(Chapter 11)(Alcohols Phenols and Ethers)

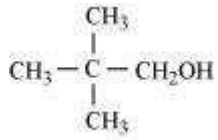
XII

Intext Questions

Question 11.1:

Classify the following as primary, secondary and tertiary alcohols:

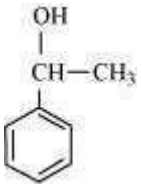
(i)



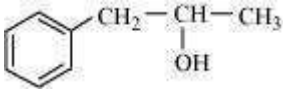
(ii) $H_2C = CH - CH_2OH$

(iii) $CH_3 - CH_2 - CH_2 - OH$

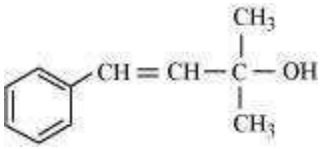
(iv)



(v)



(vi)



Answer

Primary alcohol → (i), (ii), (iii)

Secondary alcohol → (iv), (v)

Tertiary alcohol → (vi)

Question 11.2:

Identify allylic alcohols in the above examples.

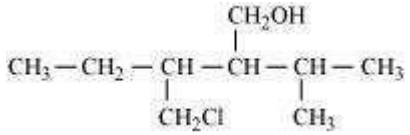
Answer

The alcohols given in (ii) and (vi) are allylic alcohols.

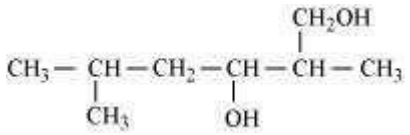
Question 11.3:

Name the following compounds according to IUPAC system.

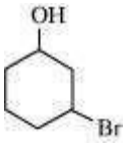
(i)



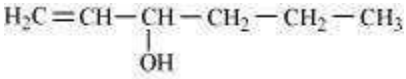
(ii)



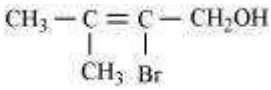
(iii)



(iv)



(v)



Answer

(i) 3-Chloromethyl-2-isopropylpentan-1-ol

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

(iii) 3-Bromocyclohexanol

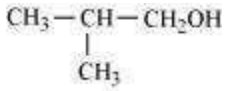
(iv) Hex-1-en-3-ol

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

Question 11.4:

Show how are the following alcohols prepared by the reaction of a suitable Grignard reagent on methanal?

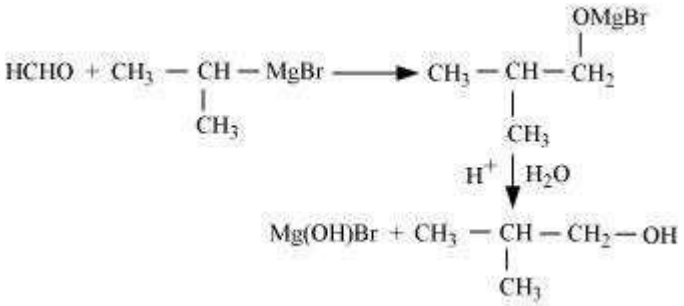
(i)



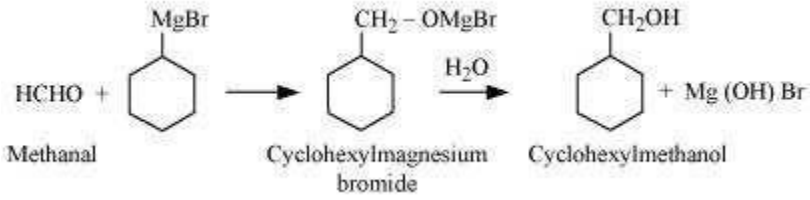
(ii)

Answer

(i)



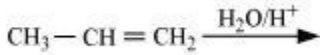
(ii)



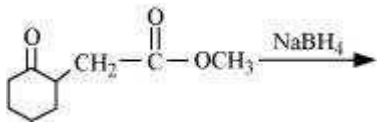
Question 11.5:

Write structures of the products of the following reactions:

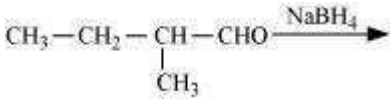
(i)



(ii)

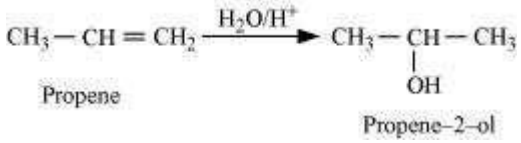


(iii)

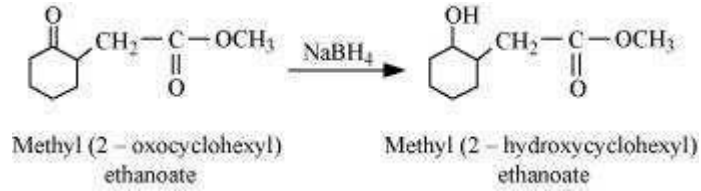


Answer

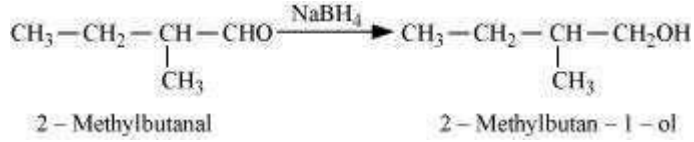
(i)



(ii)



(iii)



Question 11.6:

Give structures of the products you would expect when each of the following alcohol reacts with (a) HCl-$ZnCl_2$ (b) HBr and (c) $SOCl_2$.

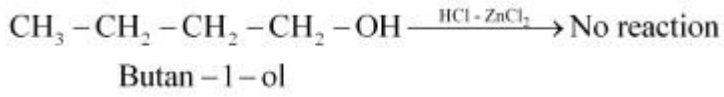
(i) Butan-1-ol

(ii) 2-Methylbutan-2-ol

Answer

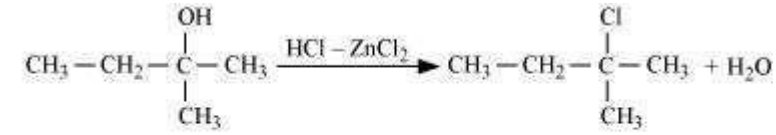
(a)

(i)



Primary alcohols do not react appreciably with Lucas' reagent ($HCl\text{-}ZnCl_2$) at room temperature.

(ii)

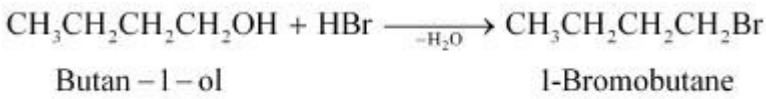


2 – Methylbutan – 2 – ol (3°) | 2 – Chloro – 2 – Methylbutane (White turbidity)

Tertiary alcohols react immediately with Lucas' reagent.

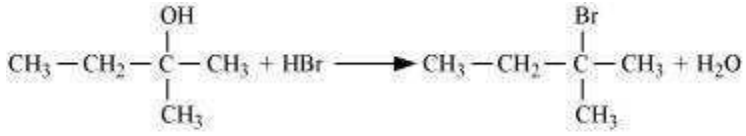
(b)

(i)



Butan – 1 – ol | 1-Bromobutane

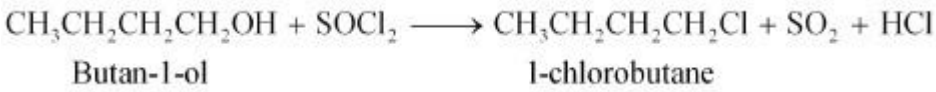
(ii)



2 – Methylbutan – 2 – ol (3°) | 2 – Bromo – 2 – Methylbutane

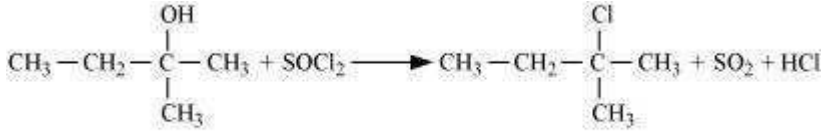
(c)

(i)



Butan-1-ol | 1-chlorobutane

(ii)



2 – Methylbutan – 2 – ol | 2 – Chloro – 2 – Methylbutane

Question 11.7:

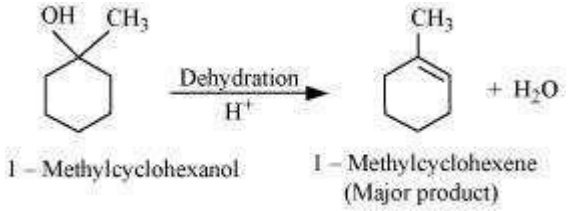
Predict the major product of acid catalysed dehydration of

(i) 1-methylcyclohexanol and

(ii) butan-1-ol

Answer

i.



(ii)

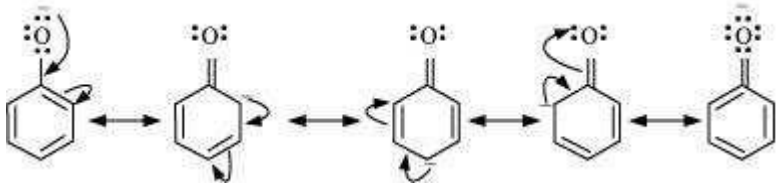
$$CH_3CH_2CH_2CH_2OH \xrightarrow[H^+]{\text{Dehydration}} CH_3CH=CHCH_3 + H_2O$$

Butan-1-ol — But-2-ene (Major product)

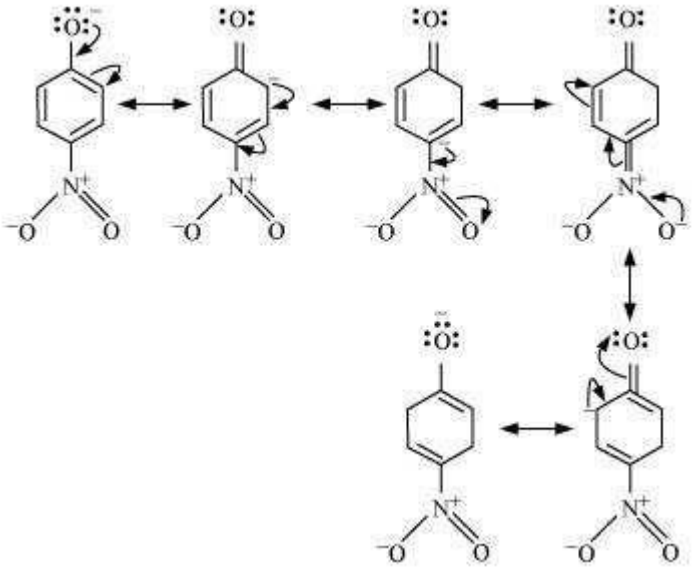
Question 11.8:

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

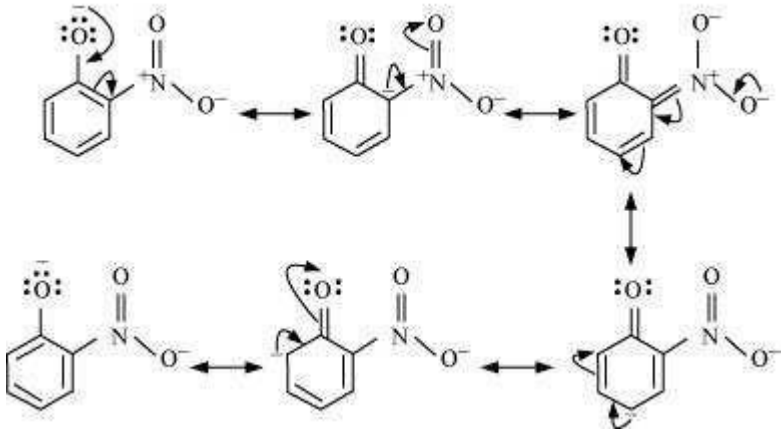
Answer



Resonance structure of the phenoxide ion



Resonance structures of *p*-nitrophenoxide ion



Resonance structures of *m*-nitrophenoxide ion

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

Question 11.9:

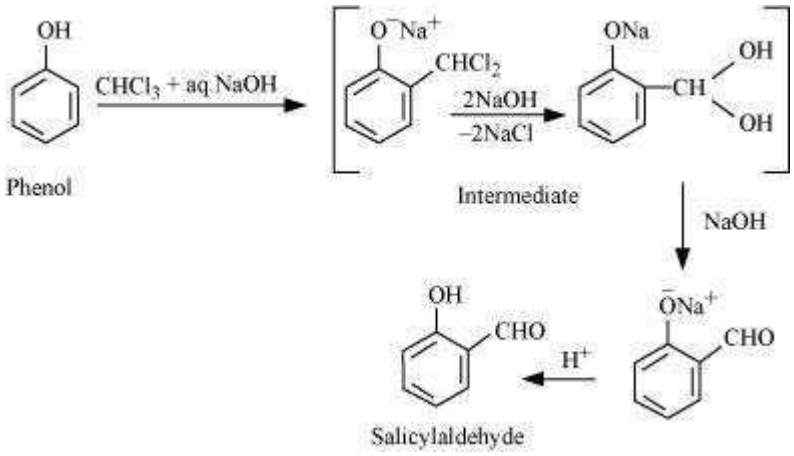
Write the equations involved in the following reactions:

(i) Reimer-Tiemann reaction

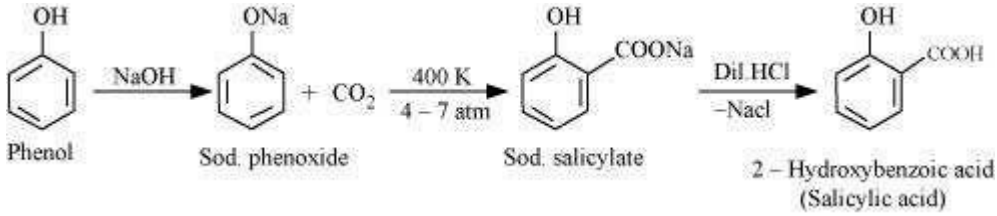
(ii) Kolbe's reaction

Answer

i. **Reimer-Tiemann reaction**



ii. **Kolbe's reaction**

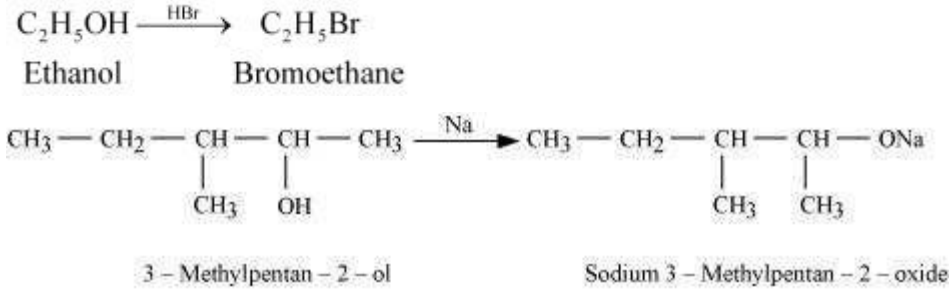


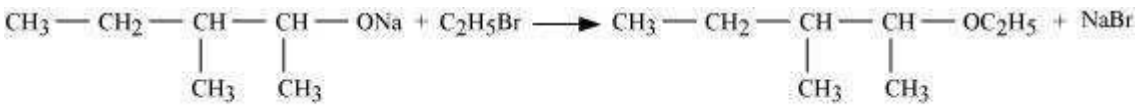
Question 11.10:

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

Answer

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 3methylpentan-2-ol.





2 – Ethoxy – 3 – methylpentane

Question 11.11:

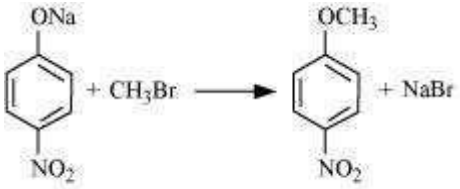
Which of the following is an appropriate set of reactants for the preparation of 1methoxy-4-nitrobenzene and why?

(i)

(ii)

Answer

Set (ii) is an appropriate set of reactants for the preparation of 1-methoxy-4nitrobenzene.



1 – Methoxy – 4 – nitrobenzene

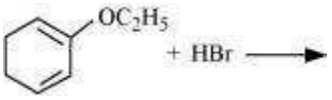
In set (i), sodium methoxide (CH_3ONa) is a strong nucleophile as well as a strong base. Hence, an elimination reaction predominates over a substitution reaction.

Question 11.12:

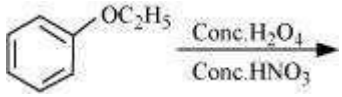
Predict the products of the following reactions:

(i) $CH_3-CH_2-CH_2-O-CH_3 + HBr \rightarrow$

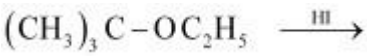
(ii)



(iii)

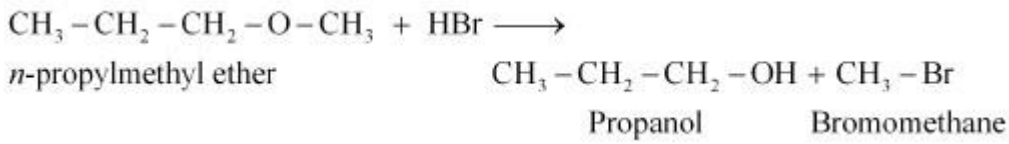


(iv)

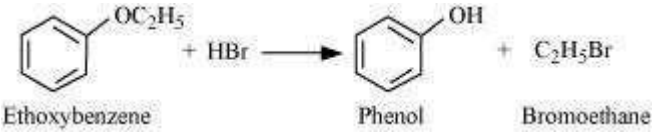


Answer

(i)



(ii)



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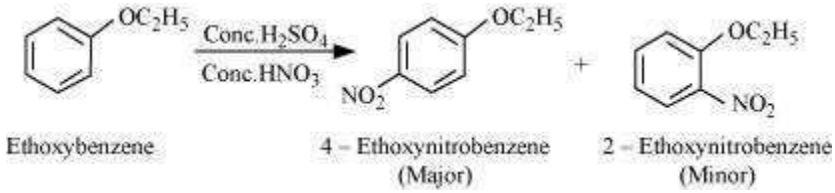

(iv)