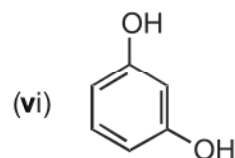
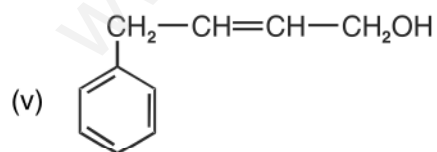
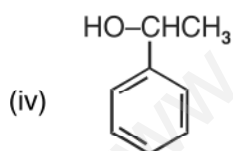
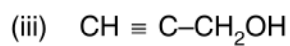
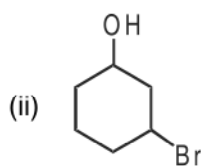
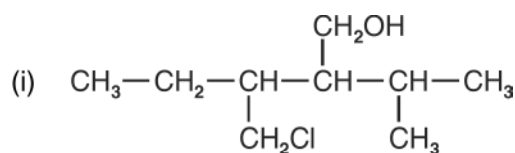
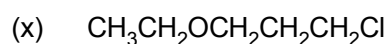
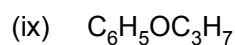
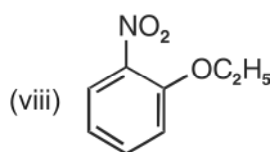
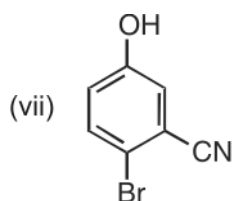


Unit - 11

ALCOHOLS, PHENOLS AND ETHERS

1. Write IUPAC names of the following compounds :





2. Write the structures of the compounds whose names are given below :

(i) 3, 5-dimethoxyhexane-1, 3, 5-triol

(ii) cyclohexylmethanol

(iii) 2-ethoxy-3-methylpentane

(iv) 3-chloromethylpentan-2-ol

(v) p-nitroanisole

3. Describe the following reactions with example :

(i) Hydroboration oxidation of alkenes

(ii) Acid catalysed dehydration of alcohols at 443K.

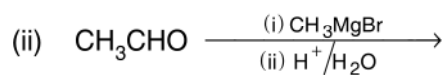
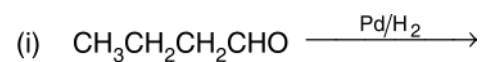
(iii) Williamson synthesis

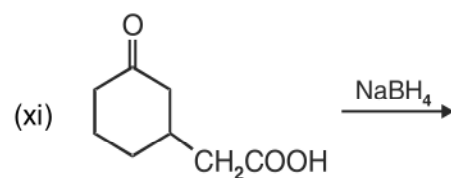
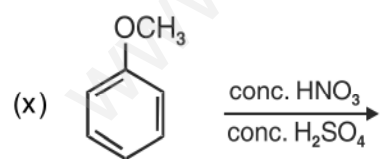
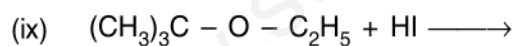
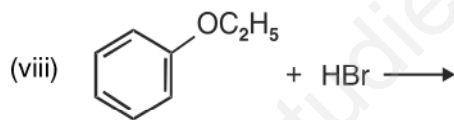
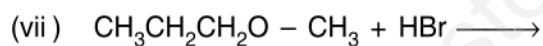
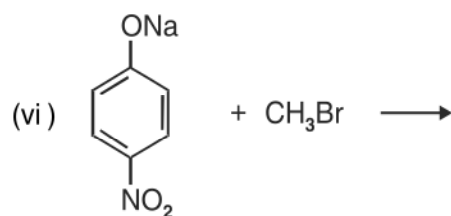
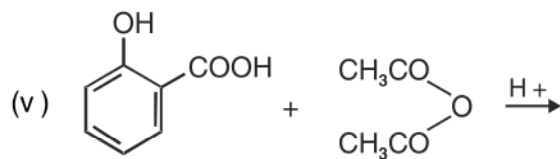
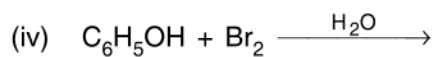
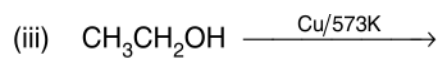
(iv) Reimer-Tiemann reaction.

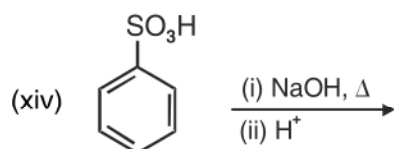
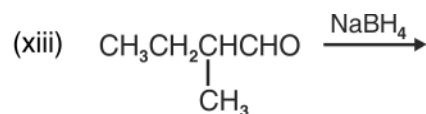
(v) Kolbe's reaction

(vi) Friedel-Crafts acylation of Anisole.

4. Complete the following reactions :

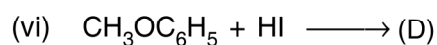
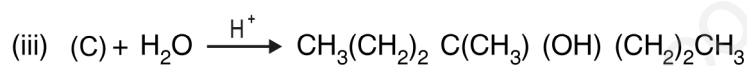
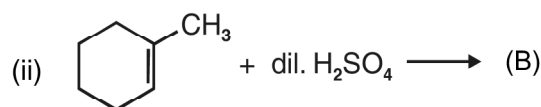
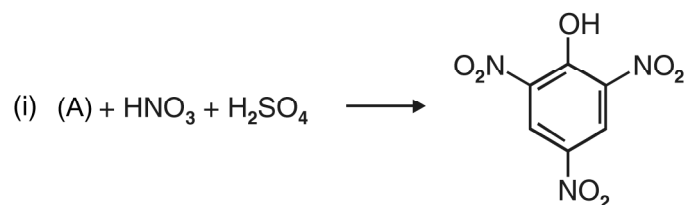




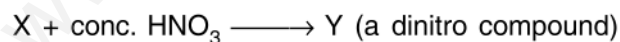
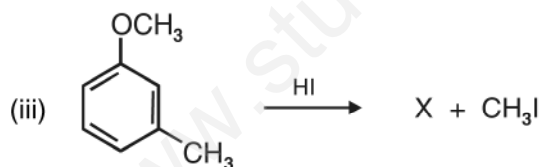
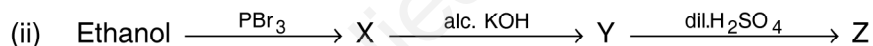
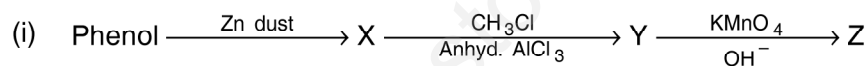


5. What happens when :
 - (i) aluminium reacts with tert-butyl alcohol
 - (ii) phenol is oxidised with chromic acid
 - (iii) cumene is oxidised in the presence of air and the product formed is treated with dilute acid.
 - (iv) phenol is treated with conc. HNO_3 .
 - (v) phenol is treated with chloroform in presence of dilute NaOH .
6. How will you convert
 - (i) propene to propan-1-ol.
 - (ii) anisole to phenol
 - (iii) butan-2-one to butan-2-ol
 - (iv) ethanal to ethanol
 - (v) phenol to ethoxybenzene
 - (vi) 1-phenylethene to 1-phenylethanol
 - (vii) formaldehyde to cyclohexylmethanol
 - (viii) butyl bromide to pentan-1-ol.
 - (ix) toluene to benzyl alcohol
 - (x) 1-propoxypropane to propyl iodide
 - (xi) ethyl bromide to 1-ethoxyethane
 - (xii) methyl bromide to 2-methoxy-2-methylpropane
 - (xiii) ethyl bromide to ethoxybenzene
 - (xiv) ethanol to benzyl ethyl ether.

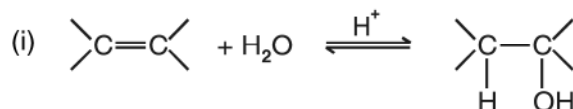
7. Identify the missing reactant or product A to D in the following equations:



8. Identify X, Y and Z in the following sequence of reactions :



10. Write the mechanism for following reactions :

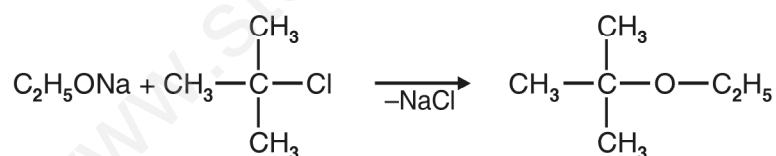


(acid catalysed hydration of alkenes)

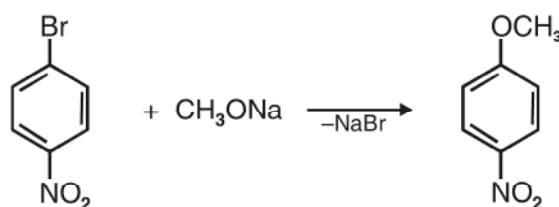
- (ii) $\text{CH}_3 - \text{CH}_2 - \text{OH} \xrightarrow[443 \text{ K}]{\text{H}^+} \text{CH}_2 = \text{CH}_2$
(acid catalysed dehydration of alcohols)
- (iii) $2\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[413 \text{ K}]{\text{H}^+} \text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
(acid catalysed nucleophilic substitution reaction)
- (iv) $\text{CH}_3\text{OCH}_3 + \text{HI} \longrightarrow \text{CH}_3\text{OH} + \text{CH}_3\text{I}$
- (v) $(\text{CH}_3)_3\text{C} - \text{O} - \text{CH}_3 + \text{HI} \longrightarrow \text{CH}_3\text{OH} + (\text{CH}_3)_3\text{C} \text{I}$

11. Give reason for the following :

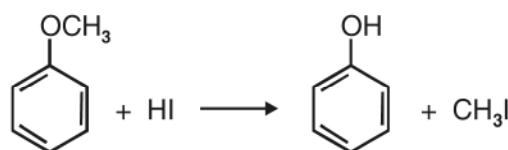
- (i) The C–O–C bond angle in dimethyl ether is (111.7°)
- (ii) Alcohols have higher boiling points than ethers of comparable molecular masses.
- (iii) Phenols are more acidic than alcohols.
- (iv) Nitrophenol is more acidic than o-methoxyphenol.
- (v) Phenol is more reactive towards electrophilic substitution reaction than benzene.
- (vii) The following is not an appropriate method for the preparation of t-butyl ethyl ether :



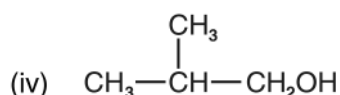
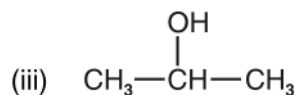
- (a) What would be the major product of this reaction?
- (b) Write suitable reaction for the preparation of t-butyl ethyl ether.
- (viii) The following is not an appropriate method for the preparation of 1-methoxy-4-nitrobenzene;



- (x) Write the suitable reaction for the preparation of 1-methoxy-4-nitrobenzene
- (ix) o-nitrophenol is steam volatile but p-nitrophenol is not.
- (x) phenol is less polar than ethanol.
- (xi) The phenyl methyl ether reacts with HI to form phenol and iodomethane and not iodobenzene and methanol.



- (xii) methanol is less acidic than water.
 - (xiii) alcohols can act as weak base as well as weak acids.
 - (xiv) phenols do not give protonation reaction readily.
 - (xvi) absolute ethanol can not be obtained by fractional distillation of ethanol and water mixture.
12. Arrange the following in the increasing order of property shown :
- (i) methanol, ethanol, diethylether, ethyleneglycol. (Boiling points)
 - (ii) phenol, o-nitrophenol, m-nitrophenol, p-nitrophenol. (Acid strength)
 - (iii) dimethylether, ethanol, phenol. (Solubility in water)
 - (iv) n-butanol, 2-methylpropan-1-ol, 2-methylpropan-2-ol. (Acid strength)
13. Give a chemical test to distinguish between the following pair of compounds.
- (i) n-propyl alcohol and isopropylalcohol
 - (ii) methanol and ethanol
 - (iii) cyclohexanol and phenol.
 - (iv) propan-2-ol and 2-methylpropan-2-ol.
 - (v) phenol and anisole
 - (vi) ethanol and diethyl ether
- *14. Which of the following compounds gives fastest reaction with HBr and why?
- (i) $(\text{CH}_3)_3\text{COH}$
 - (ii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

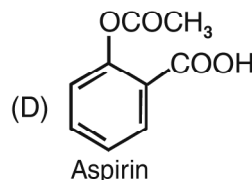
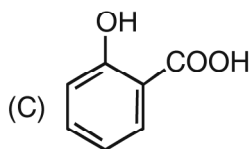
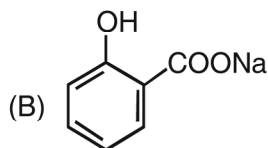
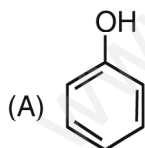


- *15. What is the function of ZnCl_2 (anhyd) in Lucas test for distinction between 1° , 2° and 3° alcohols.
16. An alcohol A ($\text{C}_4\text{H}_{10}\text{O}$) on oxidation with acidified potassium dichromate gives carboxylic acid B ($\text{C}_4\text{H}_8\text{O}_2$). Compound A when dehydrated with conc. H_2SO_4 at 443 K gives compound C. Treatment of C with aqueous H_2SO_4 gives compound D ($\text{C}_4\text{H}_{10}\text{O}$) which is an isomer of A. Compound D is resistant to oxidation but compound A can be easily oxidised. Identify A, B, C and D and write their structures.

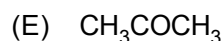
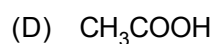
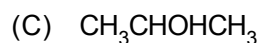
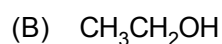
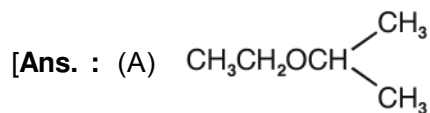
[Ans. : [A] : $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$ [B] : $\text{CH}_3\text{CH}(\text{CH}_3)\text{COOH}$
 [C] : $(\text{CH}_3)_2\text{C} = \text{CH}_2$ [D] : $(\text{CH}_3)_3\text{C} - \text{OH}$

- *17. An organic compound A having molecular formula $\text{C}_6\text{H}_6\text{O}$ gives a characteristic colour with aqueous FeCl_3 . When A is treated with NaOH and CO_2 at 400 K under pressure, compound B is obtained. Compound B on acidification gives compound C which reacts with acetyl chloride to form D which is a popular pain killer. Deduce the structure of A, B, C and D. What is the common name of Drug D?

[Ans. :

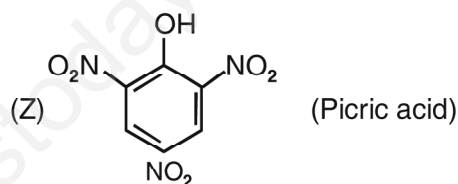
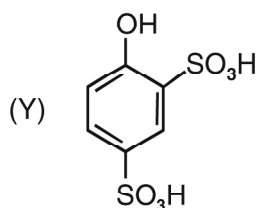


19. An ether A ($\text{C}_5\text{H}_{12}\text{O}$) when heated with excess of hot concentrated HI produced two alkyl halides which on hydrolysis form compounds B and C. Oxidation of B gives an acid D whereas oxidation of C gave a ketone E. Deduce the structures of A, B, C, D and E.



20. Phenol, $\text{C}_6\text{H}_5\text{OH}$ when it first reacts with concentrated sulphuric acid, forms Y. Y is reacted with concentrated nitric acid to form Z. Identify Y and Z and explain why phenol is not converted commercially to Z by reacting it with conc. HNO_3 .

[Ans. :



Phenol is not reacted directly with conc. HNO_3 because the yield of picric acid is very poor]

21. Synthesise the following alcohols from suitable alkenes.



22. How are the following ethers prepared by williumson synthesis?

