

# 10

# ALCOHOLS, PHENOLS AND ETHERS

## PREVIOUS YEARS' QUESTIONS

2019

### Very Short Answer Type Questions [1 Mark]

1. Arrange the following in increasing order of acidic character:

Benzonic acid, phenol, cresol.

[AI Panchkula]

Ans. Cresol < Phenol < Benzoic acid

### Short Answer Type Questions [2 Marks]

2. Define with equation:

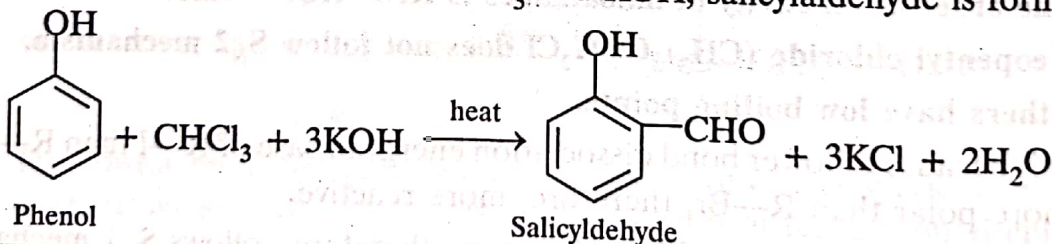
(a) Reimer-Tiemann reaction

(b) Williamson's synthesis

[CBSE]

Ans. (a) Reimer-Tiemann reaction:

When phenol is heated with  $\text{CHCl}_3$  and  $\text{KOH}$ , salicylaldehyde is formed.



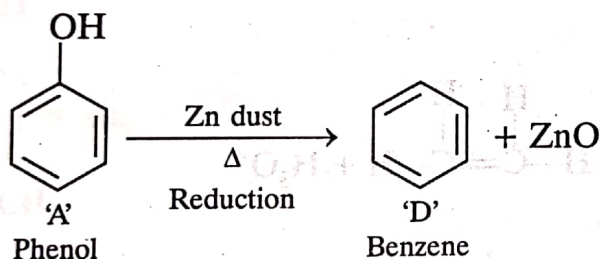
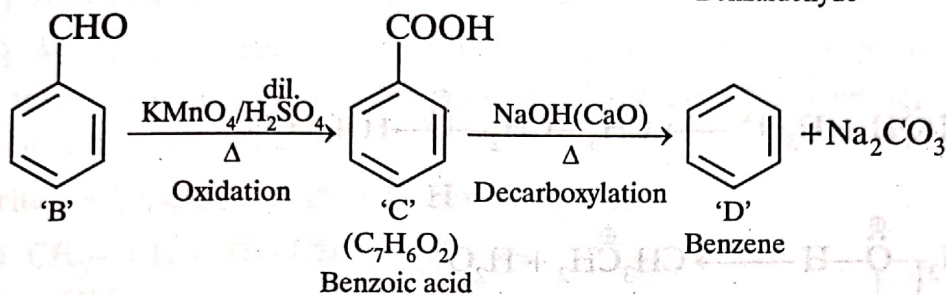
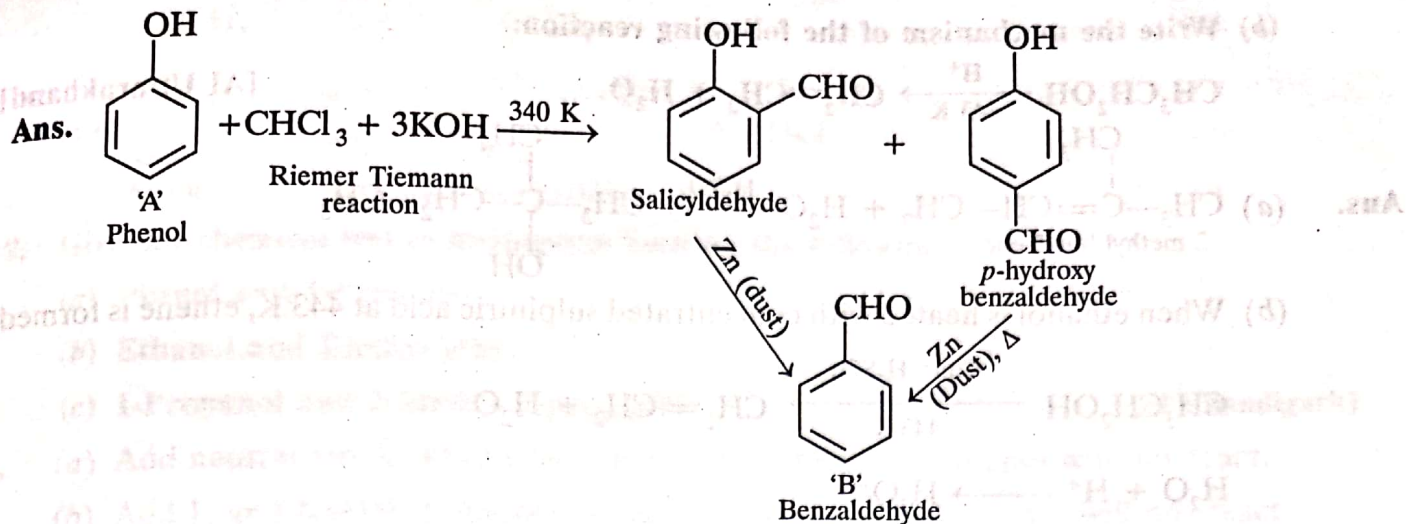
(b) Williamson's ether synthesis:

When sodium ethoxide is treated with methyl iodide, methoxy ethane and sodium iodide are formed.



3. An aromatic compound 'A' on treatment with  $\text{CHCl}_3$  and  $\text{KOH}$  gives two compounds which gave the same product when distilled with zinc dust. Oxidation of 'B' gives 'C' with molecular formula  $\text{C}_7\text{H}_6\text{O}_2$ . Sodium salt of 'C' on heating with soda lime gives 'D' which may be obtained by distilling 'A' with zinc dust. Identify A, B, C and D.

[AI Chandigarh, HOTS]



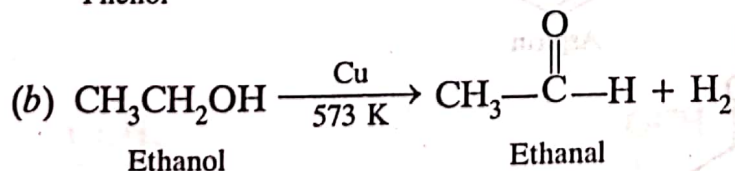
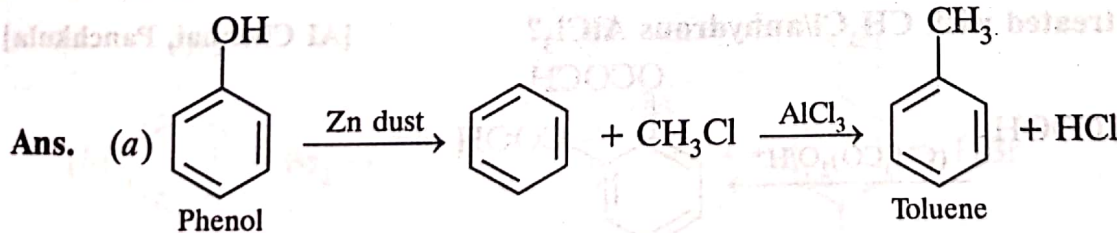
'A' is phenol, 'B' is benzaldehyde, 'C' is benzoic acid and 'D' is benzene.

4. How do you convert the following:

(a) Phenol to toluene

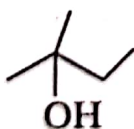
(b) Ethanol to ethanal

[CBSE]

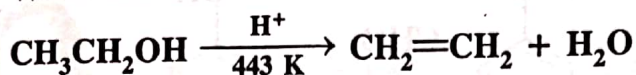


Long Answer Type [I] Questions [3 Marks]

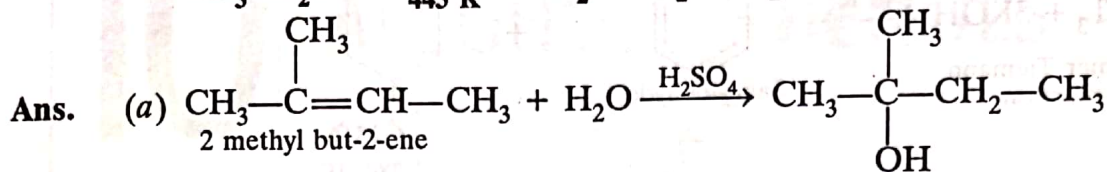
5. (a) How will you synthesise the following from appropriate alkene:



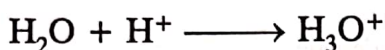
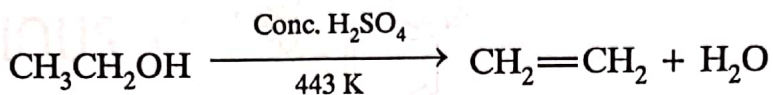
(b) Write the mechanism of the following reaction:



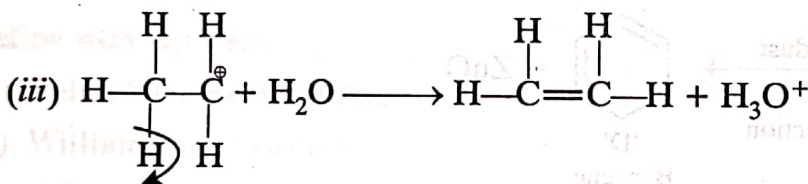
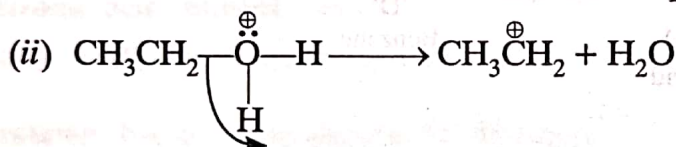
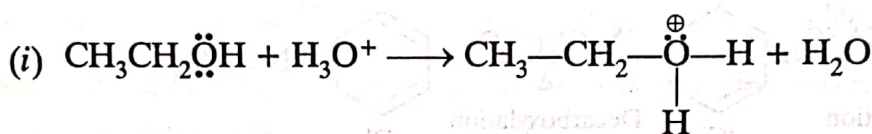
[AI Uttarakhand]



(b) When ethanol is heated with concentrated sulphuric acid at 443 K, ethene is formed.



Mechanism:



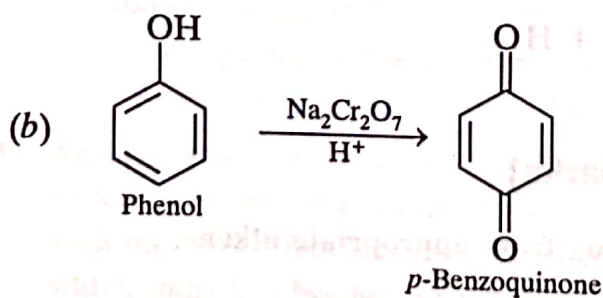
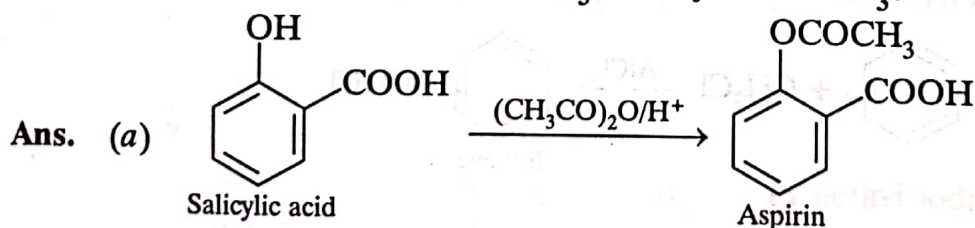
6. What happens when

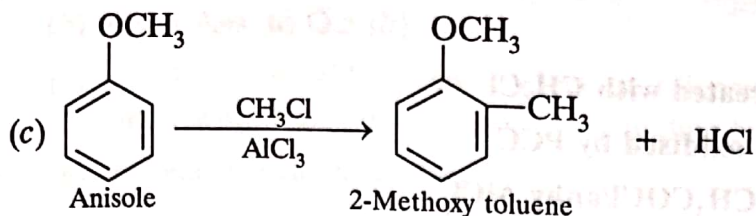
(a) Salicylic acid is treated with  $(\text{CH}_3\text{CO})_2\text{O}/\text{H}^+$ ?

(b) Phenol is oxidised with  $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}^+$ ?

(c) Anisole is treated with  $\text{CH}_3\text{Cl}/\text{anhydrous AlCl}_3$ ?

[AI Chennai, Panchkula]





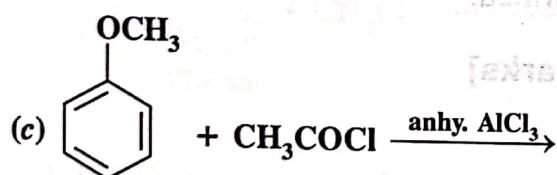
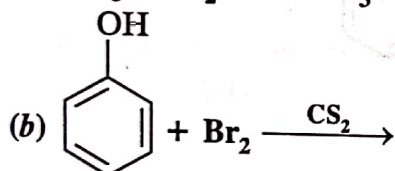
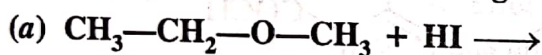
7. Give one chemical test to distinguish between the following

- (a) Phenol and 1-Propanol  
 (b) Ethanol and Diethyl ether  
 (c) 1-Propanol and 2-Methyl 2-propanol

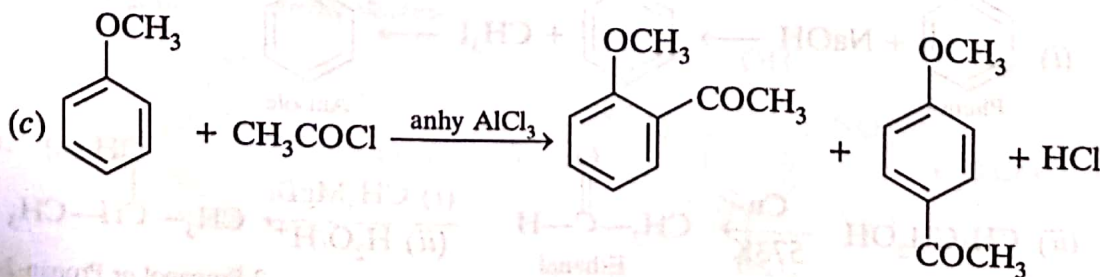
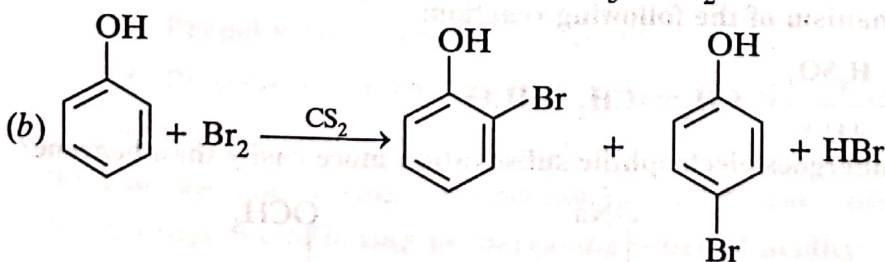
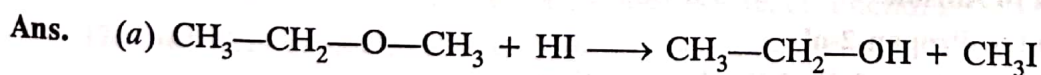
[AI Chandigarh]

- Ans. (a) Add neutral  $\text{FeCl}_3$ . Phenol will give violet colour, 1-propanol will not react.  
 (b) Add  $\text{I}_2$  and  $\text{NaOH}$ . Ethanol will give yellow ppt. Diethyl ether will not react.  
 (c) Add Lucas reagent (conc.  $\text{HCl}$  + Anhy.  $\text{ZnCl}_2$ ) 1-Propanol will not react at room temperature, 2-methyl propan-2-ol will give turbidity immediately due to formation of tert. butyl chloride.

8. Write the products of the following reactions:



[AI Chandigarh]



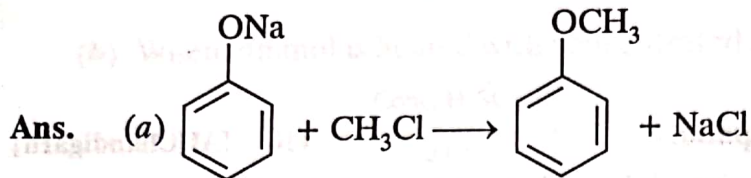
9. What happen when

(a) Sodium phenoxide is treated with  $\text{CH}_3\text{Cl}$

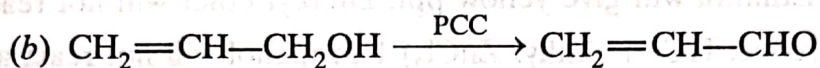
(b)  $\text{CH}_2=\text{CH}-\text{CH}_2\text{OH}$  is oxidised by PCC

(c) Phenol is treated with  $\text{CH}_3\text{COCl}/\text{anhy AlCl}_3$

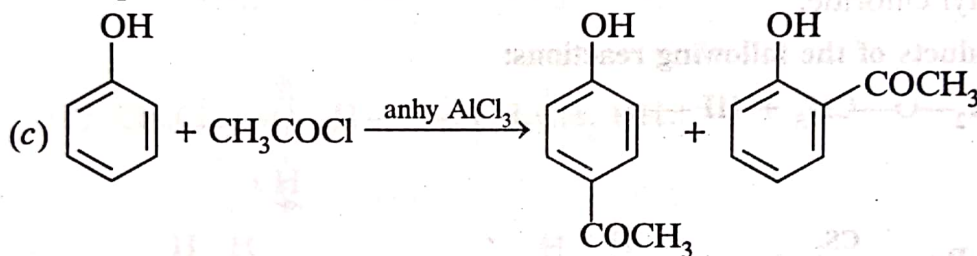
Write chemical equation in support of your answer. [AI Panchkula]



Anisole is formed.



Prop-2-en-1-al is formed.



*o*- and *p*-hydroxy acetophenone is formed.

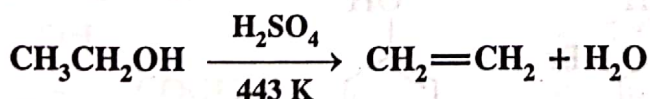
### Long Answer Type [II] Questions [5 Marks]

10. (a) How do you convert the following:

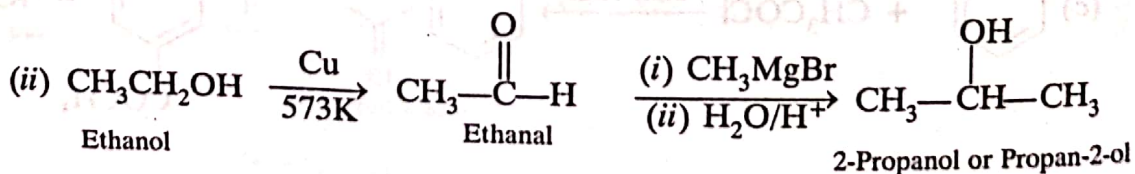
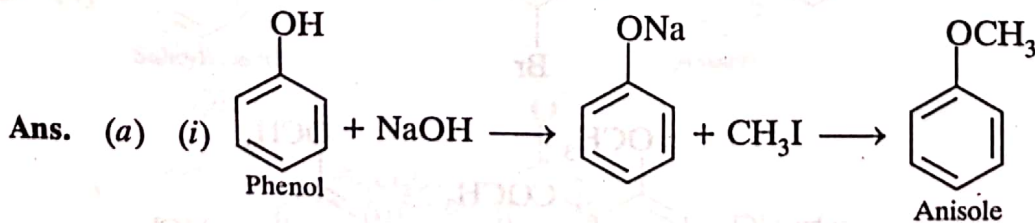
(i) Phenol to Anisole

(ii) Ethanol to Propan-2-ol

(b) Write the mechanism of the following reaction:



(c) Why phenol undergoes electrophilic substitution more easily than benzene? [Delhi]



(b) Refer Ans. to Q.5 (b).

(c) It is because  $-OH$  group is electron releasing, activating, therefore, it undergoes electrophilic substitution more readily than benzene due to  $+R$  effect.

11. (a) Account for the following:

(i) *o*-nitrophenol is more steam volatile than *p*-nitrophenol.

(ii) *t*-butyl chloride on heating with sodium methoxide gives 2-methylpropene instead of *t*-butylmethylether.

(b) Write the reaction involved in the following:

(i) Reimer-Tiemann reaction

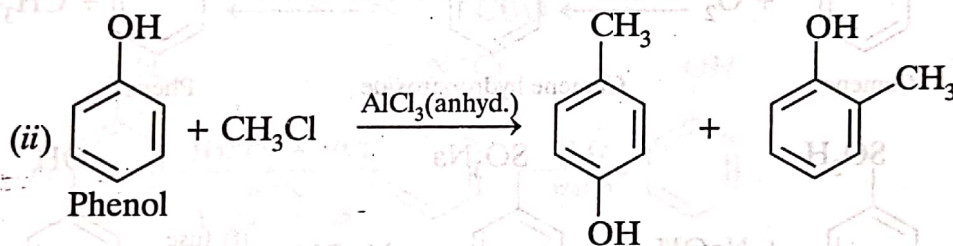
(ii) Friedal-Crafts Alkylation of Phenol.

(c) Give simple chemical test to distinguish between Ethanol and Phenol. [Delhi]

Ans. (a) (i) Ortho nitrophenol is steam volatile because of weak intra-molecular H-bonding, whereas *p*-nitrophenol is associated with inter-molecular H-bonding. Therefore, it is not steam volatile.

(ii) It is due to  $-I$  and  $-R$  effect of  $-NO_2$  group and  $+I$  and  $+R$  effect of  $CH_3$  group, *p*-nitrophenoxide ion is more stable than *p*-methyl phenoxide ion.

(b) (i) Refer Ans. to Q.2 (a).



(c) Add neutral  $FeCl_3$ . Ethanol does not react. Phenol gives violet colour.

12. (a) Give equations for the following reactions:

(i) Phenol is treated with conc.  $HNO_3$

(ii) Propene is treated with  $B_2H_6$  followed by  $H_2O_2/OH^-$ .

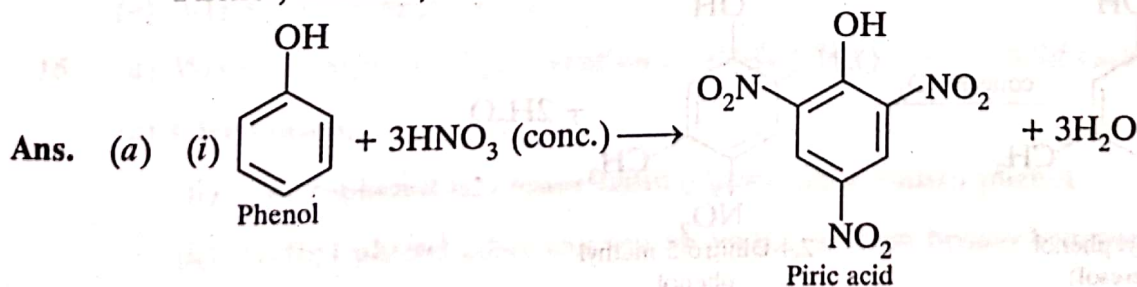
(iii) Sodium tert. butoxide is treated with  $CH_3Cl$ .

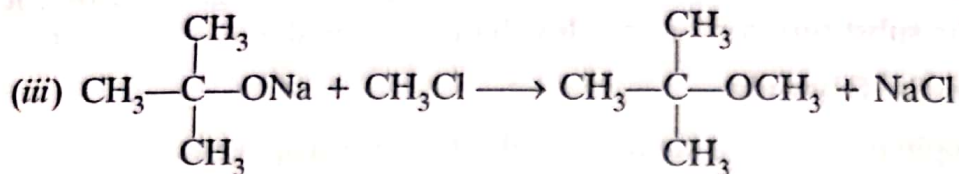
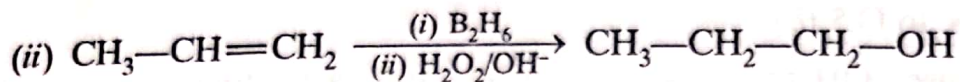
(b) How will you distinguish between butan-1-ol and butan-2-ol?

(c) Arrange the following in increasing order of acidity:

Phenol, Ethanol, Water.

[CBSE]





(b) Add  $\text{I}_2$  and  $\text{NaOH}$ . Butan-2-ol will give yellow ppt of iodoform where as butan-1-ol will not react.

(c) Ethanol < water < phenol

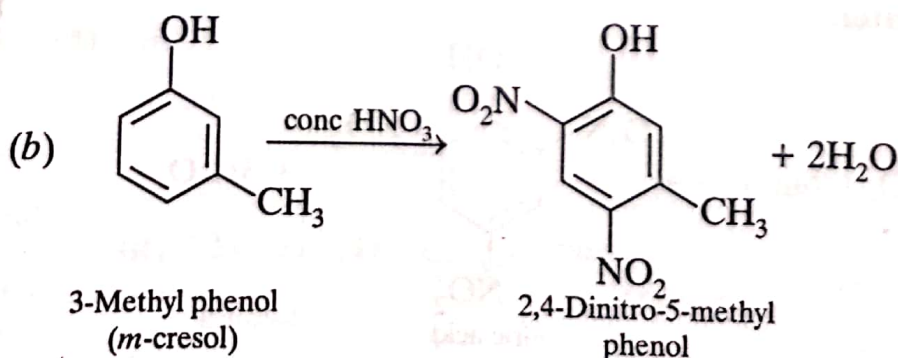
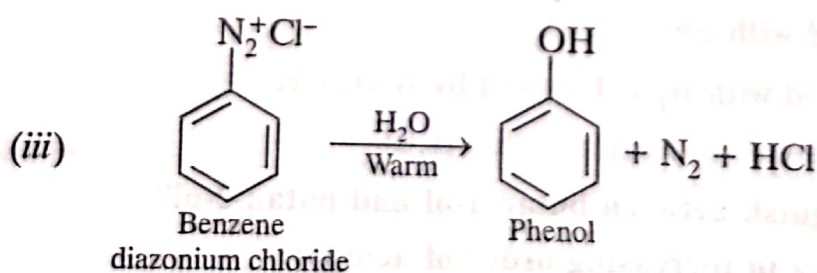
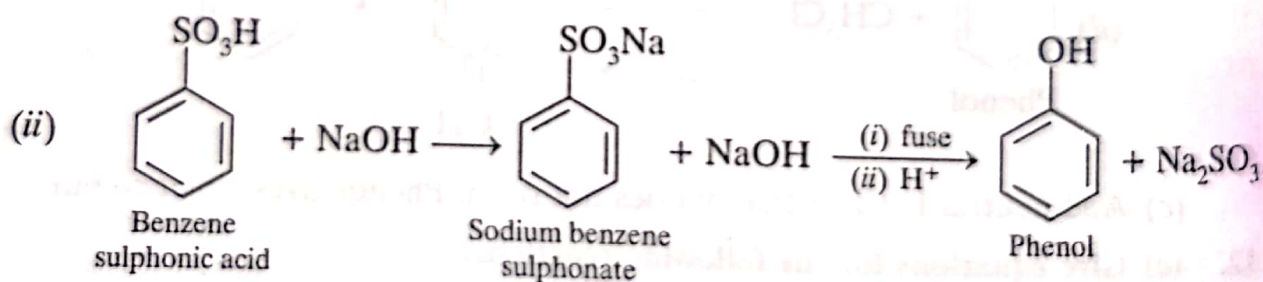
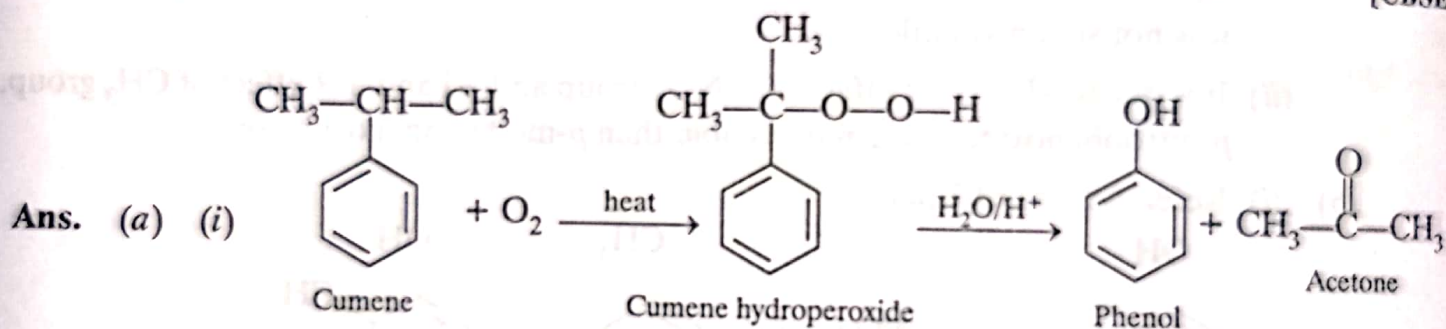
13. (a) How can you obtain phenol from

(i) Cumene (ii) Benzene sulphonic acid (iii) Benzene diazonium chloride?

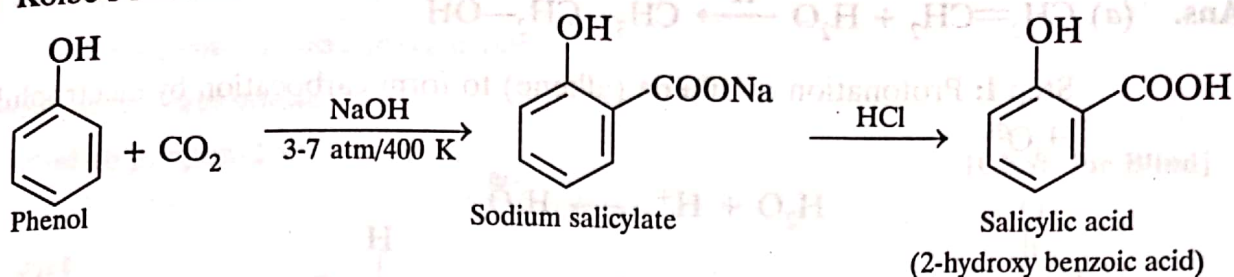
(b) Write the structure of major product obtained from dinitration of 3-methyl phenol.

(c) Write the reaction involved in Kolbe's reaction.

[CBSE]



(c) Kolbe's reaction



14. (a) How are following conversions carried out: [CBSE]

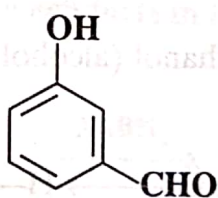
(i) Aniline to phenol

(ii) Ethanal to propan-2-ol

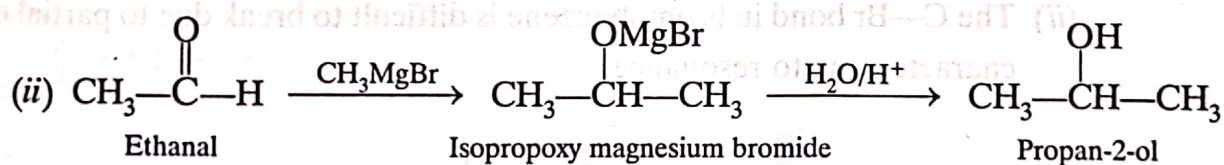
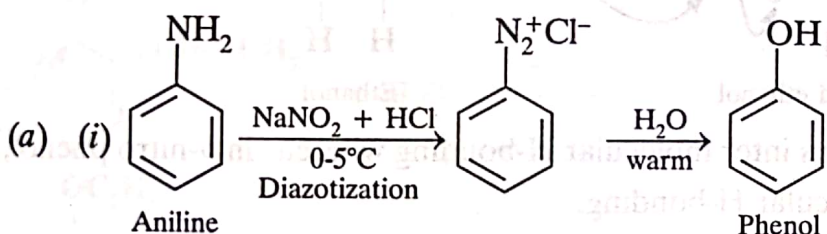
(b) Give chemical test to distinguish between the following pairs of compounds:

(i) *n*-propyl alcohol and iso propyl alcohol

(ii) Phenol and Benzyl alcohol

(c) Write IUPAC name of 

Ans.



(b) (i) Heat both the compounds with I<sub>2</sub> and NaOH at 330 K. Iso propyl alcohol will give yellow ppt. of iodoform *n*-propyl alcohol will not give yellow ppt.

(ii) Add neutral FeCl<sub>3</sub> solution to both the compounds, phenol give violet colour whereas benzyl alcohol does not react with FeCl<sub>3</sub>.

(c) 3-Hydroxy benzaldehyde.

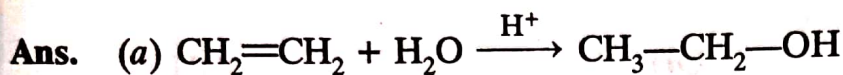
15. (a) Write mechanism of preparation of alcohol from alkene (acid catalysed hydration)

(b) Give reason:

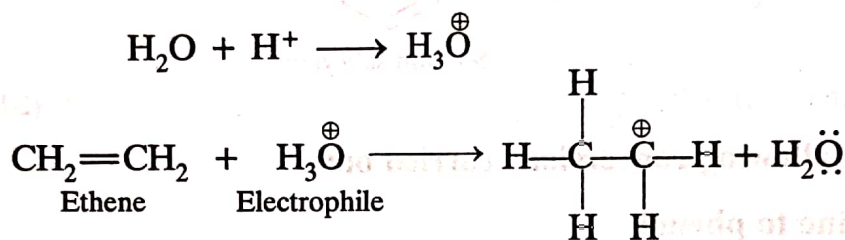
(i) *o*-nitrophenol has lower boiling point than *p*-nitro phenol.

(ii) Methyl phenyl ether can not be prepared from bromo benzene. [CBSE for Blind]

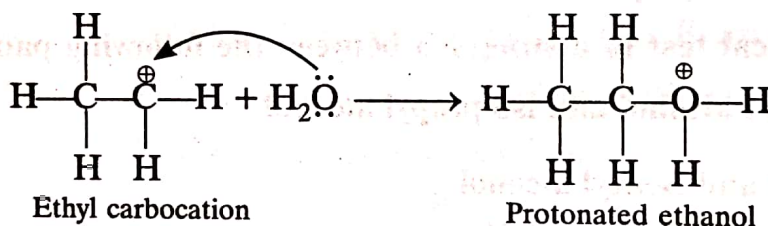




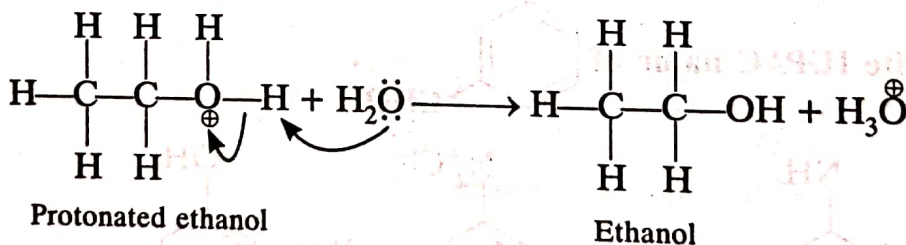
**Step I: Protonation of ethene (alkene) to form carbocation by electrophilic attack of  $\text{H}_3\text{O}^\oplus$ :**



**Step II: Nucleophilic attack of water on carbocation:**



**Step III: Deprotonation to form ethanol (alcohol):**



- (b) (i) *p*-nitro phenol has inter molecular H-bonding whereas in *o*-nitro phenol, there is weak intra-molecular H-bonding.
- (ii) The C—Br bond in bromobenzene is difficult to break due to partial double bond character due to resonance.