with acidic dichromate followed by reaction with Fehling solution.
- (c) Oxidation by heating with copper followed by reaction with Fehling solution.
- (d) Oxidation with cone.  $\text{H}_2\text{SO}_4$  followed by reaction with Fehling solution.

Question 3. The compound which gives the most stable carbonium ion on dehydration is

- (a)  $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$
- (b)  $(\text{CH}_3)_3\text{COH}$
- (c)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
- (d)  $\text{CH}_3\text{CH(OH)CH}_2\text{CH}_3$

Question 4. In the following compounds:



The order of acidity is

- (a)  $\text{III} > \text{IV} > \text{I} > \text{II}$
- (b)  $\text{I} > \text{IV} > \text{III} > \text{II}$
- (c)  $\text{II} > \text{I} > \text{III} > \text{IV}$
- (d)  $\text{IV} > \text{III} > \text{I} > \text{II}$

Question 5. In  $\text{CH}_3\text{CH}_2\text{OH}$ , the bond that undergoes heterolytical change most readily is

- (a) C-C
- (b) C-O
- (c) C-H
- (d) O-H

Question 6. Phenol reacts with  $\text{Br}_2$  in  $\text{CS}_2$  at low temperature to give

- (a) o-Bromophenol
- (b) o-and p-promophenols
- (c) p-Bromophenol
- (d) 2, 4, 6Tribromophenol

Question 7. In the reaction of phenol with  $\text{CHCl}_3$  and aqueous  $\text{NaOH}$  at 343 K, the electrophile attacking the ring is:

- (a)  $\text{CHCl}_3$   
 (b)  $\text{CHCl}_2$   
 (c)  $\text{CCl}_2$   
 (d)  $\text{COCl}_2$

Question 8. Which of the following is most acidic?

- (a) Phenol  
 (b) Benzyl alcohol  
 (c) m-chlorophenol  
 (d) cyclohexanol

Question 9. The correct order of boiling points for primary ( $1^\circ$ ), Secondary ( $2^\circ$ ) and Tertiary ( $3^\circ$ ) alcohols is

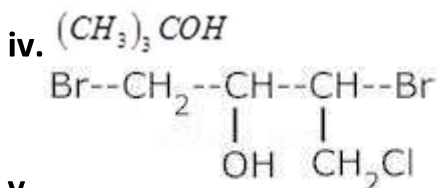
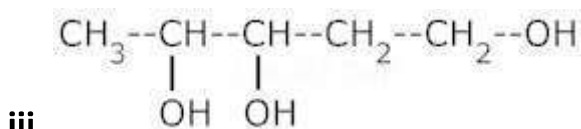
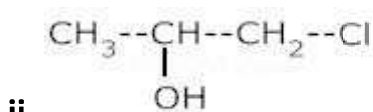
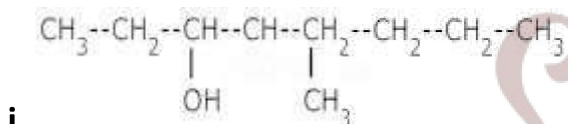
- (a)  $1^\circ > 2^\circ > 3^\circ$   
 (b)  $3^\circ > 2^\circ > 1^\circ$   
 (c)  $2^\circ > 1^\circ > 3^\circ$   
 (d)  $2^\circ > 3^\circ > 1^\circ$

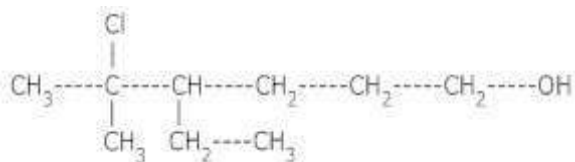
Question 10. When Phenol is distilled with zinc dust, it gives

- (a) Benzene  
 (b) Toluene  
 (c) Benzaldehyde  
 (d) Benzoic acid

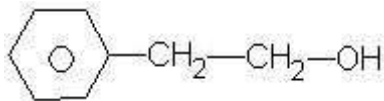
### Very Short Questions-

1. Write IUPAC names of :-

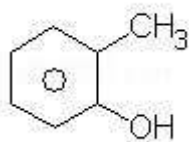




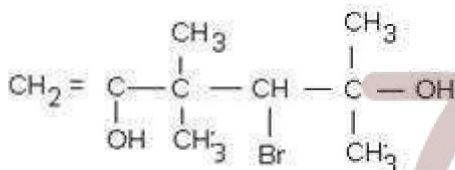
vi.



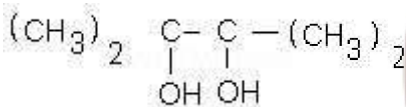
vii.



viii.



ix.



x.

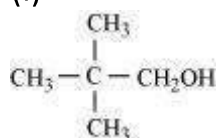
## Short Questions-

- Phenol is acidic in nature.
- Phenol has a smaller dipole moment than methanol.
- o- nitrophenol has lower boiling point (is more volatile) than p – nitrophenol.
- Methanol is miscible with water while iodomethane is not.
- Alcohols have higher boiling points than isomeric ethers.
- Ethers are soluble in water alkanes are not.
- The order of acidic strength in alcohols is  $R\text{CH}_2\text{OH} > R_2\text{CHOH} > R_3\text{COH}$
- During preparation of ester from alcohol and acid, water has to be removed as soon as it is formed.
- Ethers can not be prepared by dehydration of secondary or tertiary alcohols.
- Reaction of anisole with HI gives methyl iodide and phenol.

## Long Questions-

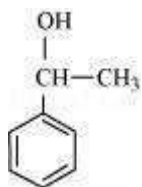
- Classify the following as primary, secondary and tertiary alcohols:

(i)

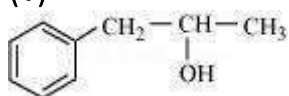
(ii)  $\text{H}_2\text{C} = \text{CH} - \text{CH}_2\text{OH}$ (iii)  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{OH}$ 

(iv)

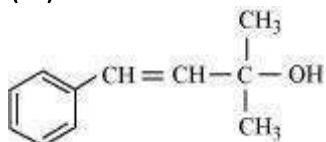




(v)

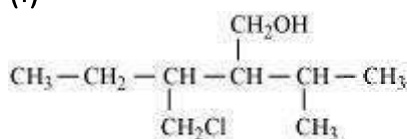


(vi)

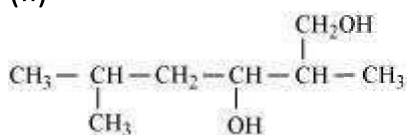


2. Name the following compounds according to IUPAC system.

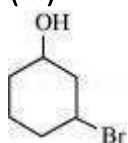
(i)



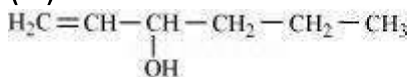
(ii)



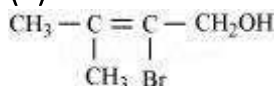
(iii)



(iv)



(v)



3. Give structures of the products you would expect when each of the following alcohol reacts with (a)  $\text{HCl} - \text{ZnCl}_2$  (b)  $\text{HBr}$  and (c)  $\text{SOCl}_2$ .

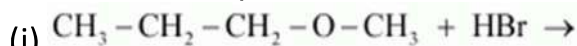
(i) Butan-1-ol

(ii) 2-Methylbutan-2-ol

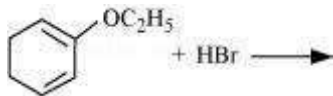
4. *Ortho* and *para* nitrophenols are more acidic than phenol. Draw the resonance structures of the corresponding phenoxide ions.

5. Write the reactions of Williamson synthesis of 2-ethoxy-3-methylpentane starting from ethanol and 3-methylpentan-2-ol.

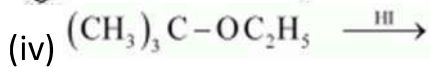
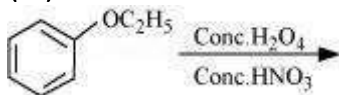
6. Predict the products of the following reactions:



(ii)

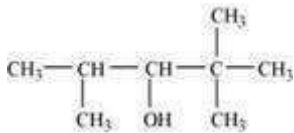


(iii)

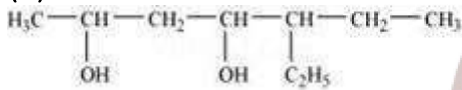


7. Write IUPAC names of the following compounds:

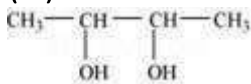
(i)



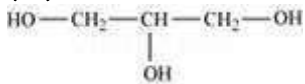
(ii)



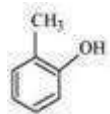
(iii)



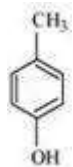
(iv)



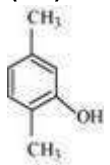
(v)



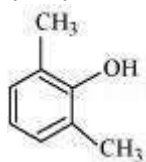
(vi)



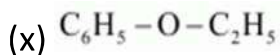
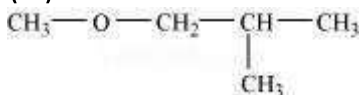
(vii)



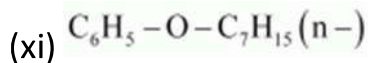
(viii)



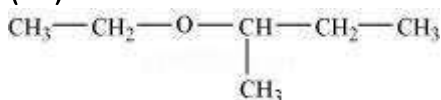
(ix)



Swotters



(xii)



8. Write structures of the compounds whose IUPAC names are as follows:

- 2-Methylbutan-2-ol
- 1-Phenylpropan-2-ol
- 3,5-Dimethylhexane -1, 3, 5-triol
- 2,3 - Diethylphenol
- 1 - Ethoxypropane
- 2-Ethoxy-3-methylpentane
- Cyclohexylmethanol
- 3-Cyclohexylpentan-3-ol
- Cyclopent-3-en-1-ol
- 3-Chloromethylpentan-1-ol.

### Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- Assertion and reason both are correct statements and reason is correct explanation for assertion.
- Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- Assertion is correct statement but reason is wrong statement.
- Assertion is wrong statement but reason is correct statement.

**Assertion:** Primary and secondary alcohols can be distinguished by Victor-Meyer's test.

**Reason:** Primary alcohols form nitrolic acid which dissolves in NaOH to form blood red colouration but secondary alcohols form pseudonitrols which give blue colouration with NaOH.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- Assertion and reason both are correct statements and reason is correct explanation for assertion.
- Assertion and reason both are correct statements but reason is not correct explanation for assertion.
- Assertion is correct statement but reason is wrong statement.
- Assertion is wrong statement but reason is correct statement.

**Assertion:** Reimer-Tiemann reaction of phenol with  $\text{CHCl}_3$  in  $\text{NaOH}$  at  $340\text{K}$  gives salicylic acid as the major product.

**Reason:** The reaction occurs through intermediate formation of  $^+\text{CHCl}_2$ .

### Case Study Questions-

1. Read the passage given below and answer the following questions:

An organic compound (A) having molecular formula  $\text{C}_6\text{H}_6\text{O}$  gives a characteristic colour with aqueous  $\text{FeCl}_3$  solution. (A) on treatment with  $\text{CO}_2$  and  $\text{NaOH}$  at  $400\text{K}$  under pressure gives (B), which on acidification gives a compound (C). The compound (C) reacts with acetyl chloride to give (D) which is a popular pain killer.

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) Compound (A) is:

- a) 2-Hexanol.
- b) Dimethyl ether.
- c) Phenol.
- d) 2-Methyl pentanol.

(ii) Compound (C) is:

- a) Salicylic acid.
- b) Salicylaldehyde.
- c) Benzoic acid.
- d) Benzaldehyde.

(iii) Number of carbon atoms in compound (D) is:

- a) 7
- b) 6
- c) 8
- d) 9

(iv) The conversion of compound (A) to (C) is known as:

- a) Reimer-Tiemann reaction.
- b) Kolbe's reaction.
- c) Schimdt reaction.
- d) Swarts reaction.

- (v) Compound (A) on heating with compound (C) in presence of  $\text{POCl}_3$  gives a compound (D) which is used:
- In perfumery as a flavouring agent
  - As an antipyretic
  - As an analgesic
  - As an intestinal antiseptic.

2. Read the passage given below and answer the following questions:

A compound (X) containing C, H and O is unreactive towards sodium. It also does not react with Schiff's reagent. On refluxing with an excess of hydroiodic acid, (X) yields only one organic product (Y). On hydrolysis, (Y) yields a new compound (Z) which can be converted into (Y) by reaction with red phosphorus and iodine. The compound (Z) on oxidation with potassium permanganate gives a carboxylic acid. The equivalent weight of this acid is 60.

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) The compound (X) is an:

- Acid.
- Aldehyde.
- Alcohol.
- Ether.

(ii) The IUPAC name of the acid formed is:

- Methanoic acid.
- Ethanoic acid.
- Propanoic acid.
- Butanoic acid.

(iii) Compound (Y) is:

- Ethyl iodide.
- Methyl iodide.
- Propyl iodide.
- Mixture of (a) and (b).

(iv) Compound (Z) is:

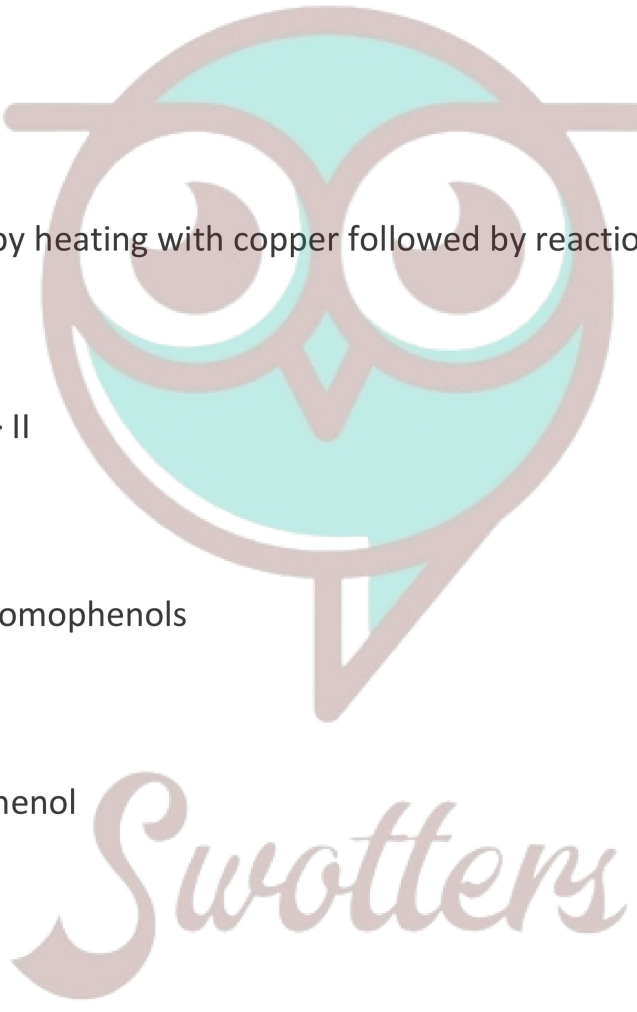
- Methanol.
- Ethanol.

- c) Propanol.
- d) Butanol.

(v) Compound (X) on treatment with excess of  $\text{Cl}_2$  in presence of light gives:

- a.  $\alpha$ -Chlorodiethyl ether.
- b.  $\alpha, \alpha'$ -Dichlorodiethyl ether.
- c. Perchlorodiethyl ether.
- d. None of these.

### MCQ Answers-

1. Answer: (d)  $\text{CH}_3\text{OH}$
  2. Answer: (c) Oxidation by heating with copper followed by reaction with Fehling solution.
  3. Answer: (b)  $(\text{CH}_3)_3\text{COH}$
  4. Answer: (d)  $\text{IV} > \text{III} > \text{I} > \text{II}$
  5. Answer: (d) O-H
  6. Answer: (b) o- and p-phenols
  7. Answer: (c)  $\text{CCl}_2$
  8. Answer: (c) m-chlorophenol
  9. Answer: (a)  $1^\circ > 2^\circ > 3^\circ$
  10. Answer: (a) Benzene
- 

### Very Short Answers-

- (i) **Ans.** 5 – Methyl octan-3-ol
- (ii) **Ans.** 1-Chloro propan-2-ol
- (iii) **Ans.** Pentan – 1,3,4 – triol

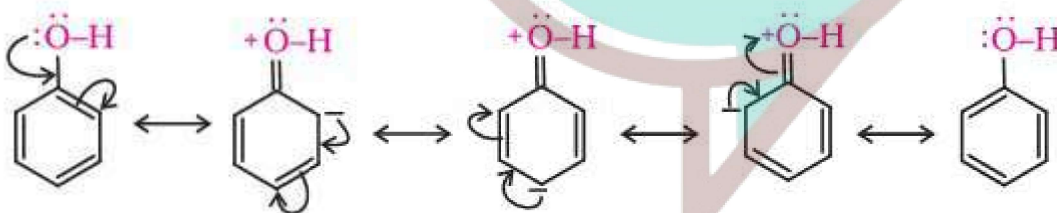


- (iv) **Ans.** 2 – Methylpropan -2-ol
- (v) **Ans.** 1,3 – Dibromo – 4- chloro – 2- butanol
- (vi) **Ans.** 5 – Chloro – 4 – ethyl – 5- methyl hexanol.
- (vii) **Ans.** 2 – Phenyl ethanol
- (viii) **Ans.** 2- Methyl phenol.
- (ix) **Ans.** 4- Bromo -3, 3,5 – trimethyl – hex -1-ene- 2,5- diol
- (x) **Ans.** 2,3 – Dimethylbutan – 2,3 –diol

### Short Answers-

**Ans 1.** Phenol is acidic in nature because

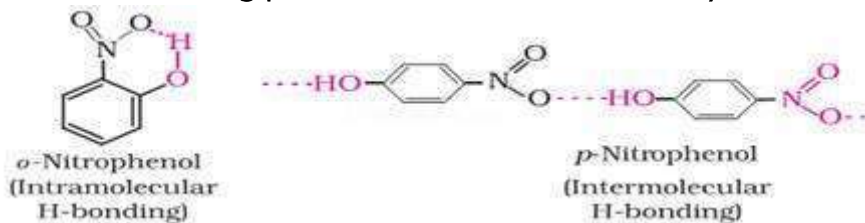
(a) phenol, due to resonance, the positive charge rests on oxygen making the shared pair of electrons more towards oxygen and hydrogen as  $H^+$



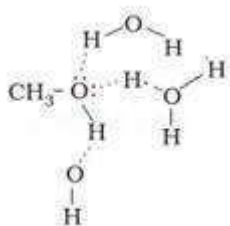
(b) The carbon attached to OH is  $sp^2$  hybridize and is more electronegative, this decreases the electron density on oxygen, increasing the polarity of O-H bond and ionization of phenol. The phenoxide ion formed by loss of  $H^+$  is more resonance stabilized than phenol itself.

**Ans 2.** In phenol due to electron rich benzene ring the C-O bond is less polar whereas in methanol the C-O bond is highly polar. Therefore the dipole moment of methanol is higher than phenol.

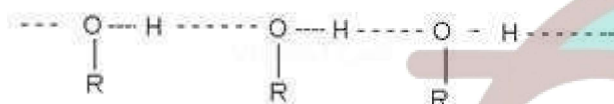
**Ans 3.** P- nitrophenol has intermolecular hydrogen bonding which increases the boiling point while in o- nitro phenol due to presence of intra molecular hydrogen bonding, there is a decrease in boiling point and increase in volatility.



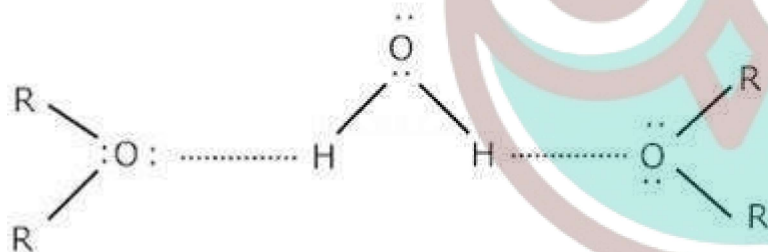
**Ans 4.** Methanol can form intermolecular hydrogen bonding with water but there is no hydrogen bonding in iodomethane and water. Therefore methanol is miscible in water.



**Ans 5.** Alcohols can form intermolecular hydrogen bonds due to their high polarity whereas, ether cannot. Therefore alcohols have higher boiling points than isomeric ethers.



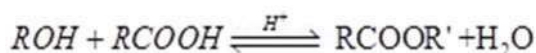
**Ans 6.** Ethers can form H-bonding with water molecule whereas alkenes cannot. Therefore ethers are soluble in water and alkanes are not.



**Ans 7.** In alcohols, the acidic strength is due to polar nature of O-H bond. An electron releasing group e.g., alkyl groups, increases electron density on oxygen tending to decrease the polarity of O-H bond. This decreases the acid strength. Therefore the order of acid strength is .



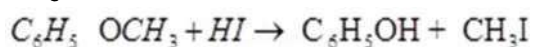
**Ans 8.** The reaction between alcohol and carboxylic acid is reversible and goes in backward direction if water is not removed as soon as it is formed.



**Ans 9.** For secondary and tertiary alcohols, elimination competes over substitution and alkenes are formed on acidic dehydration as the reaction follows  $S_N1$  mechanism. Therefore the acidic dehydration of secondary or tertiary alcohols does not give ethers.

**Ans 10.** In case of anisole, methyl phenyl oxonium ion,  $C_6H_5 - \overset{\oplus}{O} - CH_3$  is formed by

protonation of ethers during reaction with HI. The bond between O-CH<sub>3</sub> is weaker than the bond between O-C<sub>6</sub>H<sub>5</sub> because carbon of phenyl group is SP<sup>2</sup> hybridised and there is a partial double bond character. Therefore the attack by I<sup>-</sup> ion breaks O-CH<sub>3</sub> bond to form CH<sub>3</sub>I.



## Long Answers-

**Ans 1.** Primary alcohol → (i), (ii), (iii)

Secondary alcohol → (iv), (v)

Tertiary alcohol → (vi)

**Ans 2. (i)** 3-Chloromethyl-2-isopropylpentan-1-ol

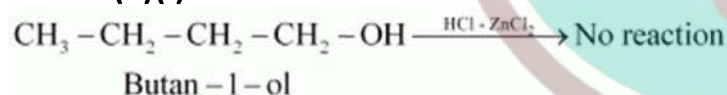
**(ii)** 2, 5-Dimethylhexane-1, 3-diol

**(iii)** 3-Bromocyclohexanol

**(iv)** Hex-1-en-3-ol

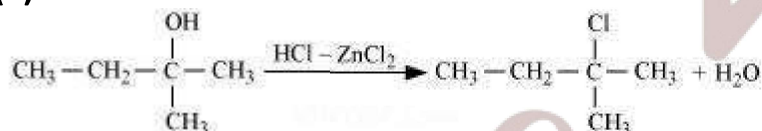
**(v)** 2-Bromo-3-methylbut-2-en-1-ol

**Ans 3. (a)(i)**



Primary alcohols do not react appreciably with Lucas' reagent (HCl-ZnCl<sub>2</sub>) at room temperature.

**(ii)**



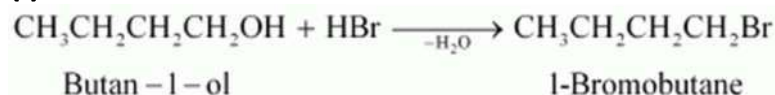
2-Methylbutan-2-ol (3°)

2-Chloro-2-Methylbutane  
(White turbidity)

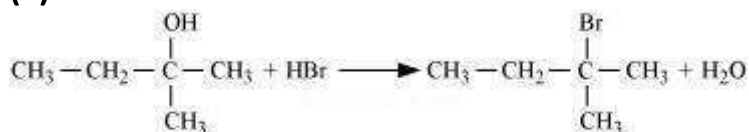
Tertiary alcohols react immediately with Lucas' reagent.

**(b)**

**(i)**



**(ii)**

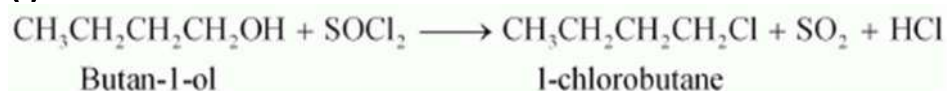


2-Methylbutan-2-ol (3°)

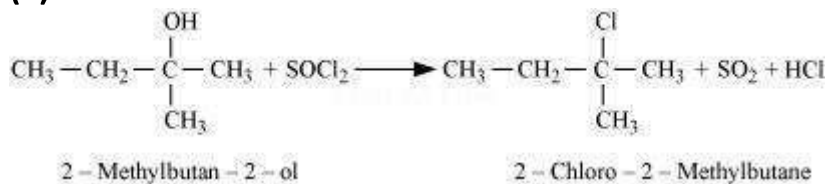
2-Bromo-2-Methylbutane

**(c)**

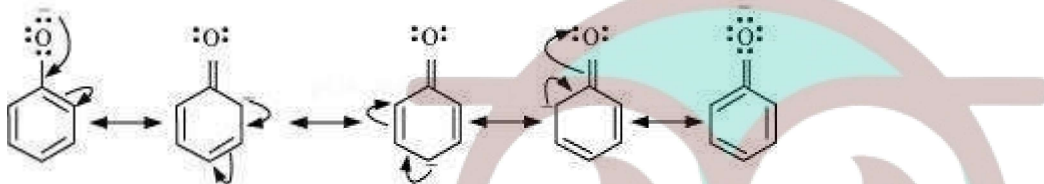
(i)



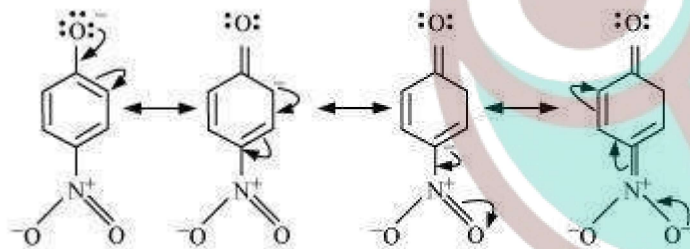
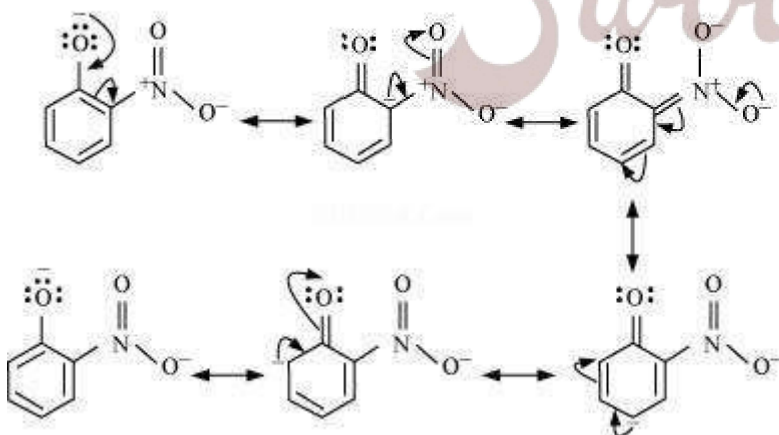
(ii)



Ans 4.

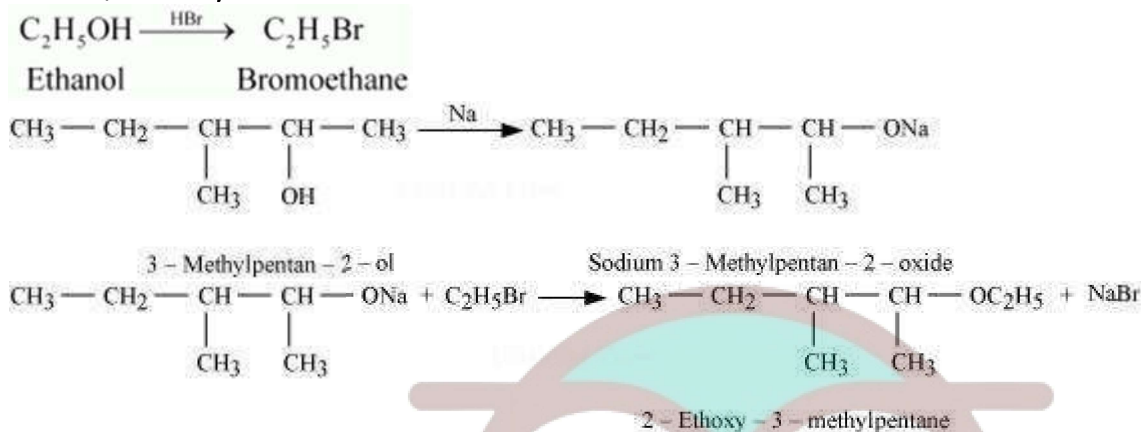


Resonance structure of the phenoxide ion

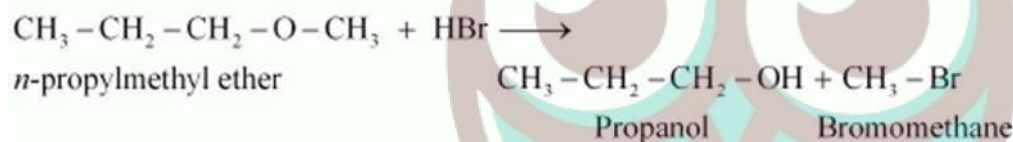
Resonance structures of *p*-nitrophenoxide ionResonance structures of *o*-nitrophenoxide ion

It can be observed that the presence of nitro groups increases the stability of phenoxide ion.

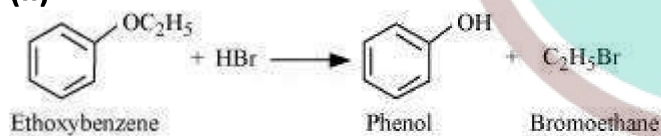
**Ans 5.** In Williamson synthesis, an alkyl halide reacts with an alkoxide ion. Also, it is an  $S_N2$  reaction. In the reaction, alkyl halides should be primary having the least steric hindrance. Hence, an alkyl halide is obtained from ethanol and alkoxide ion from 3-methylpentan-2-ol.



**Ans 6. (i)**



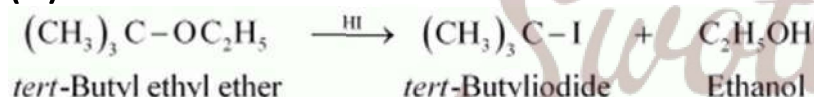
**(ii)**



**(iii)**



**(iv)**



**Ans 7. (i)** 2, 2, 4-Trimethylpentan-3-ol

**(ii)** 5-Ethylheptane-2, 4-diol

**(iii)** Butane-2, 3-diol

**(iv)** Propane-1, 2, 3-triol

**(v)** 2-Methylphenol

**(vi)** 4-Methylphenol

**(vii)** 2, 5-Dimethylphenol

**(viii)** 2, 6-Dimethylphenol

**(ix)** 1-Methoxy-2-methylpropane

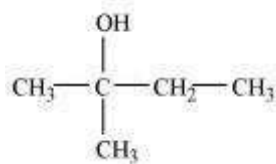
**(x)** Ethoxybenzene

**(xi)** 1-Phenoxyheptane

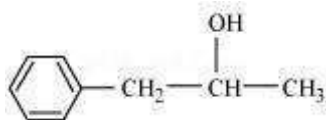


(xii) 2-Ethoxybutane

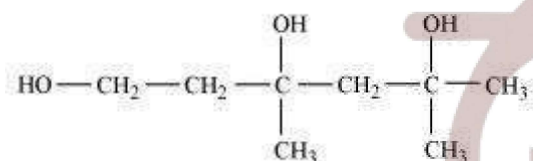
Ans 8. (i)



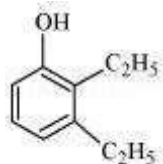
(ii)



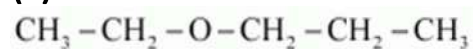
(iii)



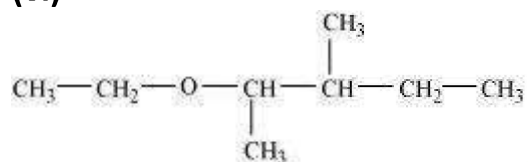
(iv)



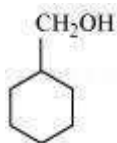
(v)



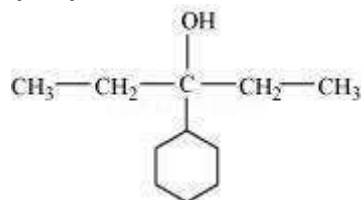
(vi)



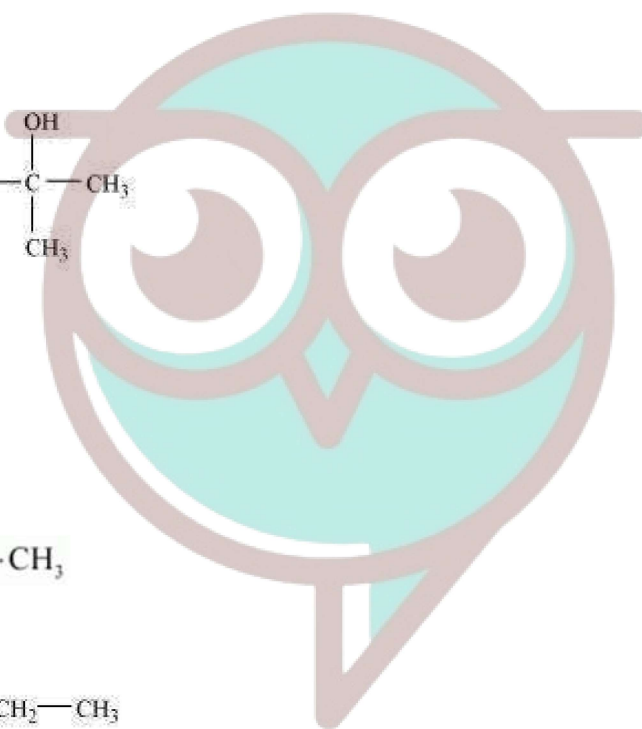
(vii)



(viii)



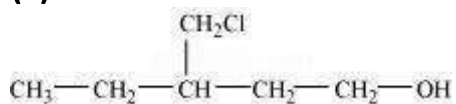
(ix)



# Swotters



(x)



### Assertion and Reason Answers-

1. (a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

2. (c) Assertion is correct statement but reason is wrong statement.

#### Explanation:

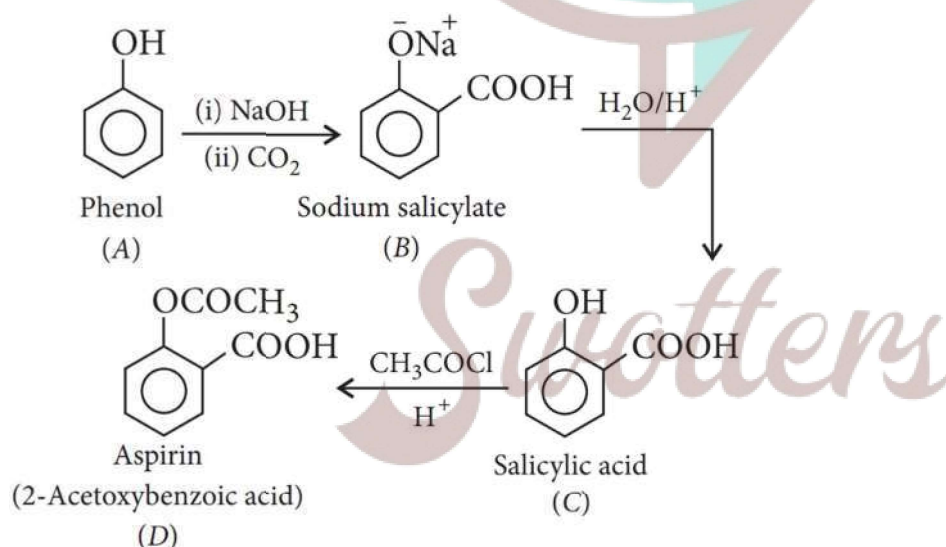
Intermediate formed is dichlorocarbene.

### Case Study Answers-

1. Answer :

(i) (c) Phenol.

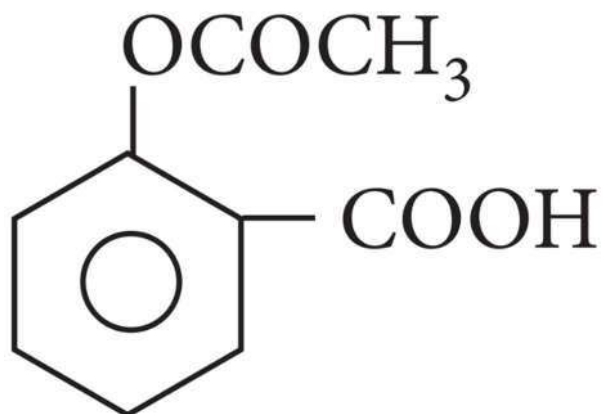
#### Explanation:



(ii) (a) Salicylic acid.

(iii) (d) 9

#### Explanation:



It has 9 C-atoms.

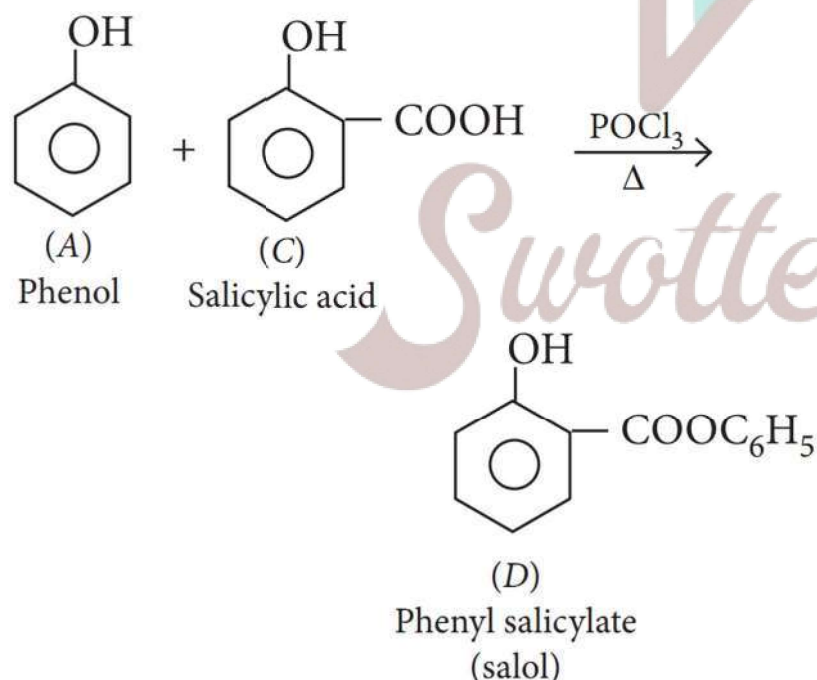
(iv) (b) Kolbe's reaction.

**Explanation:**

Sodium phenoxide when heated with  $\text{CO}_2$  at 400K under a pressure of 4-7 atm followed by acidification gives 2-hydroxybenzoic acid (salicylic acid) as the main product along with a small amount of 4-hydroxybenzoic acid. This reaction is called Kolbe's reaction.

(v) (d) As an intestinal antiseptic.

**Explanation:**



Salol is used as an intestinal antiseptic.

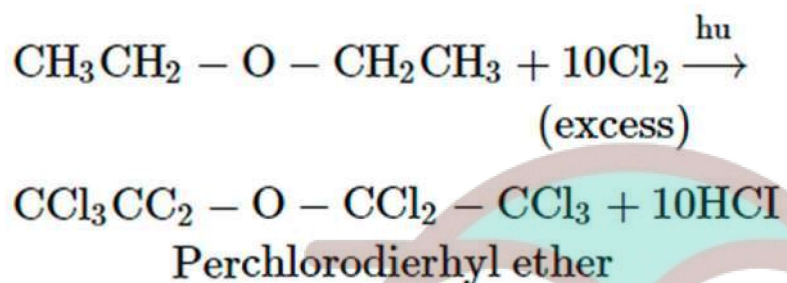
**2. Answer :**



(v) (c) Perchlorodiethyl ether.

**Explanation:**

In the presence of light and excess of chlorine, all the hydrogen atoms of diethyl ether are substituted to give perchlorodiethyl ether.



Swotters