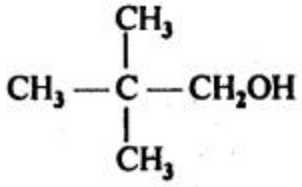
THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

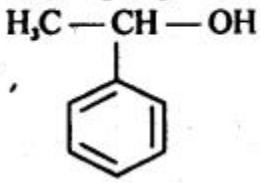
ALCOHOLS,PHENOLS AND ETHERS

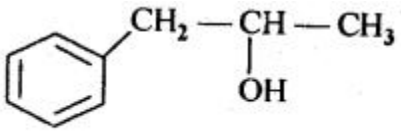
1.1. Classify the following as primary, secondary and tertiary alcohols.

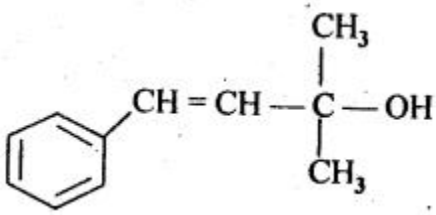
(i) 

(ii) $H_2C=CH-CH_2OH$

(iii) $CH_3CH_2CH_2OH$

(iv) 

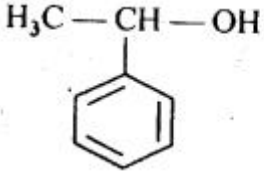
(v) 

(vi) 

Ans: Primary alcohols: (i), (ii), (iii)
Secondary alcohols: (iv), (v)
Tertiary alcohols: (vi)

11.2. Identify aliylic alcohols in the above examples.

Ans: (ii) and (iv) i.e. $H_2C=CH-CH_2OH$ and

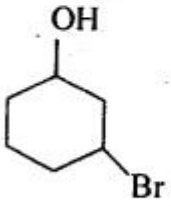


are allylic alcohols

11.3. Name the following compounds according to IUPAC system.

(i) $CH_3-CH_2-\underset{\displaystyle CH_2Cl}{\underset{|}{CH}}-\underset{\displaystyle CH_2OH}{\underset{|}{CH}}-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$

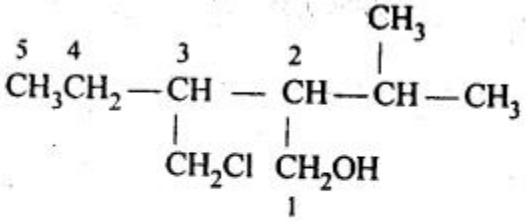
(ii) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-\underset{\displaystyle OH}{\underset{|}{CH}}-\underset{\displaystyle CH_2OH}{\underset{|}{CH}}-CH_3$

(iii) 

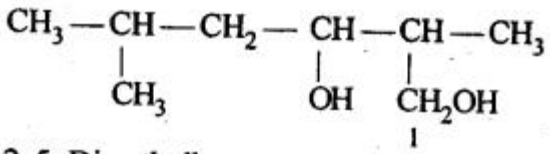
(iv) $H_2C=CH-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_2-CH_2-CH_3$

(v) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=\underset{\displaystyle Br}{\underset{|}{C}}-CH_2OH$

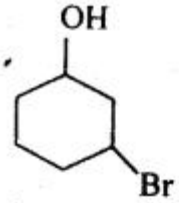
Ans:

(i) 

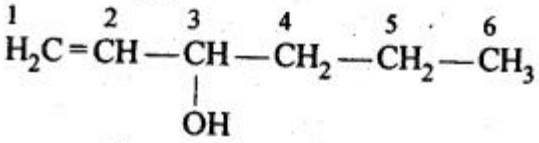
3 – Chloromethyl – 2 – isopropylpentan – 1 – ol
6 5 4 3 2

(ii) 

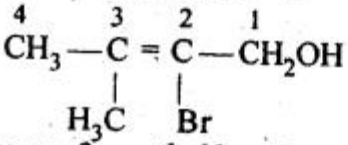
2, 5–Dimethylhexane – 1, 3 – diol

(iii) 

3 – Bromocyclohexanol

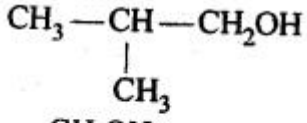
(iv) 

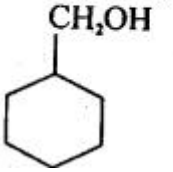
Hex–1–en–3–ol

(v) 

2–Bromo–3– methyl but–2–en–1–ol

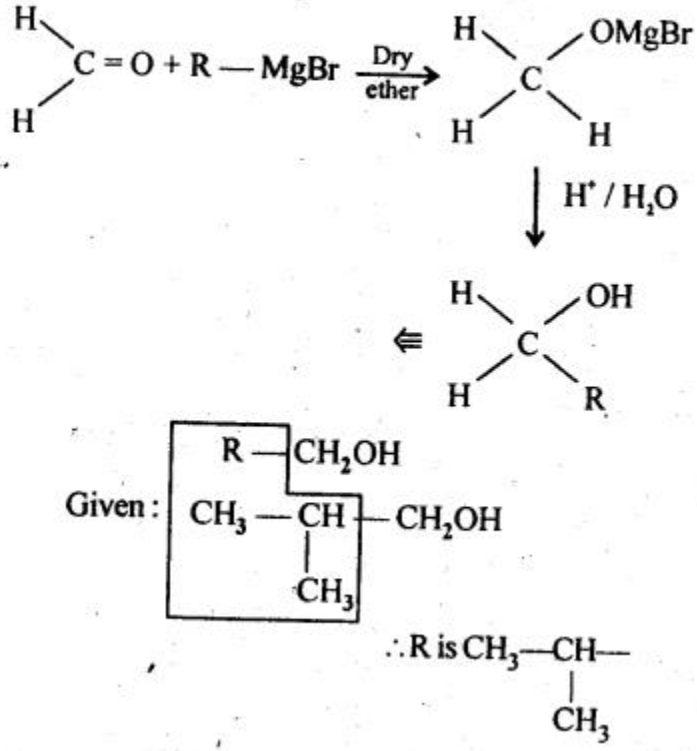
11.4. Show how are the following alcohols prepared by the reaction of a suitable Grignard reagent on methanal ?

(i) 

(ii) 

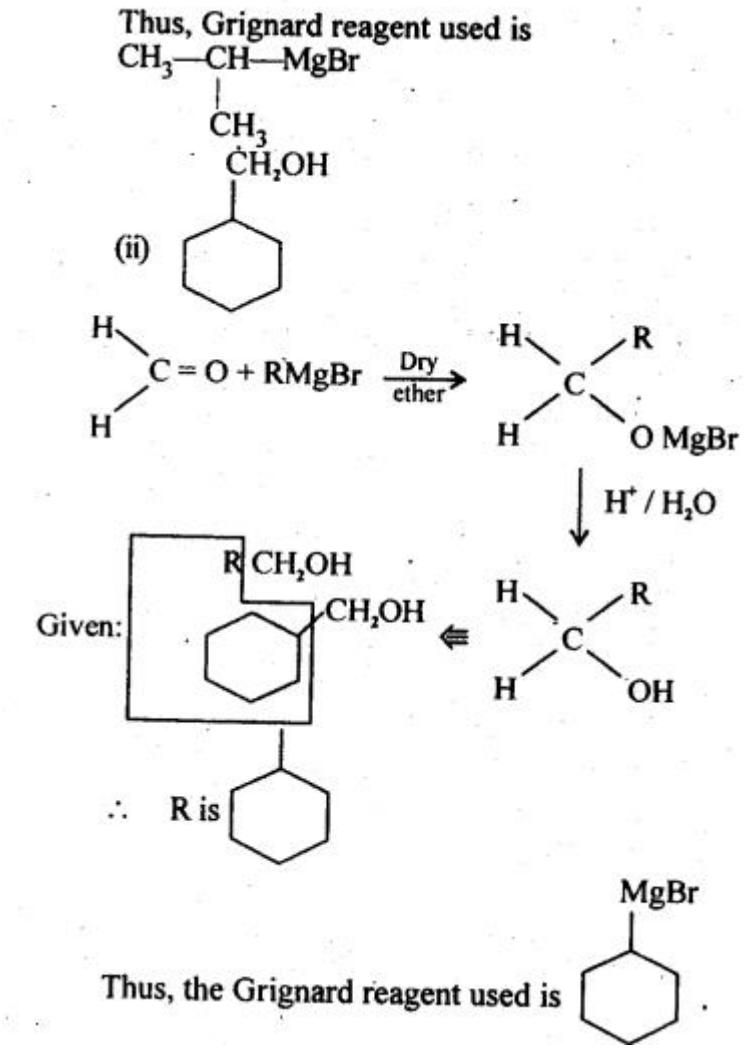
Ans:

(i) $CH_3-CH(CH_3)-CH_2OH$



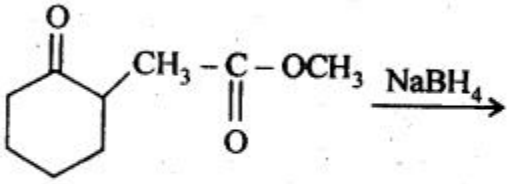
Given : $R-CH_2OH$ where R is $CH_3-CH(CH_3)-$

$\therefore$ R is $CH_3-CH(CH_3)-$



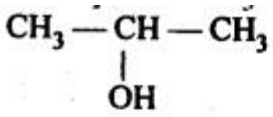
11.5. Write structures of the products of the following reactions:

(i) $CH_3 - CH = CH_2 \xrightarrow{H_2O/H^+}$

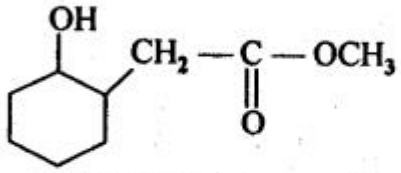
(ii) 

(iii) $CH_3 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CHO \xrightarrow{NaBH_4}$

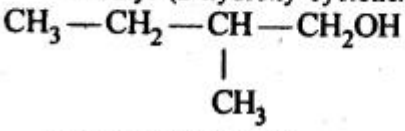
Ans:

(i) 

Propan-2-ol

(ii) 

Methyl (2-hydroxy cyclohexyl) ethanoate

(iii) 

2–Methylbutan–1–ol

11.6. Give structures of the products you would expect when each of the following alcohol reacts with (a)HCl-$ZnCl_2$ (b)HBrand (c) $SOCl_2$
(i)Butan-1-ol
(ii)2-Methylbutan-2-ol

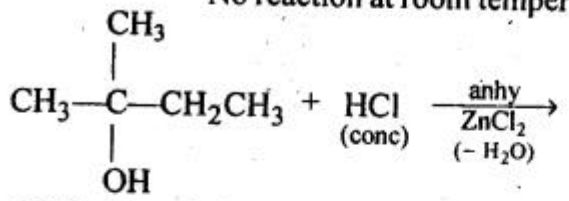
Ans:

(a) with $HCl - ZnCl_2$

$$CH_3CH_2CH_2CH_2OH + HCl \xrightarrow[ZnCl_2]{anhy}$$

butan -1-ol (1°) (conc)

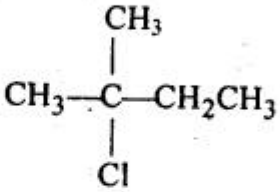
No reaction at room temperature



$$+ HCl \xrightarrow[(-H_2O)]{anhy\ ZnCl_2}$$

(conc)

2-Methylbutan-2-ol (3°)

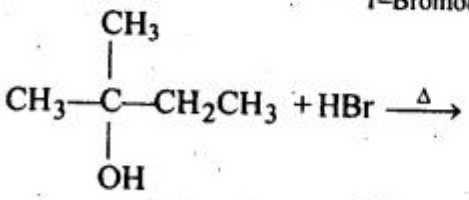


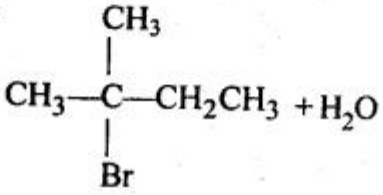
2-Chloro-2-methylbutane
(white turbidity)

(b) with HBr

$$CH_3CH_2CH_2CH_2OH + HBr \xrightarrow{\Delta} CH_3CH_2CH_2CH_2Br + H_2O$$

1–Bromobutane



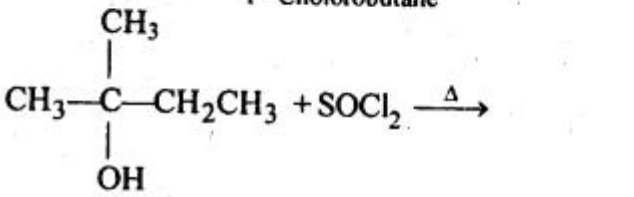


2-Bromo-2-methylbutane

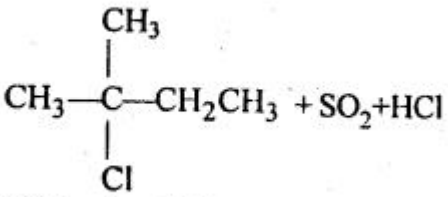
(c) with $SOCl_2$

$$CH_3CH_2CH_2CH_2OH + SOCl_2 \xrightarrow{\Delta} CH_3CH_2CH_2CH_2Cl + SO_2 + HCl$$

1– Cholorobutane

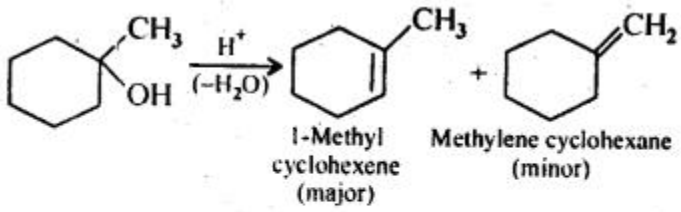


$$\xrightarrow{\Delta}$$



2-Chloro-2-methyl-butane

11.7. Predict the major product of acid catalysed dehydration of
(i) 1-nicthylcyclohcxanoland
(ii) butan-1-ol
Ans:



1-Methyl cyclohexene (major)

Methylene cyclohexane (minor)

(ii) $CH_3CH_2CH_2CH_2OH \longrightarrow$

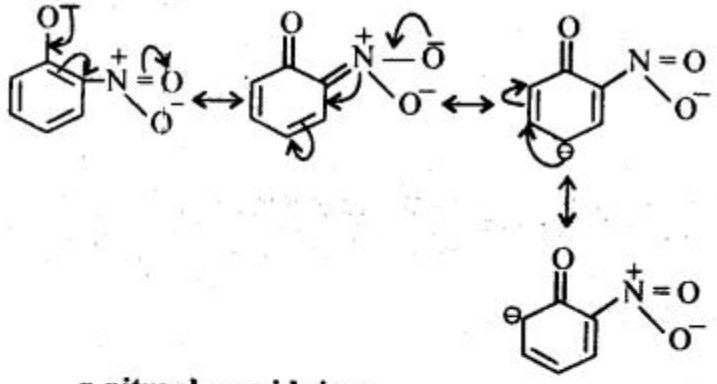
$CH_3CH{=}CH{-}CH_3$ + $CH_3CH_2CH{=}CH_2$

But-2-ene (major) But-1-ene (minor)

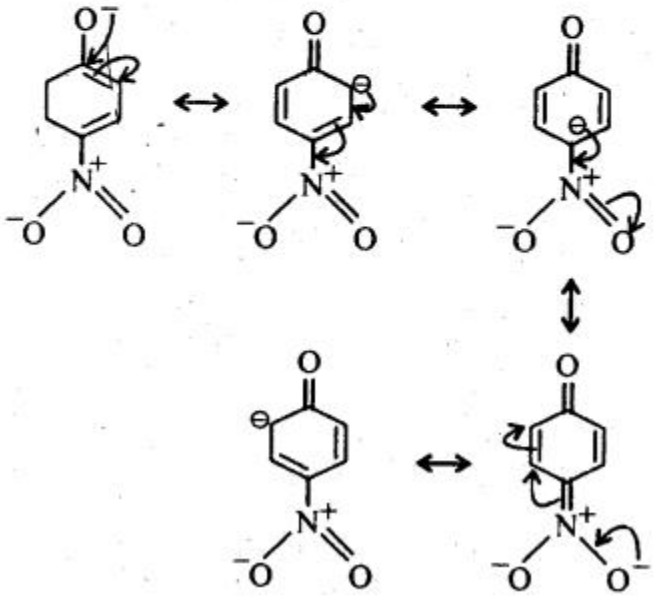
11.8. Ortho and para nitrophenols are more acidic than phenol. Draw the resonance structures of the corresponding phenoxide ions.
Ans:
The resonance structures of o-and p- nitrophenoxide ions and phenoxide ion are given

below:

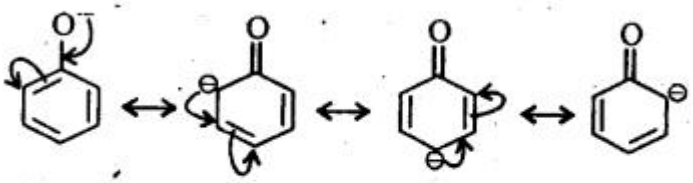
o-nitrophenoxide ion :



p-nitrophenoxide ion :



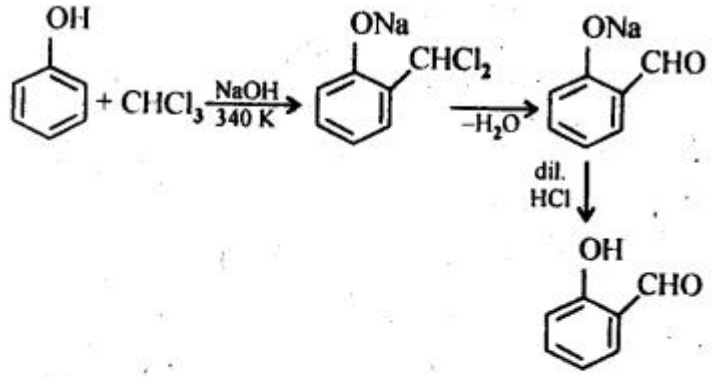
phenoxide ion :



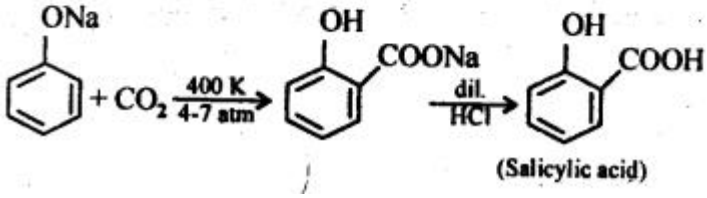
Due to –R effect of $-NO_2$ group, *o*– and *p*–nitrophenoxide are more stable than phenoxide ion. As a result, *o*– and *p*–nitrophenols are more acidic than phenol.

11.9; Write the equations involved in the following reactions:
(i) Reimer-Tiemann reaction
(ii) Kolbe's reaction

Ans: (i) Reimer-Tiemann reaction

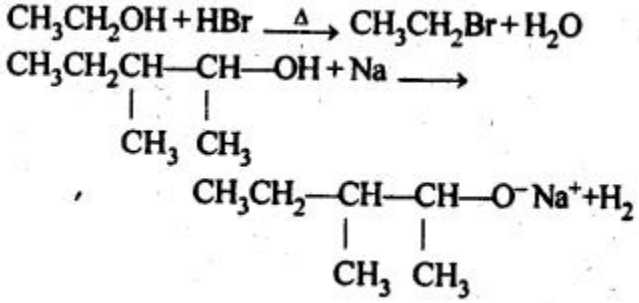


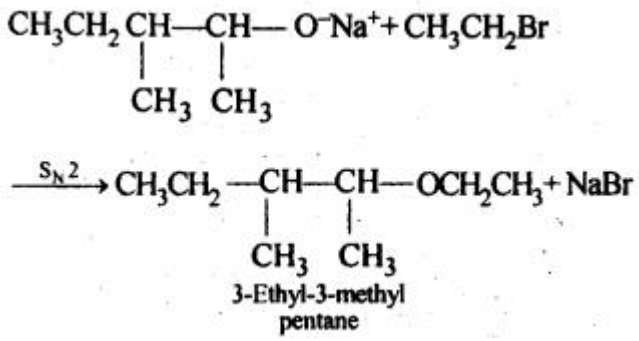
(ii) **Kolbe's reaction**



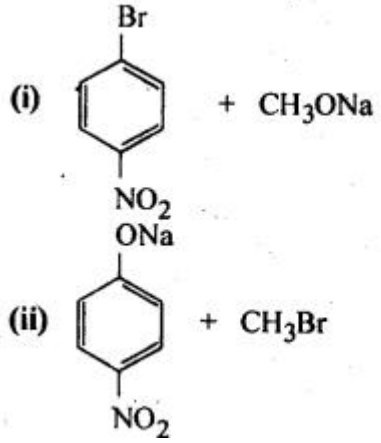
11.10. Write the reactions of Williamson synthesis of 2-ethoxy-3-methylpentane starting from ethanol and 3-methylpentan-2-ol.

Ans: In Williamsons's synthesis, the alkyl halide should be primary. Thus, the alkyl halide should be derived from ethanol and the alkoxide ion from 3-methylpentan-2-ol. The synthesis is as follows



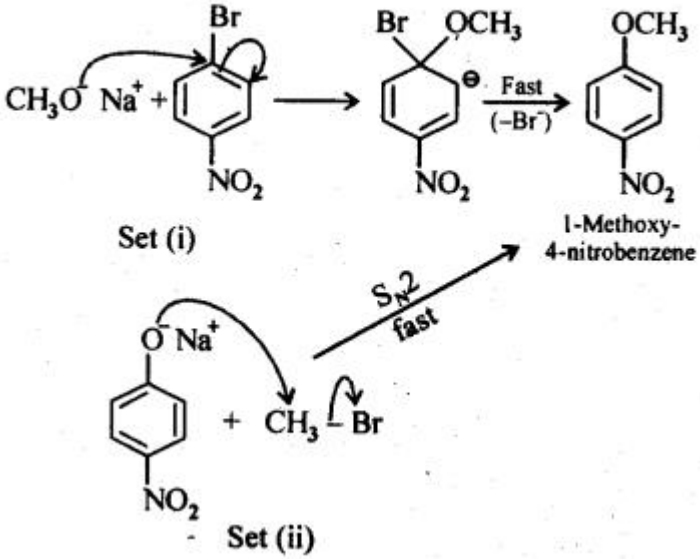


11.11. Which of the following is an appropriate set of reactants for the preparation of l-methoxy-4- nitrobenzene and why?



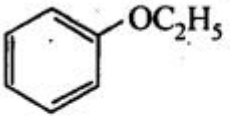
Ans:

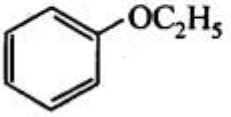
Chemically, both sets are equally probable.



11.12. Predict the products of the following reactions:

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

(ii)  + HBr ⟶

(iii)  + HBr ⟶

(iv) $(CH_3)_3C-OC_2H_5 \xrightarrow{HI}$

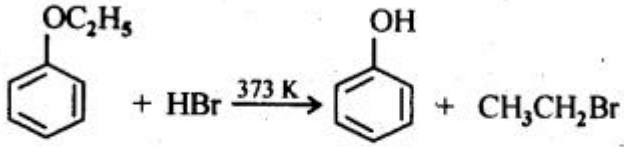
Ans:

(i) $CH_3CH_2CH_2OCH_3 + HBr \xrightarrow{373K}$

$CH_3CH_2CH_2OH$ + CH_3Br

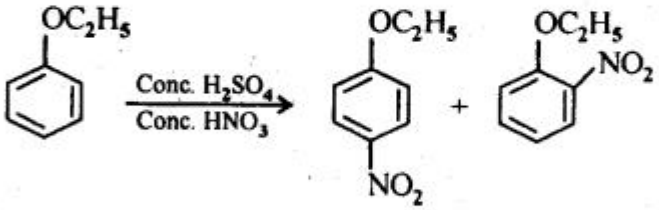
Propan-1-ol Bromomethane

(ii)



Phenol Bromoethane

(iii)



(Major) (Minor)

(iv) $(CH_3)_3C-OC_2H_5 + HI \longrightarrow$