

Long Answer Questions

Long Answer Questions (PYQ)

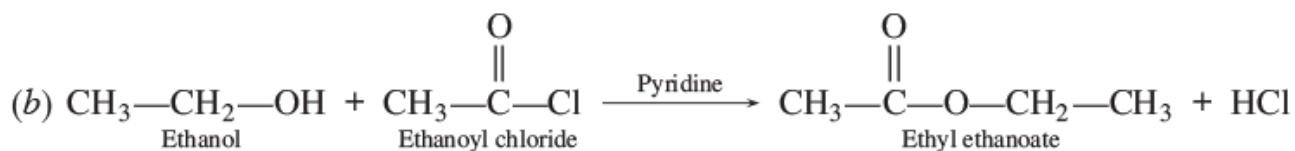
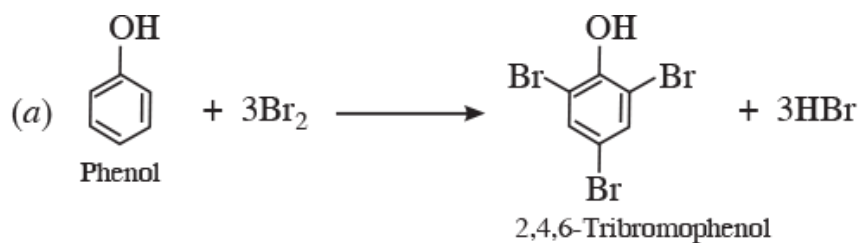
Q.1. Answer the following question :

Q. What happens when

- phenol reacts with bromine water?
- ethanol reacts with CH_3COCl /pyridine?
- anisole reacts with HI ?

Write the chemical equations involved in the above reactions.

Ans.



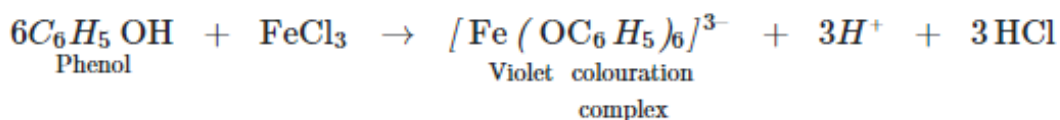
Q. Distinguish between:

- Ethanol and phenol
- Propan-2-ol and 2-methylpropan-2-ol

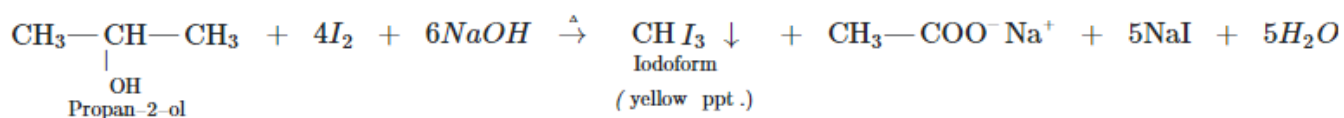
[CBSE (F) 2016]

Ans.

a. Phenol gives violet colouration with FeCl_3 solution but ethanol does not.



b. Propan-2-ol when warmed with I_2 in NaOH gives yellow precipitate of iodoform while 2-methylpropan-2-ol does not respond to this test.



Q.2. Answer the following question :

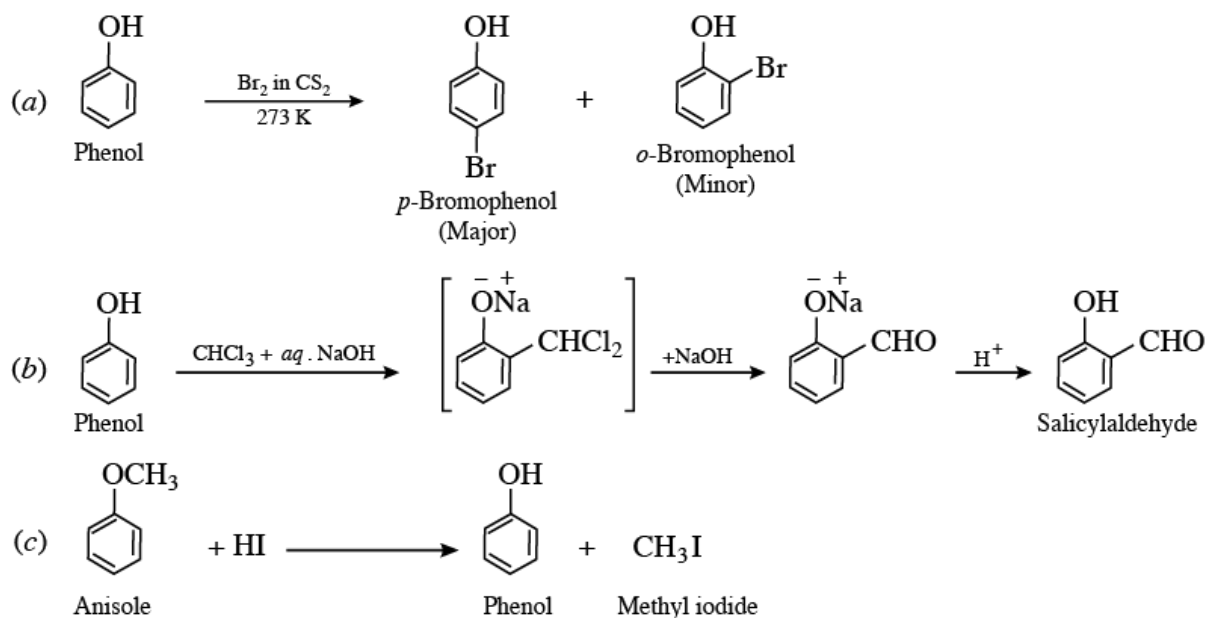
Q. Write equations of the following reactions:

a. Bromine in CS_2 with phenol

b. Treating phenol with chloroform in the presence of aq. NaOH

c. Anisole reacts with HI

Ans.



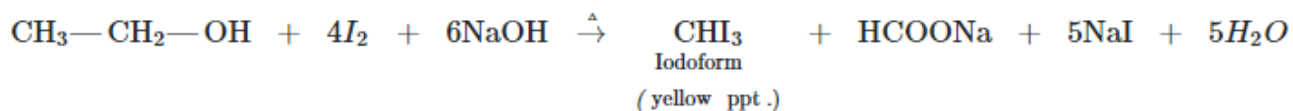
Q. Distinguish between

a. Ethanol and Diethyl ether

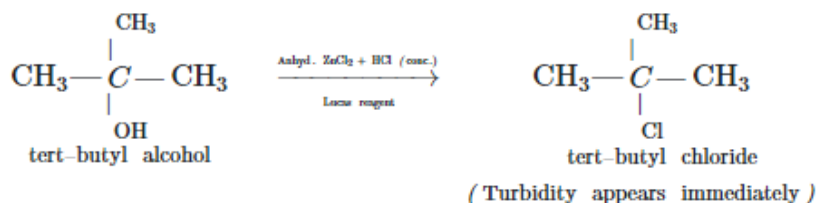
b. Propanol and t-butyl alcohol

Ans.

- a. Ethanol when warmed with I_2 in NaOH gives yellow precipitate of iodoform while diethyl ether does not.



- b. *tert*-butyl alcohol on treatment with the Lucas reagent immediately gives turbidity while propanol does not produce turbidity at room temperature.



Q.3. Answer the following question :

Q. Write the formula of reagents used in the following reactions:

- Bromination of phenol to 2, 4, 6-tribromophenol
- Hydroboration of propene and then oxidation to propanol.

Ans.

- $\text{Br}_2(\text{aq})$
- B_2H_6 , H_2O , H_2O_2 and OH^-

Q. Arrange the following compound groups in the increasing order of their property indicated:

- p*-nitrophenol, ethanol, phenol (acidic character)
- Propanol, propane, propanal (boiling point)

Ans.

- Ethanol < Phenol < *p*-nitrophenol
- Propane < Propanal < Propanol

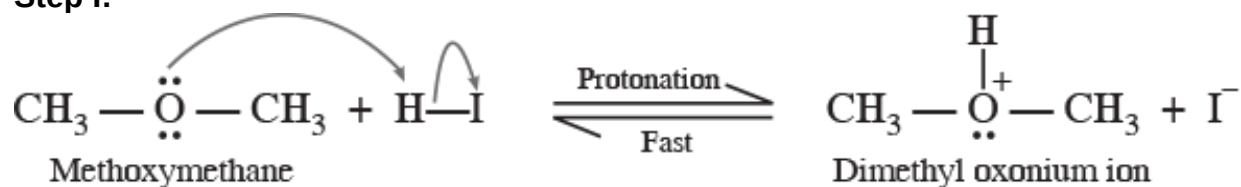
Long Answer Questions (OIQ)

Q.1. Answer the following question :

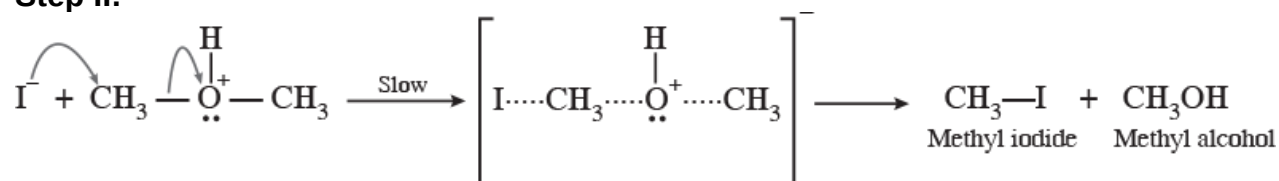
Q. Write mechanism of the reaction of HI with methoxymethane.

Ans. The cleavage of methoxymethane with HI follows S_N2 mechanism.

Step I:

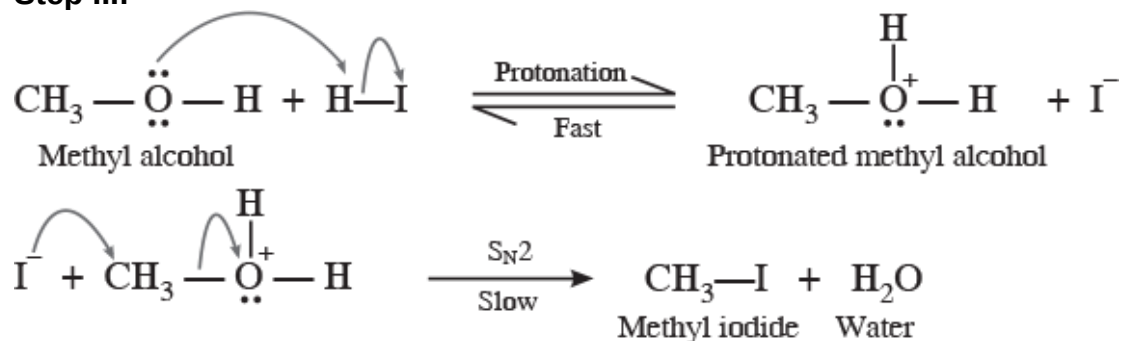


Step II:

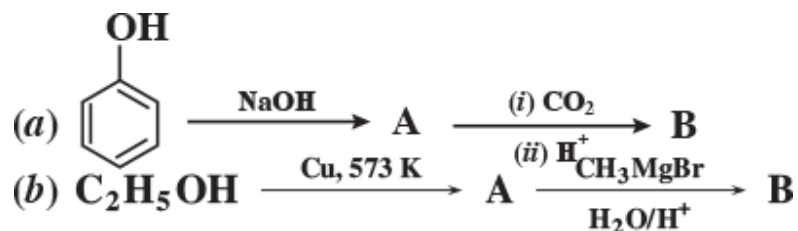


If excess of HI is used, methyl alcohol formed in step II further reacts with another molecule of HI to form CH_3I .

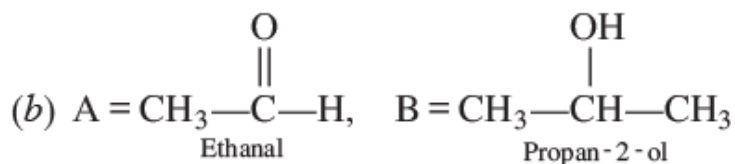
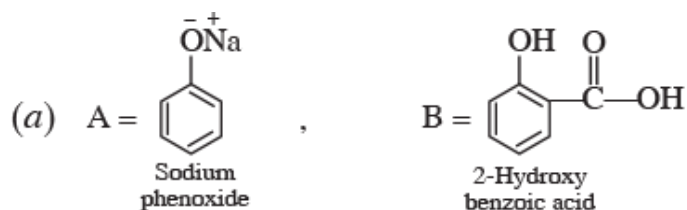
Step III:



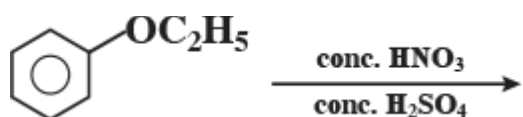
Q. Identify A and B in the following reactions:



Ans.

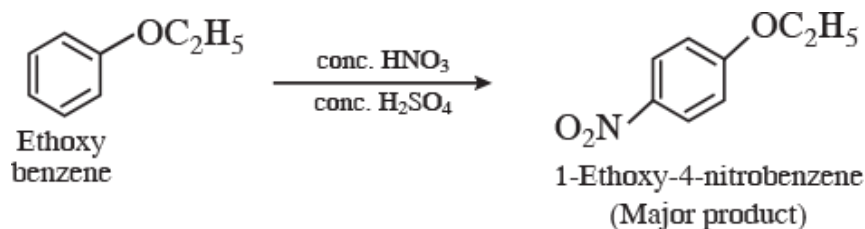


Q. Give the structure and the IUPAC name of the major product obtained in the following reaction



[CBSE Sample Paper 2015]

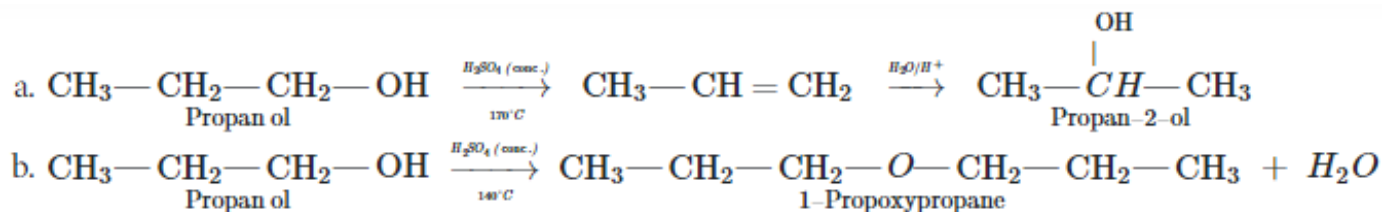
Ans.



Q.2. How are the following conversions carried out?

- Propanol to propan-2-ol
- Propanol to 1-propoxypropane

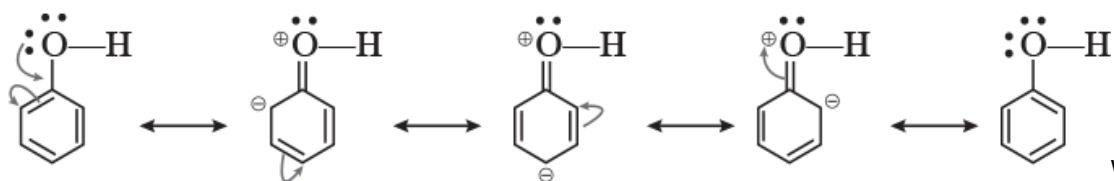
Ans.



Q. Explain the following behaviours:

- OH group attached to a carbon of benzene ring activates it towards electrophilic substitution.
- Reactivity of all the three classes of alcohols with conc. HCl and ZnCl_2 is different.
- Anisole reacts with HI to give phenol and methyl iodide and not iodobenzene and methyl alcohol.

Ans. (a). Due to +R effect of the OH group, the electron density in the benzene ring increases thereby facilitating the attack by an electrophile. Further, the electron density is relatively higher at the *o*- and *p*-positions, therefore, electrophilic substitution occurs mainly at *o*- and *p*-positions.



(b) The reaction of alcohols with conc. HCl and ZnCl_2 takes place through intermediate formation of carbonium ions. Greater the stability of carbonium ion greater is the reactivity of alcohol. Due to +ve I effect of alkyl groups the stability of carbonium ion follows the order $1^\circ < 2^\circ < 3^\circ$. As a result of this reactivity of alcohols towards conc. HCl and ZnCl_2 follows the same order *i.e.*, $1^\circ < 2^\circ < 3^\circ$.

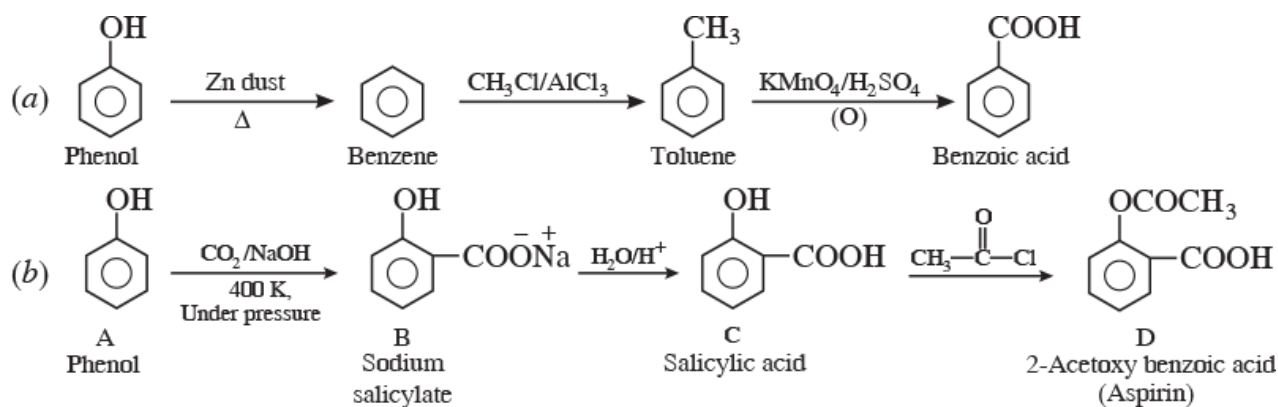
c. Protonation of anisole gives oxonium ion $\left(\text{C}_6\text{H}_5 - \overset{\cdot\cdot}{\underset{\text{H}}{\text{O}}}^+ - \text{CH}_3 \right)$. The bond between $\text{O}-\text{CH}_3$ is weaker than the bond between $\text{O}-\text{C}_6\text{H}_5$ because the carbon of phenyl group is sp_2 hybridised and there is partial double bond character. Therefore, the attack by I^- ion breaks $\text{O}-\text{CH}_3$ bond to give methyl iodide and phenol.

Q.3. Answer the following question :

Q.

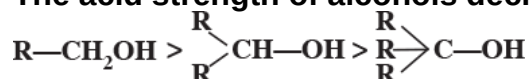
- How will you convert phenol to benzoic acid?
- An organic compound A having molecular formula $\text{C}_6\text{H}_6\text{O}$ gives a characteristic colour with aqueous FeCl_3 solution. A on treatment with CO_2 and NaOH at 400 K under pressure gives B which on acidification gives a compound C. The compound C reacts with acetyl chloride to give D which is a popular pain killer. Deduce the structure of A, B, C and D.

Ans.



Q.

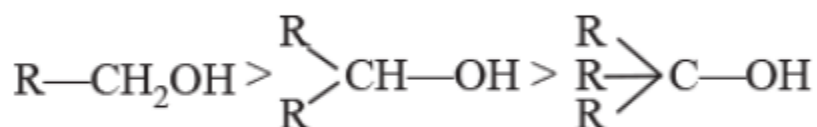
a. The acid strength of alcohols decreases in the order



b. Phenol is more easily nitrated than benzene.

Ans.

a. The acidic character of alcohols is due to the polar nature of O—H bond. As alkyl groups have +I effect, therefore, electron density on oxygen increases from 1° to 3° alcohols. In other words, the O—H bond in 3° alcohols is most polar whereas it is least polar in 1° alcohols. Thus, the acid strength of alcohols follows the order

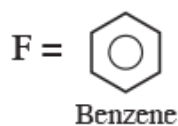
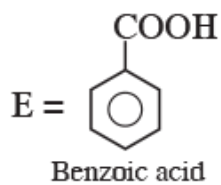
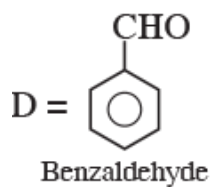
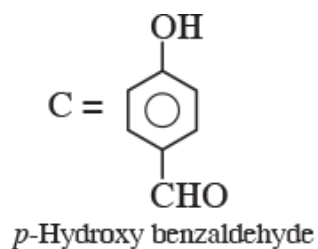
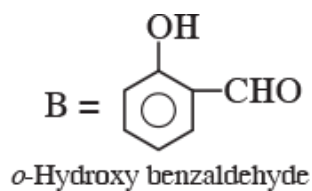
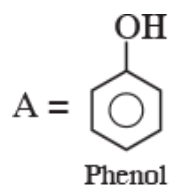


b. Nitration involves attack of electrophile nitronium ($\overset{+}{N}O_2$) ion on benzene ring. Due to +R effect of O—H group electron density increases at ortho and para position in phenol. Therefore, phenol is more easily nitrated than benzene.

Q.4. An aromatic compound 'A' on treatment with $CHCl_3/KOH$ gives two compounds 'B' and 'C'. Both B and C give the same product 'D' when distilled with zinc dust. Oxidation of D gives E having molecular formula $C_7H_6O_2$. The sodium salt of E on heating with sodalime gives F which may also be obtained by distilling A with zinc dust. Identify A to F.

[HOTS]

Ans.



Reactions involved:

