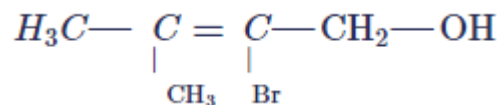


Very Short Answer Questions

Very Short Answer Questions (PYQ)

Q.1. Write the IUPAC name of the following compound:

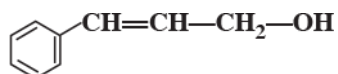
[CBSE (AI) 2017]



Ans. 2-Bromo-3-methylbut-2-en-1-ol

Q.2. Write the IUPAC name of the following compound:

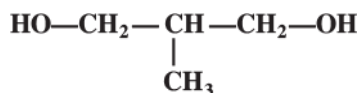
[CBSE (AI) 2017]



Ans. 3-phenylprop-2-en-1-ol

Q.3. Write the IUPAC name of the following compound :

[CBSE (AI) 2011]

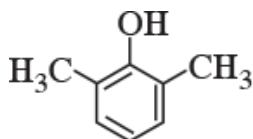


Ans. 2-methylpropane- 1, 3-diol.

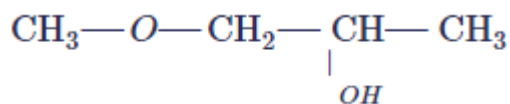
Q.4. Draw the structure of 2, 6-dimethylphenol.

[CBSE (AI) 2011]

Ans.



Q.5. Write the IUPAC name of the following compound:



[CBSE Chennai 2015]

Ans. 1-methoxypropan-2-ol.

Q.6. How would you convert ethanol to ethene?

[CBSE (AI) 2011]

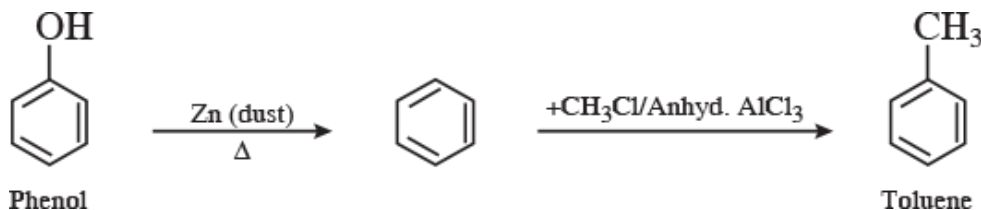
Ans.



Q.7. How is toluene obtained from phenol?

[CBSE Delhi 2013C]

Ans.



Q.8. Of the two hydroxy organic compounds ROH and R' OH, the first one is basic and the other is acidic in behaviour. How is R different from R'?

Ans. R is an alkyl group whereas is an aryl group.

Q.9. Arrange the following compounds in the increasing order of their acid strengths:

4-nitrophenol, phenol, 2,4,6-trinitrophenol

[CBSE (F) 2013]

Ans. Phenol < 4-nitrophenol < 2,4,6-trinitrophenol

Q.10. Name the reagents used in the following reactions:

Friedel–Crafts alkylation of anisole

[CBSE (F) 2014]

Ans. Anhydrous aluminium chloride (anhyd. AlCl_3)

Very Short Answer Questions (OIQ)

Q.1. What is absolute alcohol?

Ans. 100% ethyl alcohol is called absolute alcohol.

Q.2. What is denatured alcohol?

[NCERT Exemplar]

Ans. Alcohol is made unfit for drinking by mixing some copper sulphate and pyridine in it. This is called denatured alcohol.

Q.3. Name the alkyl halide and sodium alkoxide used to synthesise tert-butyl ethyl ether.

Ans. Ethyl bromide and sodium tert-butoxide.

Q.4. Suggest a reagent for conversion of ethanol to ethanoic acid.

[NCERT Exemplar]

Ans.

- i. $\text{CrO}_3 - \text{H}_2\text{SO}_4$
- ii. $\text{KMnO}_4/\text{OH}^-$,
- iii. H_3O^+
- iv. Acidified KMnO_4 or $\text{K}_2\text{Cr}_2\text{O}_7$

Q.5. Phenol is an acid but does not react with sodium bicarbonate solution. Why?

[HOTS]

Ans. Phenol is a weaker acid than carbonic acid (H_2CO_3) and hence does not liberate CO_2 from sodium bicarbonate.

Q.6. Explain why sodium metal can be used for drying diethyl ether but not ethyl alcohol.

[HOTS]

Ans. Due to presence of an active hydrogen atom, ethyl alcohol reacts with sodium metal.



Diethyl ether, on the other hand, does not have replaceable hydrogen atom therefore does not react with sodium metal hence can be dried by metallic sodium.

Q.7. What is the order of dehydration of primary, secondary and tertiary alcohols?

Ans. Tertiary alcohols > Secondary alcohols > Primary alcohols.

Q.8. Suggest a reagent for the following conversion:



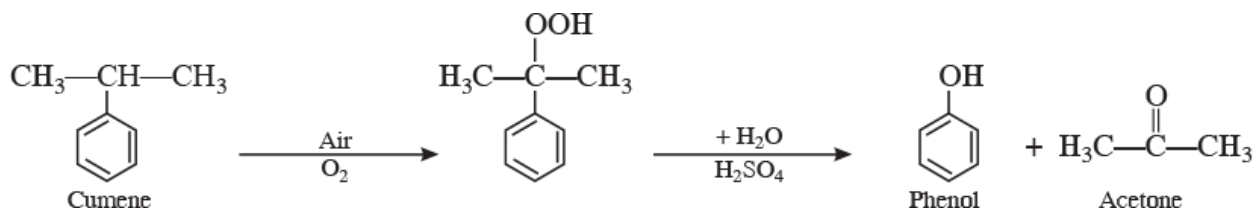
[NCERT Exemplar]

Ans. CrO₃, Pyridine and HCl (Pyridinium chlorochromate)

Q.9. Give the equation of reaction for the preparation of phenol from cumene.

[CBSE Sample Paper 2017]

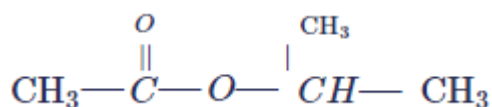
Ans.



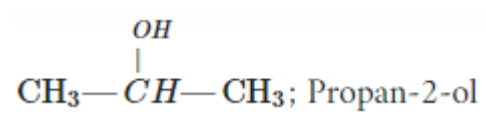
Q.10. *o*-Nitrophenol has lower boiling point than *p*-nitrophenol. Explain.

Ans. Due to intramolecular H-bonding *o*-nitrophenol exists as a discrete molecule whereas due to intermolecular H-bonding *p*-nitrophenol exists as associated molecules. As a result of this *p*-nitrophenol has higher boiling point than *o*-nitrophenol.

Q.11. Name the alcohol that is used to make the following ester:



Ans.



Short Answer Questions-I

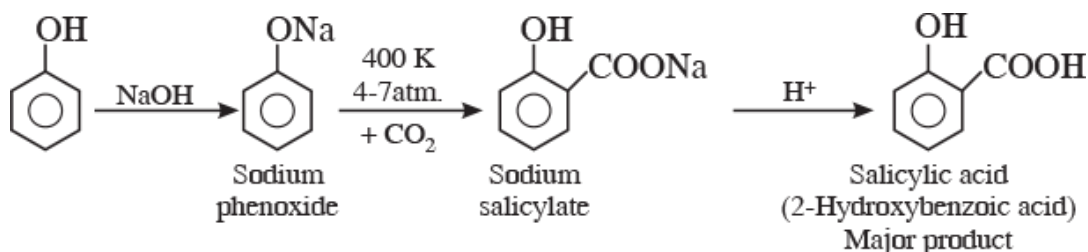
Short Answer Questions-I (PYQ)

Q.1. Illustrate the following name reactions giving a chemical reaction equation for each:

[CBSE (F) 2010]

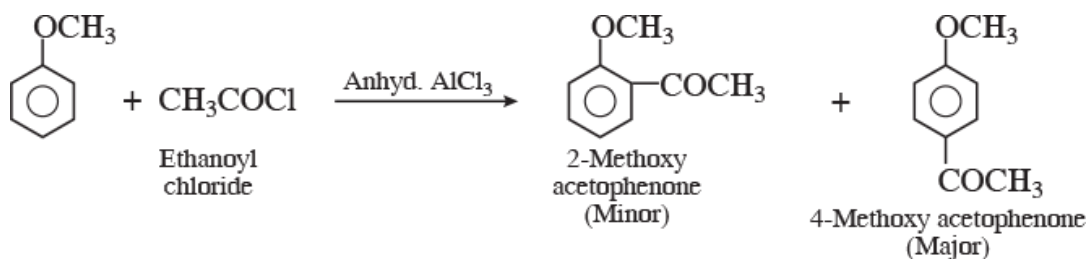
Q. Kolbe's reaction of phenol

Ans. Kolbe's reaction of phenol:



Q. Friedel-Crafts' acetylation of anisole

Ans. Friedel-Crafts' acetylation of anisole:

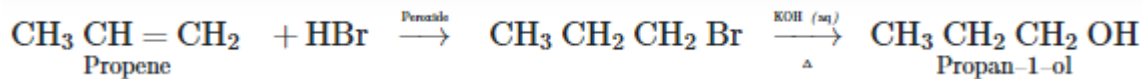


Q.2. How will you convert:

[CBSE Delhi 2013]

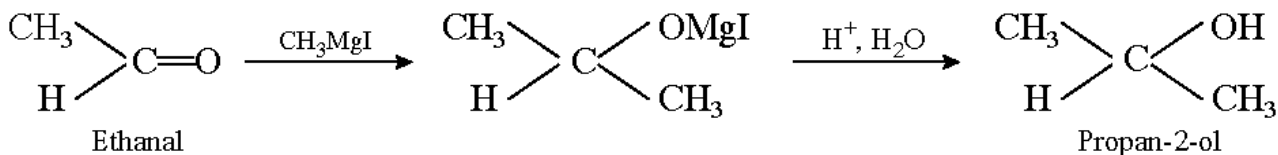
Q. Propene to Propan-1-ol?

Ans.



Q. Ethanal to Propan-2-ol?

Ans.

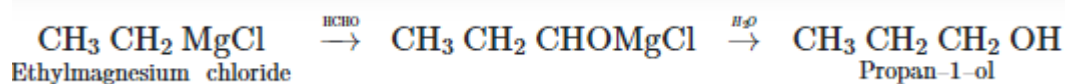


Q.3. How would you carry out the following conversions?

[CBSE (AI) 2008]

Q. Ethyl magnesium chloride to propan-1-ol

Ans.



Q. Benzyl chloride to benzyl alcohol

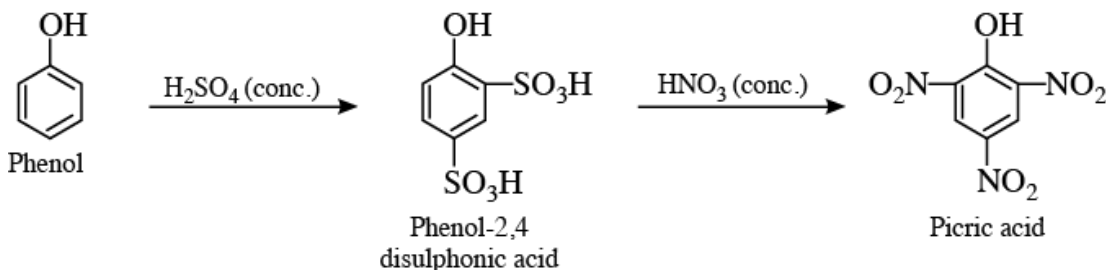
Ans.



Q.4. How would you obtain

Q. picric acid (2, 4, 6-trinitrophenol) from phenol?

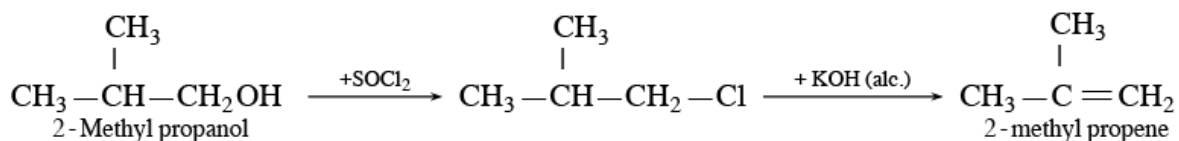
Ans.



Q. 2-Methylpropene from 2-Methylpropanol?

[CBSE Delhi 2011]

Ans.

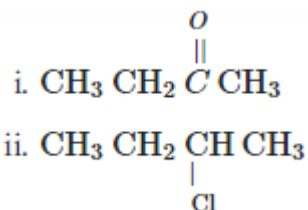


Q.5. Write the structures of the products when Butan-2-ol reacts with the following:

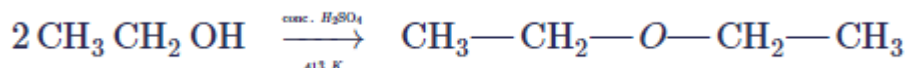
[CBSE (AI) 2017]

- i. CrO_3
- ii. SOCl_2

Ans.



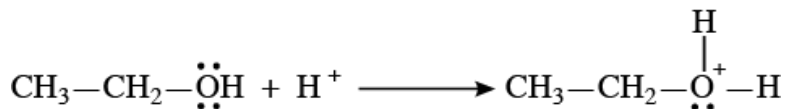
Q.6. Write the mechanism of the following reaction:



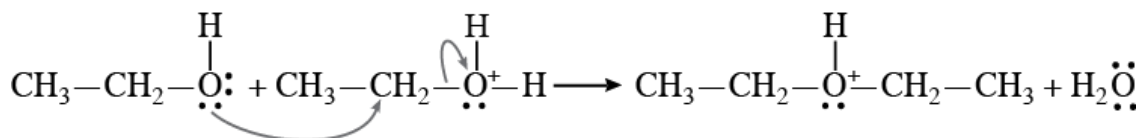
[CBSE Delhi 2016] [HOTS]

Ans. The formation of ether is a nucleophilic bimolecular reaction ($\text{S}_\text{N}2$) involving the attack of alcohol molecule on protonated alcohol as shown below:

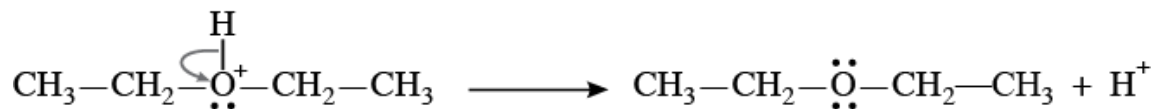
(i)



(ii)



(iii)



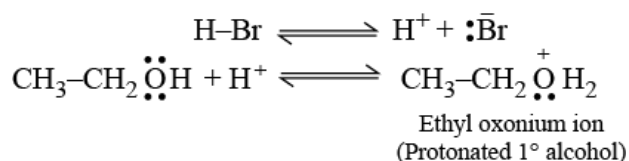
Q.7. Write the mechanism of the following reaction:



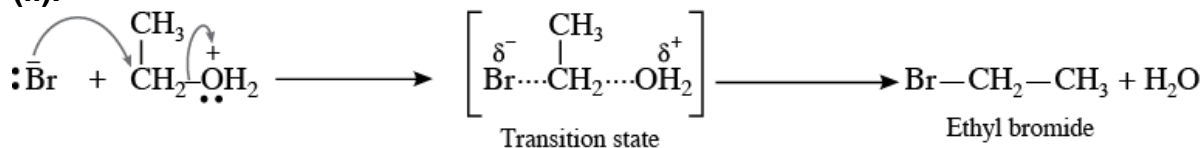
[CBSE Delhi 2014, (AI) 2014] [HOTS]

Ans. SN₂ Mechanism

(i).



(ii).



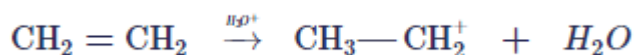
Q.8. Answer the following question :

Arrange the following compounds in the increasing order of their acid strength:

Q. *p*-cresol, *p*-nitrophenol, phenol

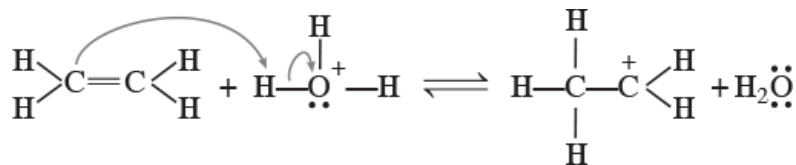
Ans. *p*-cresol < phenol < *p*-Nitrophenol

Q. Write the mechanism (using curved arrow notation) of the following reaction:



[CBSE (AI) 2017]

Ans.



Q.9. Answer the following questions.

Q. Among HI, HBr, HCl, HI is most reactive towards alcohols. Why?

Ans. HI has the lowest bond dissociation energy due to longer bond length that is why it is most reactive.

Q. Of the two alcohols; (a) $\text{CH}_2=\text{CH}-\text{CH}_2\text{OH}$ and (b) $\text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}_2\text{OH}$, which one will react more easily with conc. HCl in the presence of ZnCl_2 ?

[CBSE (F) 2012]

Ans. $\text{CH}_2=\text{CH}-\text{CH}_2\text{OH}$

Q.10. Give reasons for the following:

Q. Alcohols are more soluble in water than the hydrocarbons of comparable molecular masses.

[CBSE (AI) 2012]

Ans. This is due to the ability of alcohols to form hydrogen bonds with water molecules.

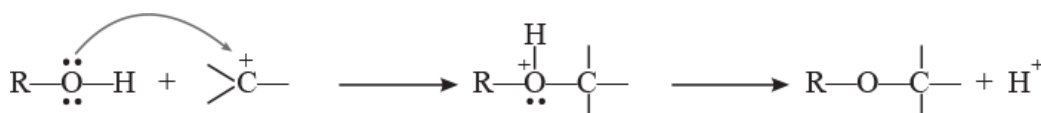
Q. Ortho-nitrophenol is more acidic than ortho-methoxyphenol.

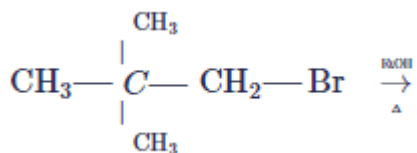
Ans. It is because nitro group is electron withdrawing which increases the acidic character whereas $-\text{CH}_3$ group is electron releasing which decreases acidic character.

Short Answer Questions-I (OIQ)

Q.1. Alcohols react both as nucleophiles as well as electrophiles. Write one reaction of each type and describe its mechanism.

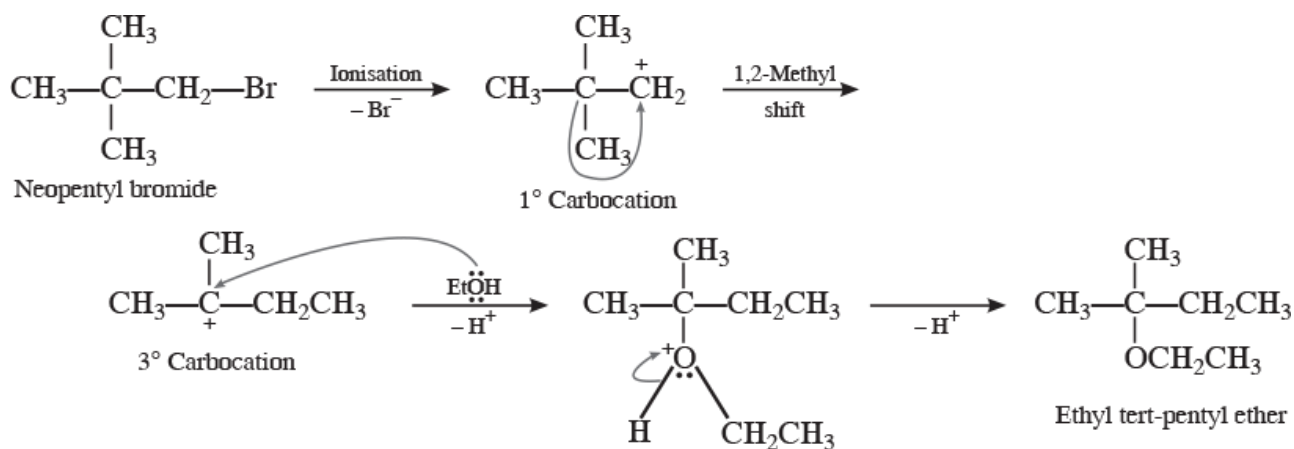
Ans. Alcohols as nucleophiles: The bond between O—H is broken when alcohols react as nucleophiles.





[HOTS]

Ans. Neopentyl bromide ionises to form first a 1° carbocation which rearranges to form the more stable 3° carbocation. This is attacked by weak nucleophile ethanol followed by loss of proton to yield ethyl tert-pentyl ether.



Q.5. Answer the following questions:

Q. Dipole moment of phenol is smaller than that of methanol. Why?

Ans. In phenol, C—O bond is less polar due to electron-withdrawing effect of benzene ring whereas in methanol, C—O bond is more polar due to electron-releasing effect of —CH₃ group.

Q. In Kolbe's reaction, instead of phenol, phenoxide ion is treated with carbon dioxide. Why?

[NCERT Exemplar]

Ans. Phenoxide ion is more reactive than phenol towards electrophilic aromatic substitution and hence undergoes electrophilic substitution with carbon dioxide which is a weak electrophile.

Q.6. Give Reasons:

Q. Relative ease of dehydration of alcohols is 3° > 2° > 1°.

Ans. The dehydration of alcohols occurs through the formation of carbocation intermediate. As the stability of carbocations decreases in the order, $3^\circ > 2^\circ > 1^\circ$, therefore, the dehydration of alcohols follows the order, $3^\circ > 2^\circ > 1^\circ$.

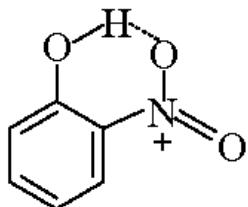
Q. *o*-nitrophenol is more acidic than *o*-methoxyphenol.

Ans. $-R$ and $-I$ effect of $-\text{NO}_2$ group decreases the electron density in $\text{O}-\text{H}$ bond and make loss of proton easy in *o*-nitrophenol whereas $+R$ effect of $-\text{OCH}_3$ group increases the electron density in $\text{O}-\text{H}$ bond and makes release of proton difficult in *o*-methoxyphenol. That is, why *o*-nitrophenol is stronger acid than *o*-methoxyphenol.

Q.7. Give reasons for the following:

Q. *p*-nitrophenol is more acidic than *o*-nitrophenol.

Ans.



H-bonding in *o*-nitrophenol

Intramolecular H-bonding in *o*-nitrophenol makes loss of proton difficult. Therefore, *p*-nitrophenol is more acidic than *o*-nitrophenol.

Q. Boiling point of ethanol is higher in comparison to methoxymethane.

Ans. Ethanol undergoes intermolecular hydrogen bonding due to presence of a hydrogen attached to electronegative oxygen atom and hence exists as associated molecules. On the other hand, methoxymethane does not form hydrogen bonds.

Q.8. Which is a stronger acid—phenol or cresol? Explain.

Ans. All the cresols are weaker acids than phenols. Methyl group has $+I$ effect (positive inductive effect) as well as hyperconjugation effect but the hyperconjugation effect predominates over the $+I$ effect. Since both these effects increase the electron density in the $\text{O}-\text{H}$ bond and hence all the cresols are weaker acids than phenols.

As hyperconjugation effect can operate only through *ortho* and *para* positions and not through meta positions, therefore, meta-cresol is stronger acid than *ortho* and *para*-cresols. However, due to stronger $+I$ effect at *ortho* position than at *para* position ($+I$ effect decreases with distance), *ortho*-cresol is a weaker acid than *para*-cresol. Thus, the order of acidic strength in increasing order is:

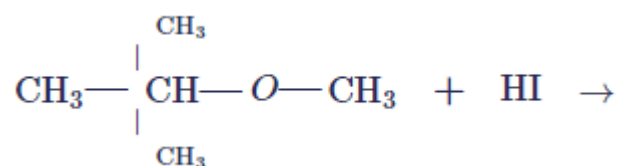
Short Answer Questions-II

Short Answer Questions-II (PYQ)

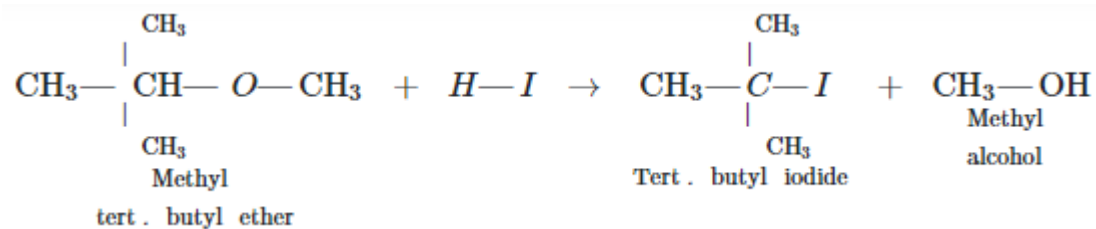
Q.1. Write the main product(s) in each of the following reactions:

[CBSE Delhi 2016]

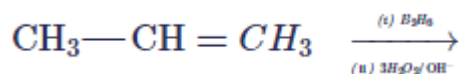
Q.



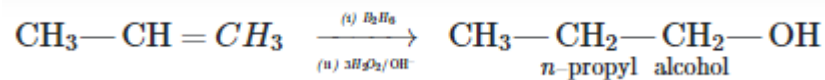
Ans.



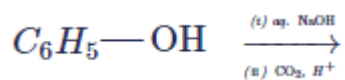
Q.



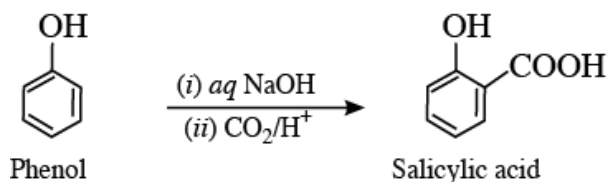
Ans.



Q.



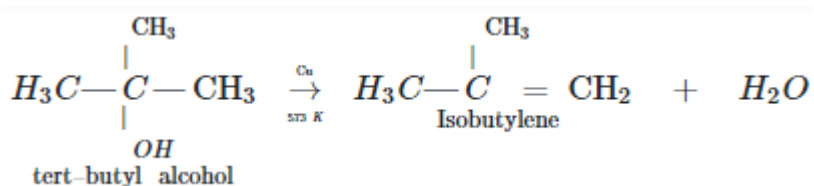
Ans.



Q.2. What happens when

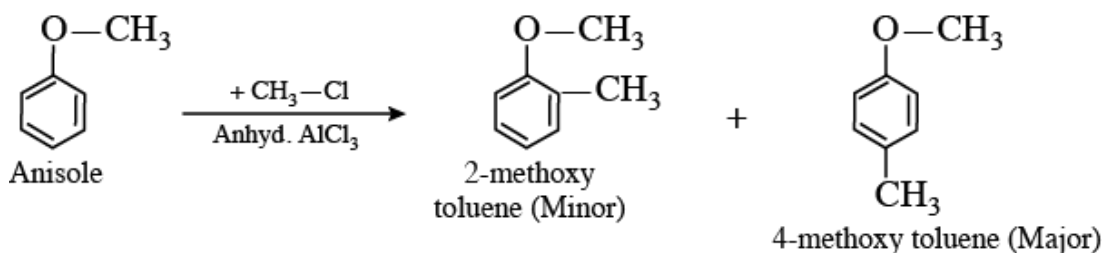
Q. (CH₃)₃C—OH is treated with Cu at 573 K,

Ans.



Q. Anisole is treated with CH₃Cl/anhydrous AlCl₃,

Ans.



Q. Phenol is treated with Zn dust?

Write chemical equations in support of your answer.

[CBSE (F) 2017]

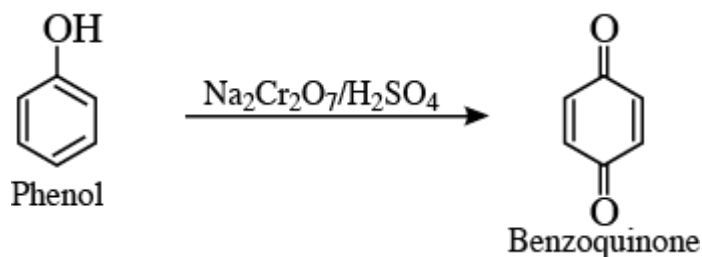
Ans.



Q.3. How would you obtain the following?

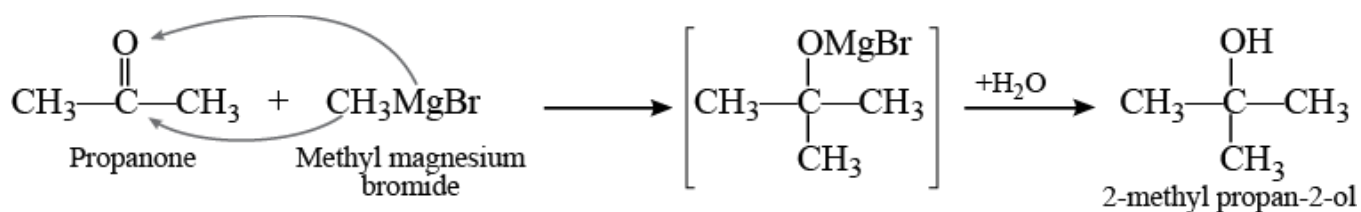
Q. Benzoquinone from phenol

Ans.



Q. 2-Methylpropan-2-ol from methylmagnesium bromide

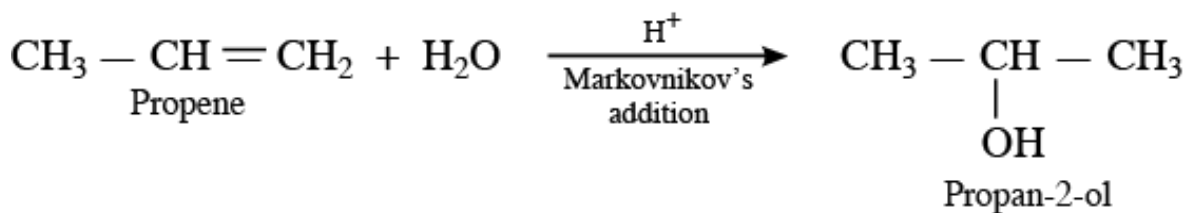
Ans.



Q. Propan-2-ol from propene

[CBSE (AI) 2011, (F) 2011]

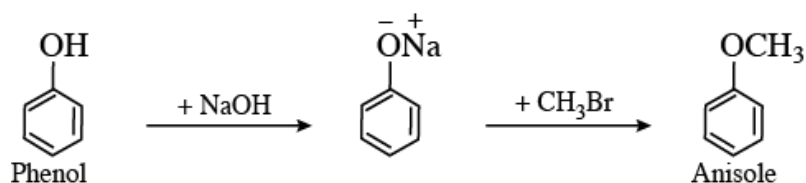
Ans.



Q.4. How do you convert the following:

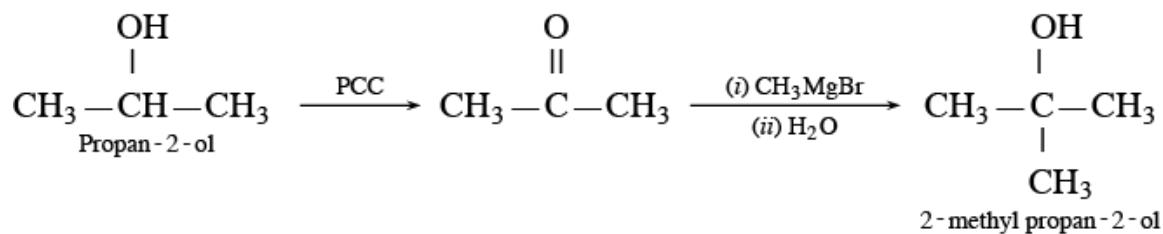
Q. Phenol to anisole

Ans.



Q. Propan-2-ol to 2-methylpropan-2-ol

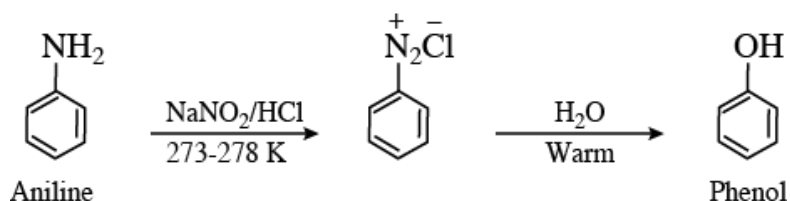
Ans.



Q. Aniline to phenol

[CBSE Delhi 2015]

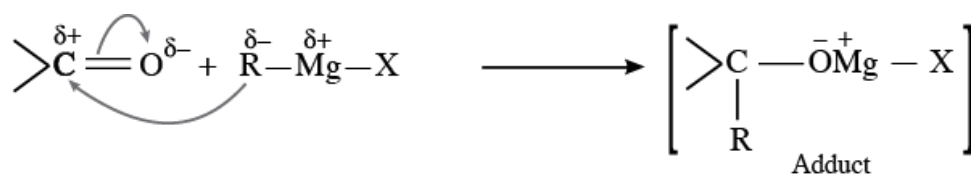
Ans.



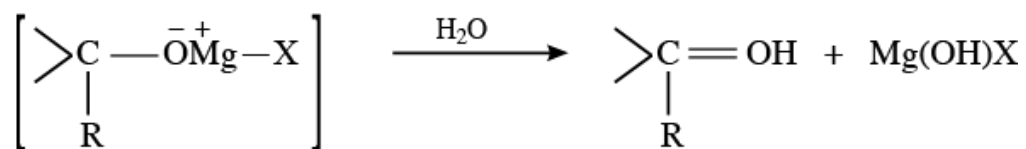
Q.5. Explain the mechanism of the following reactions:

Q. Addition of Grignard's reagent to the carbonyl group of a compound forming an adduct followed by hydrolysis.

Ans. Step I: Nucleophilic addition of Grignard reagent to carbonyl group.

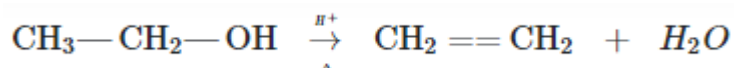


Step II: Hydrolysis



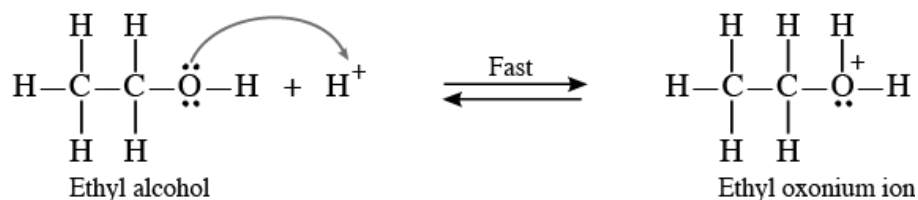
Q. Acid catalysed dehydration of an alcohol forming an alkene.

Ans.

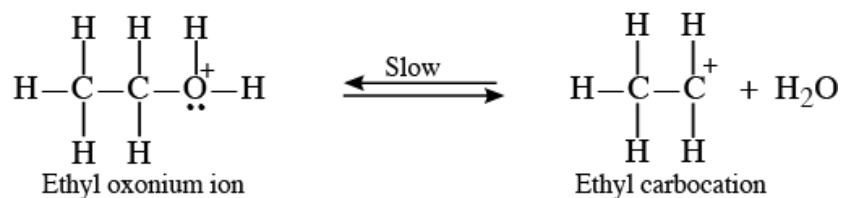


Mechanism:

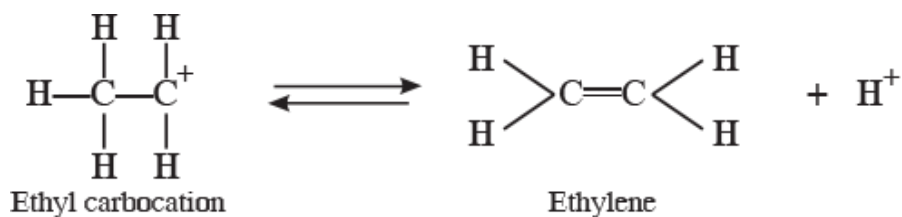
Step I: Formation of protonated alcohol



Step II: Formation of carbocation: It is the slowest step and hence, the rate determining step.



Step III: Formation of ethylene by elimination of a proton

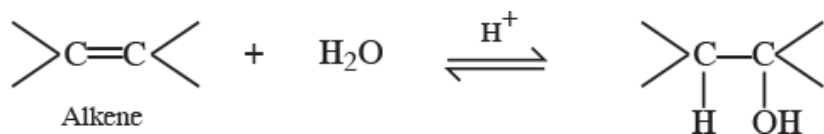


To drive the equilibrium to the right, ethylene is removed as it is formed.

Q. Acid catalysed hydration of an alkene forming an alcohol.

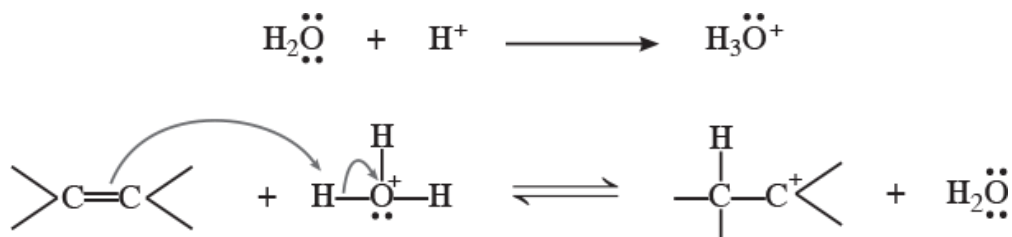
[CBSE Delhi 2009; (AI) 2012] [HOTS]

Ans.

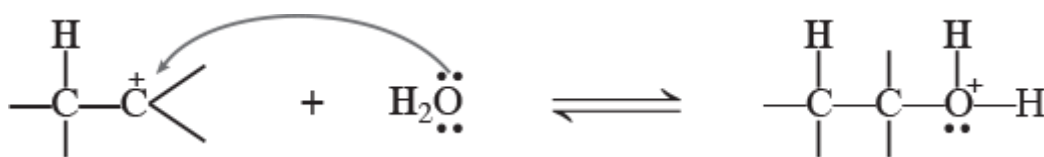


Mechanism:

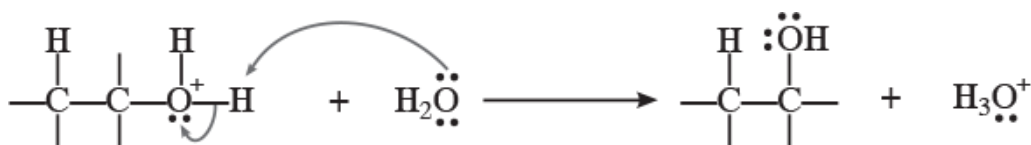
Step I: Protonation of alkene to form carbocation by electrophilic attack of H_3O^+ .



Step II: Nucleophilic attack of water on carbocation.



Step III: Deprotonation to form an alcohol



Q.6. Give reasons for the following:

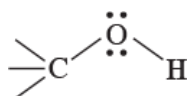
Q. Phenol is more acidic than methanol.

Ans. In phenol, the phenoxide ion obtained after the removal of a proton is stabilised by resonance whereas there is no resonance in the alkoxide ion of methanol.

Moreover, due to +I effect of CH_3 group the electron density in $\text{O}-\text{H}$ bond increases which makes release of H^+ difficult.

Q. The $\text{C}-\text{O}-\text{H}$ bond angle in alcohols is slightly less than the tetrahedral angle ($109^\circ 28'$).

Ans. It is due to the repulsion between the lone pair of electrons on oxygen atoms,



Q. $(\text{CH}_3)_3\text{C}-\text{O}-\text{CH}_3$ on reaction with HI gives $(\text{CH}_3)_3\text{C}-\text{I}$ and CH_3-OH as the main products and not $(\text{CH}_3)_3\text{C}-\text{OH}$ and CH_3-I .

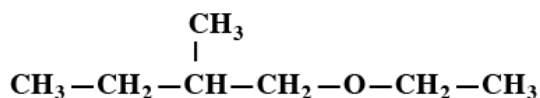
Ans.

The reaction between $(\text{CH}_3)_3\text{COCH}_3$ and HI follows SN_1 mechanism. For an SN_1 reaction, the formation of product is controlled by stability of the carbocation formed in the slowest step. Since tert-butyl carbonium ion $(\text{CH}_3)_3\text{C}^\oplus$ formed after the cleavage of C—O bond in the slowest step is more stable than methyl carbonium ion $(\text{CH}_3)^\oplus$ therefore $(\text{CH}_3)_3\text{C—I}$ and CH_3OH are the main products.

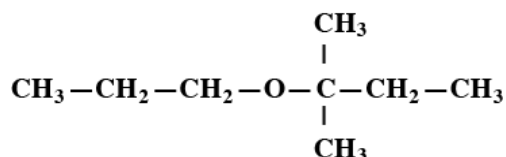
Short Answer Questions-II (OIQ)

Q.1. Give the major products that are formed by heating each of the following ethers with HI.

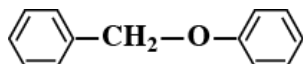
i.



ii.

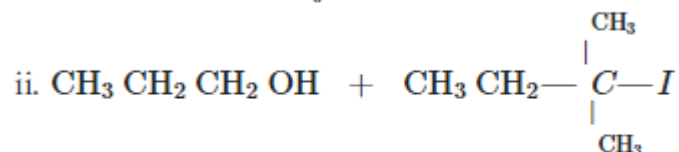
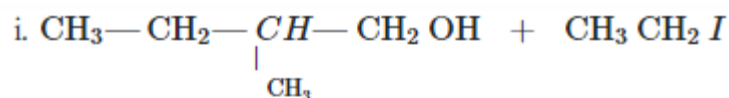


iii.

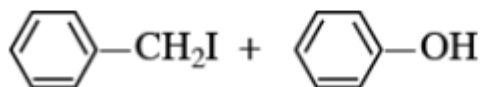


[HOTS]

Ans.



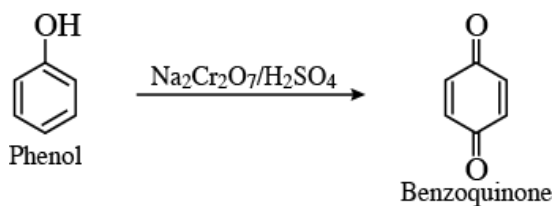
iii.



Q.2. Carry out the following conversions:

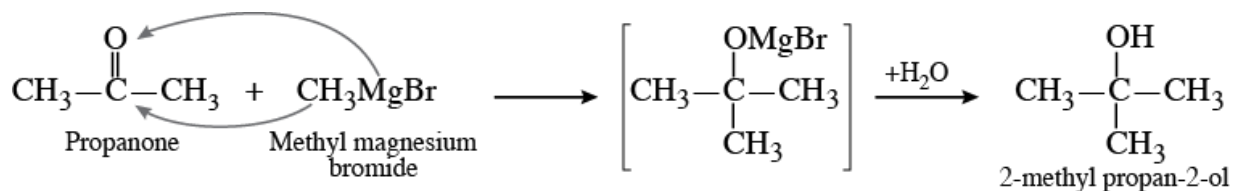
Q. Phenol to benzoquinone

Ans.



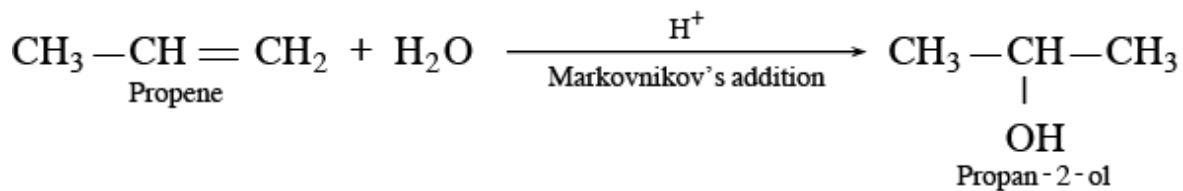
Q. Propanone to 2-Methylpropan-2-ol.

Ans.



Q. Propene to propan-2-ol.

Ans.



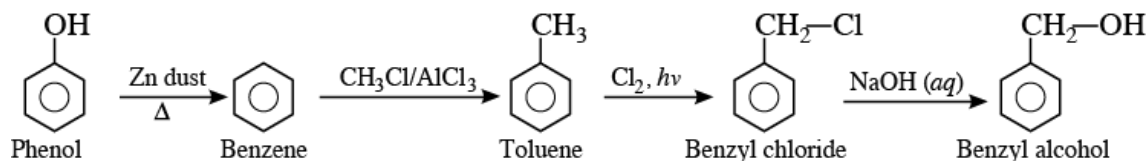
Q.3. How will you bring the following conversions?

- i. Phenol to benzyl alcohol
- ii. Phenol to m-bromophenol
- iii. Phenol to aspirin.

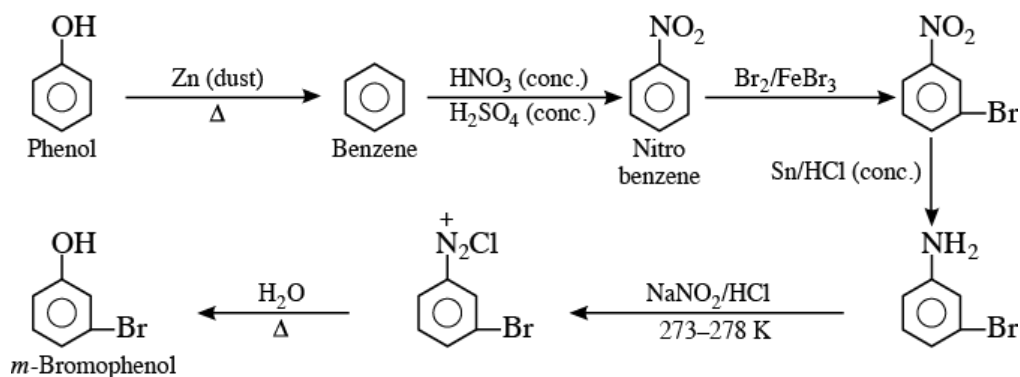
[HOTS]

Ans.

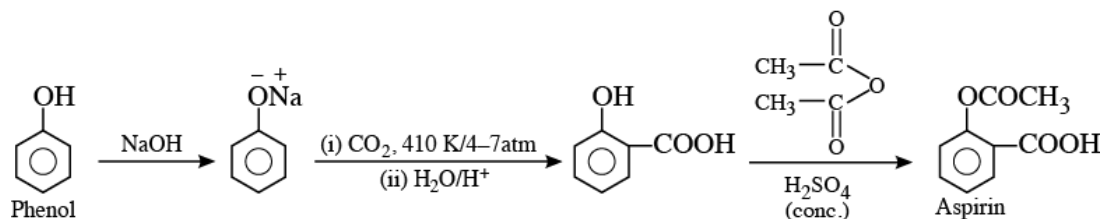
i.



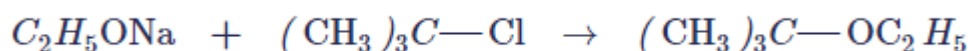
ii.



iii.



Q.4. The following is not an appropriate reaction for the preparation of tert.-butyl ethyl ether:

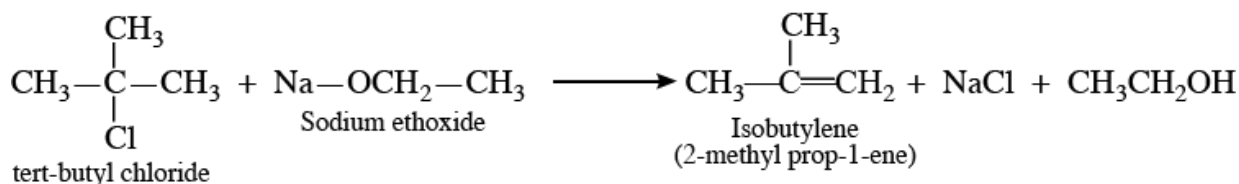


- What would be the major product of the given reaction?
- Write a suitable reaction for the preparation of tert.-butyl ethyl ether, specifying the names of reagents used.

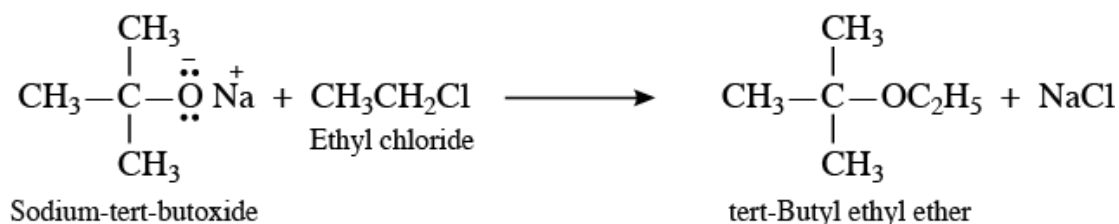
Justify your answer in both cases.

[CBSE Sample Paper 2016] [HOTS]

Ans. (i) The major product of the given reaction is 2-methylprop-1-ene. It is because sodium ethoxide ($\text{CH}_3-\text{CH}_2-\text{O}^-\text{Na}^+$) is a strong nucleophile as well as a strong base. Thus, elimination reaction predominates over substitution reaction.



(ii). To prepare tertiary butylethyl ether, the alkyl halide should be primary, *i.e.*, ethyl chloride and the nucleophile should be tertiary, *i.e.*, tertiary butoxide ion. It is because the reaction occurs by $\text{S}_{\text{N}}2$ mechanism and primary alkyl halides are most reactive in $\text{S}_{\text{N}}2$ reactions.

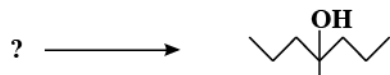


Q.5. Answer the following questions:

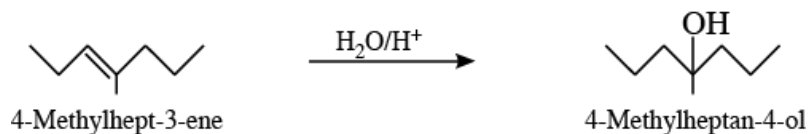
Q. Why are ethers insoluble in water?

Ans. Ethers are insoluble in water because due to the bigger size of the alkyl groups, the oxygen atom in ethers fails to form intermolecular H-bonds with water.

Q. Complete the reaction equation:



Ans.



Q. How will you know whether a given OH group is alcoholic or phenolic in nature?

Ans. Phenolic OH group gives blue or violet colouration with neutral FeCl_3 , while alcoholic OH group does not.

Q.6. Account for the following:

Q. Rectified spirit cannot be converted into absolute alcohol by simple distillation.

Ans. Rectified spirit containing 95% ethyl alcohol and 5% water forms an azeotropic mixture which distils at a constant temperature of 351.13 K.

Q. Diethyl ether does not react with sodium.

Ans. Since diethyl ether does not contain an active hydrogen attached to oxygen like alcohols and phenols, it does not react with sodium.

Q. Phenols do not undergo substitution of the —OH group like alcohols.

Ans. The C—O bond in phenols has some double bond character due to resonance and hence cannot be easily cleaved by nucleophile. In contrast, the C—O bond in alcohols is a pure single bond and hence can be easily cleaved by nucleophile.

Q.7.

- i. Arrange the following sets of compounds in order of their increasing boiling points:
 - (a) Pentan-1-ol, butan-1-ol, butan-2-ol, ethanol, propan-1-ol, methanol
 - (b) Pentan-1-ol, n-butane, pentanal, ethoxyethane.
- ii. Arrange the following compounds in increasing order of acidity and give a suitable explanation.

Phenol, *o*-nitrophenol, *o*-cresol

[NCERT Exemplar]

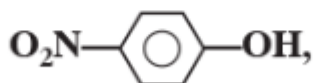
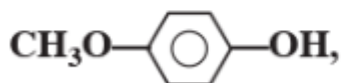
Ans.

- i. (a) Methanol < ethanol < propan-1-ol < butan-2-ol < butane-1-ol < pentan-1-ol.
(b) *n*-Butane < ethoxyethane < pentanal < pentan-1-ol.
- ii. Increasing order of acidity:
o-cresol < phenol < *o*-nitrophenol
In substituted phenols, the presence of electron-withdrawing groups enhance the acidic strength of phenol whereas, electron-releasing groups decrease the acidic strength of phenol.

Q.8. Arrange the following compounds in decreasing order of acidity.

i. H_2O , ROH , $\text{HC}\equiv\text{CH}$

ii.



iii. CH_3OH , H_2O , $\text{C}_6\text{H}_5\text{OH}$

Ans.

i. $\text{H}_2\text{O} > \text{ROH} > \text{HC}\equiv\text{CH}$

ii.

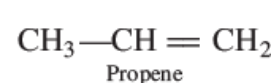
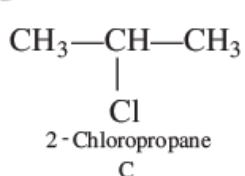
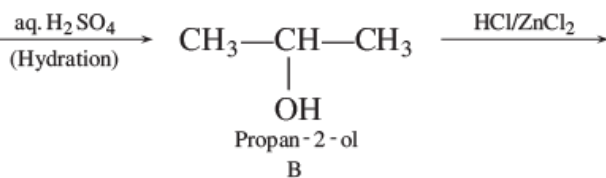
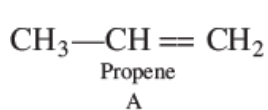
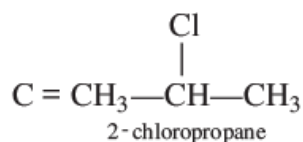
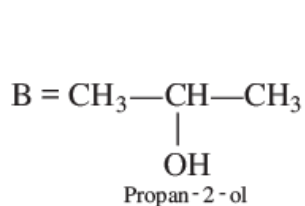
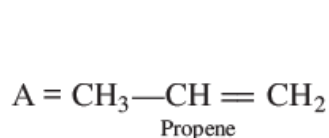


iii. $\text{C}_6\text{H}_5\text{OH} > \text{H}_2\text{O} > \text{CH}_3\text{OH}$

Q.9. An organic compound 'A' having molecular formula C_3H_6 on treatment with aqueous H_2SO_4 gives 'B' which on treatment with HCl/ZnCl_2 gives 'C'. The compound C on treatment with ethanolic KOH gives back the compound 'A'. Identify the compounds A, B, C.

[HOTS]

Ans.

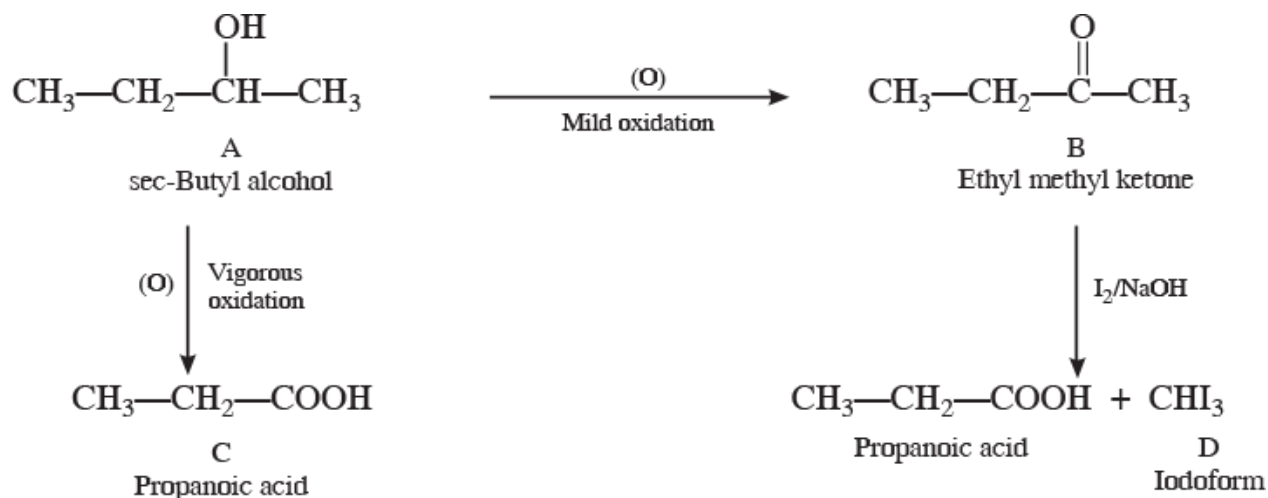


Q.10. A compound 'A' is optically active. On mild oxidation, it gives a compound 'B' but on vigorous oxidation gives another compound 'C'. C along with D is also

formed from B by reaction with iodine and alkali. Deduce the structures of A, B, C, D.

[HOTS]

Ans.

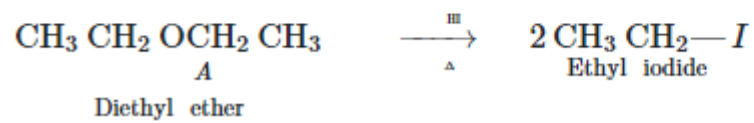
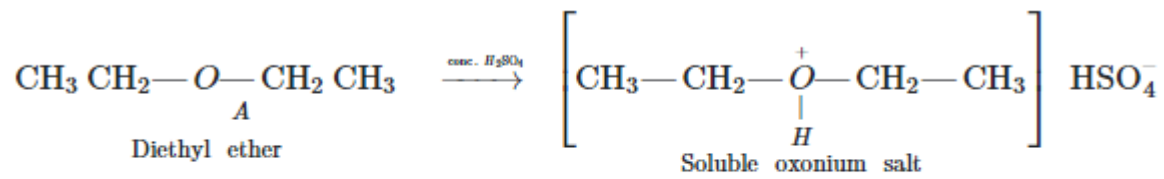


Q.11. A compound 'A' having molecular formula $\text{C}_4\text{H}_{10}\text{O}$ is found to be soluble in concentrated sulphuric acid. It does not react with sodium metal or potassium permanganate. On heating with excess of HI, it gives a single alkyl halide. Deduce the structure of compound A and explain all the reactions.

[HOTS]

Ans.

- As compound A does not react with sodium metal or potassium permanganate, it cannot be an alcohol.
- As compound A dissolves in conc. H_2SO_4 , it may be an ether.
- As compound A on heating with excess of HI gives a single alkyl halide, therefore, compound A must be a symmetrical ether.
- The only symmetrical ether having molecular formula $\text{C}_4\text{H}_{10}\text{O}$ is diethyl ether. Thus compound 'A' is diethylether, $\text{CH}_3-\text{CH}_2-\text{O}-\text{CH}_2-\text{CH}_3$.



Long Answer Questions

Long Answer Questions (PYQ)

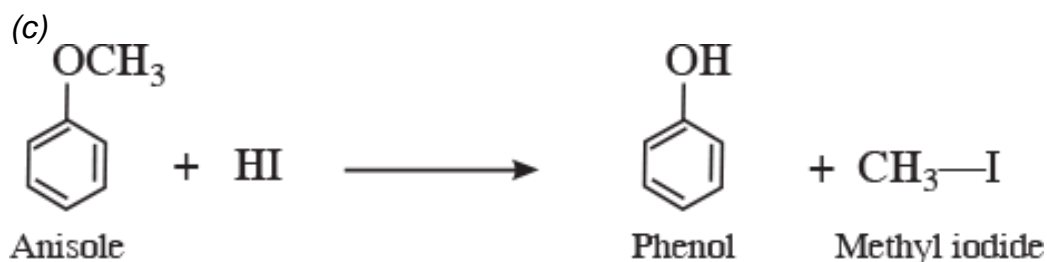
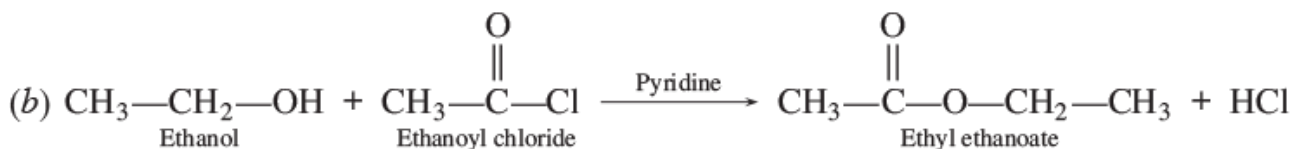
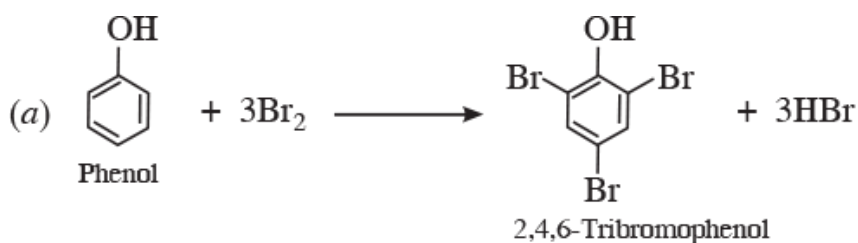
Q.1. Answer the following question :

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.



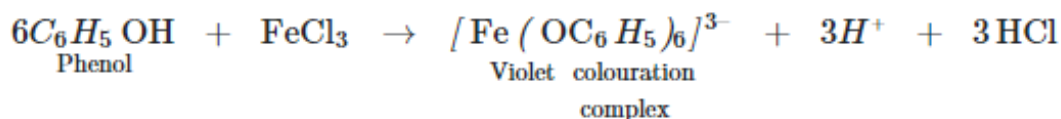
Q. Distinguish between:

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

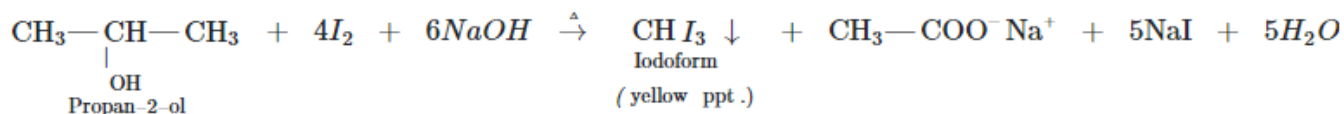
[CBSE (F) 2016]

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 :

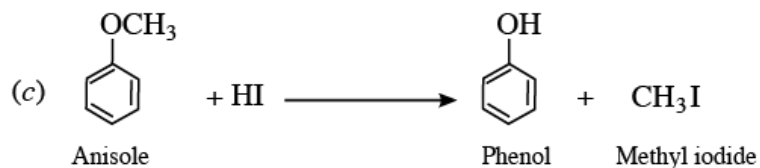
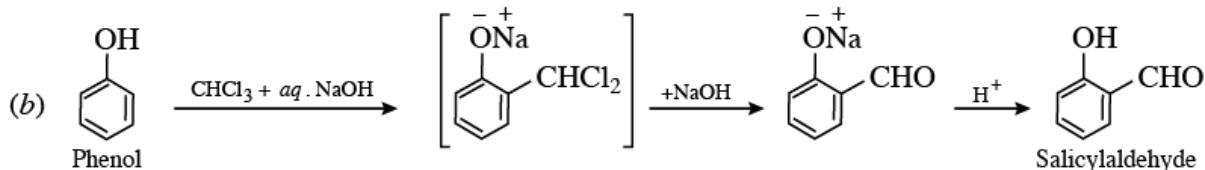
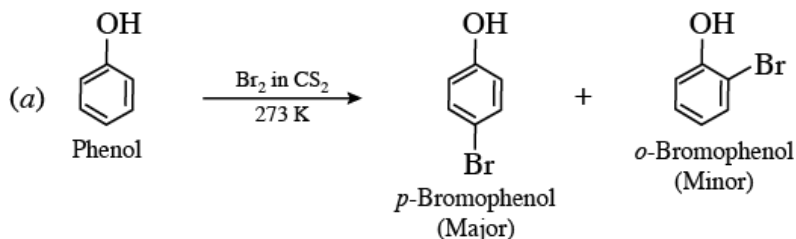
Q. Write equations of the following reactions:

a. Bromine in CS_2 with phenol

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

c. Anisole reacts with HI

Ans.



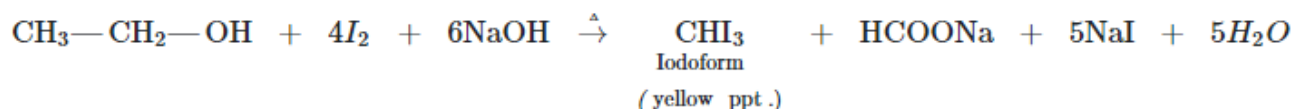
Q. Distinguish between

a. Ethanol and Diethyl ether

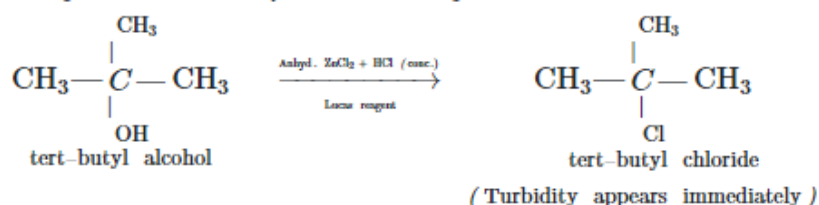
b. Propanol and t-butyl alcohol

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.

- $\text{Br}_2(\text{aq})$
- $\text{B}_2\text{H}_6, \text{H}_2\text{O}, \text{H}_2\text{O}_2$ 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

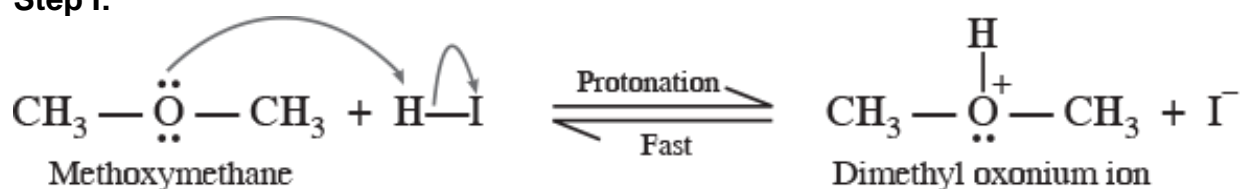
Long Answer Questions (OIQ)

Q.1. Answer the following question :

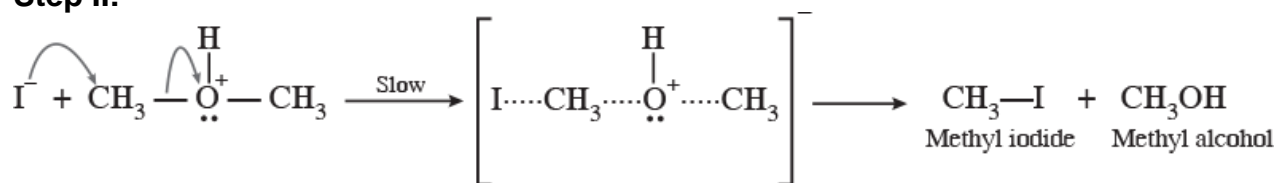
Q. Write mechanism of the reaction of HI with methoxymethane.

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

Step I:

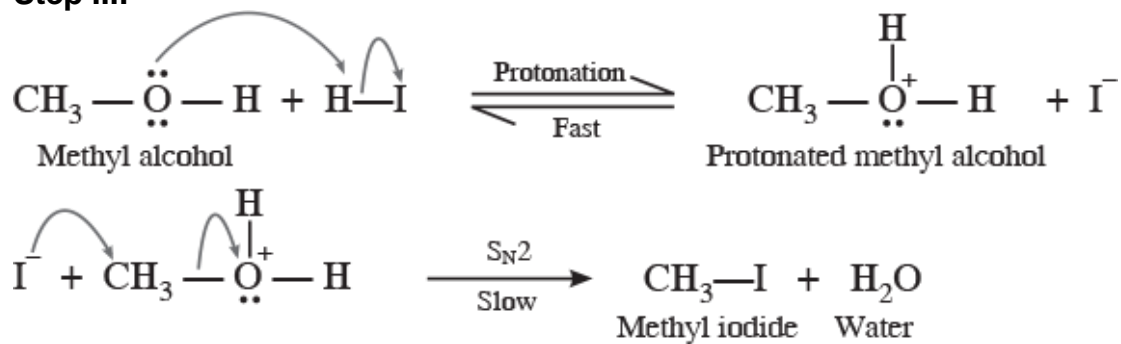


Step II:

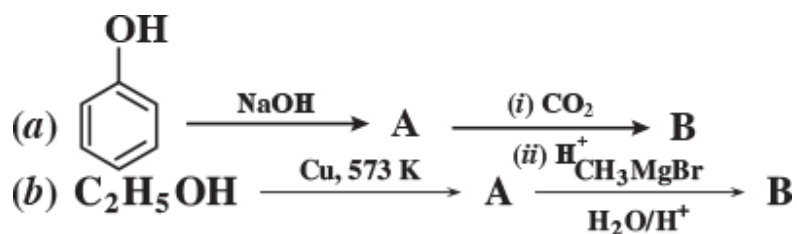


If excess of HI is used, methyl alcohol formed in step II further reacts with another molecule of HI to form CH₃I.

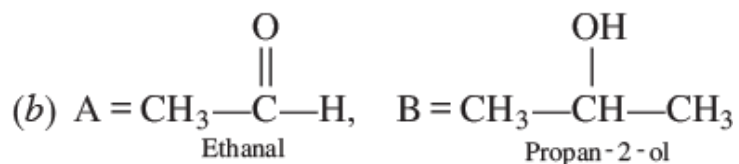
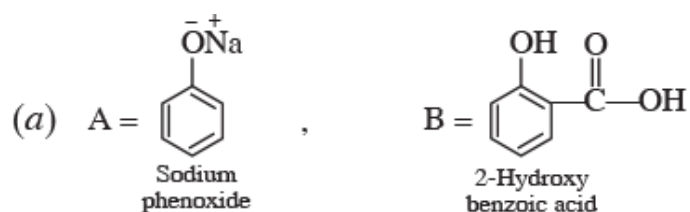
Step III:



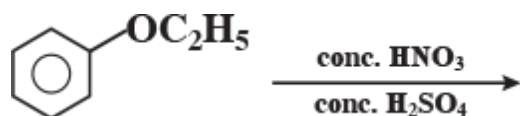
Q. Identify A and B in the following reactions:



Ans.

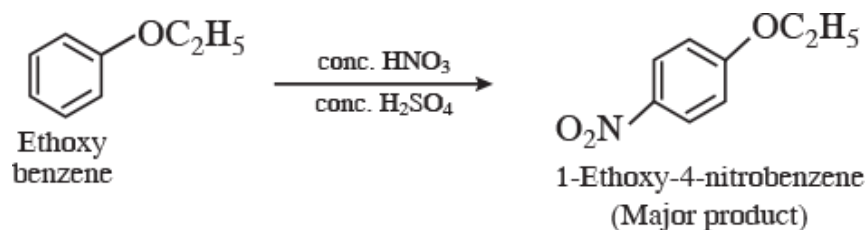


Q. Give the structure and the IUPAC name of the major product obtained in the following reaction



[CBSE Sample Paper 2015]

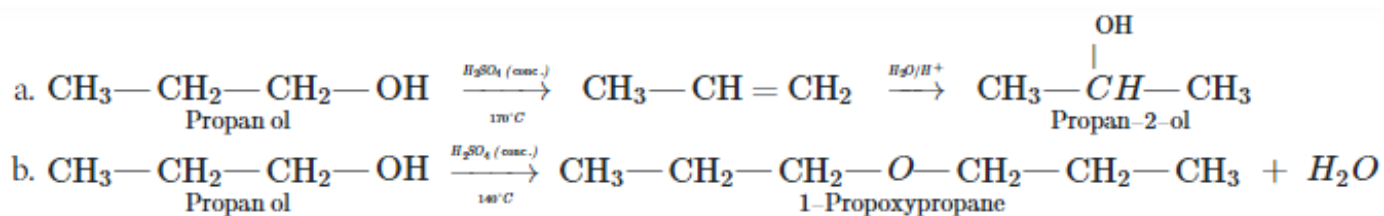
Ans.



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

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

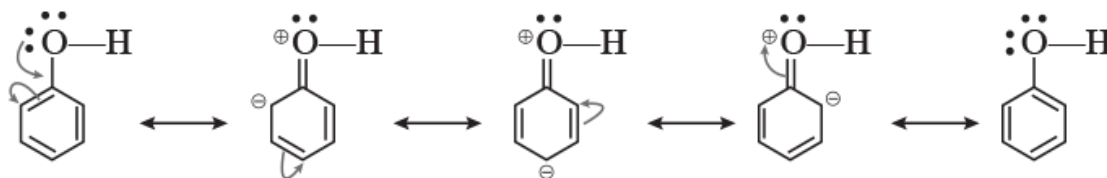
Ans.



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 ZnCl₂ 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 ZnCl₂ 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° < 2° < 3°. As a result of this reactivity of alcohols towards conc. HCl and ZnCl₂ follows the same order *i.e.*, 1° < 2° < 3°.

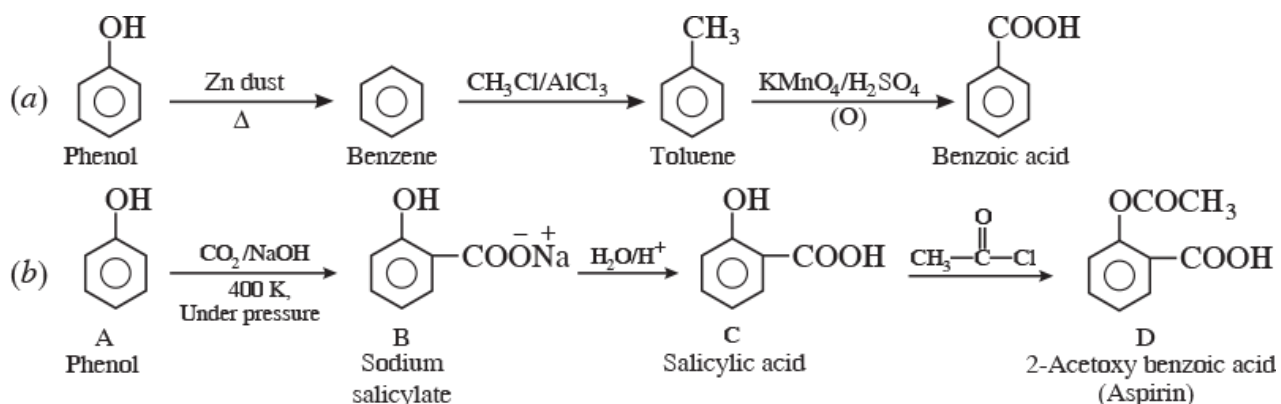
c. Protonation of anisole gives oxonium ion $\left(\text{C}_6\text{H}_5 - \overset{\oplus}{\underset{\text{H}}{\text{O}}} - \text{CH}_3 \right)$. The bond between O—CH₃ is weaker than the bond between O—C₆H₅ because the carbon of phenyl group is sp₂ hybridised and there is partial double bond character. Therefore, the attack by I⁻ ion breaks O—CH₃ bond to give methyl iodide and phenol.

Q.3. Answer the following question :

Q.

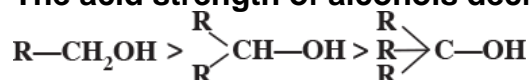
- How will you convert phenol to benzoic acid?
- An organic compound A having molecular formula C₆H₆O gives a characteristic colour with aqueous FeCl₃ solution. A on treatment with CO₂ and NaOH at 400 K under pressure gives B which on acidification gives a compound C. The compound C reacts with acetyl chloride to give D which is a popular pain killer. Deduce the structure of A, B, C and D.

Ans.



Q.

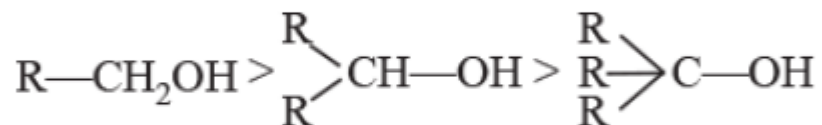
a. The acid strength of alcohols decreases in the order



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

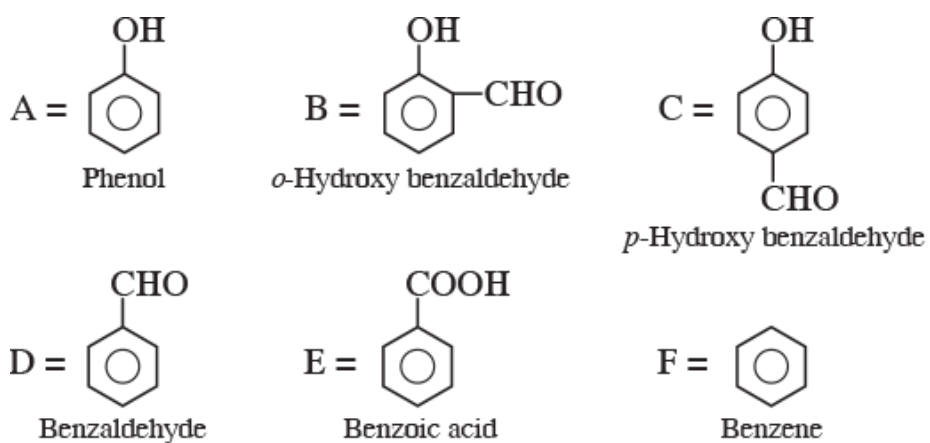


b. Nitration involves attack of electrophile nitronium (NO_2^+) ion on benzene ring. Due to +R effect of O—H group electron density increases at ortho and para position in phenol. Therefore, phenol is more easily nitrated than benzene.

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:

