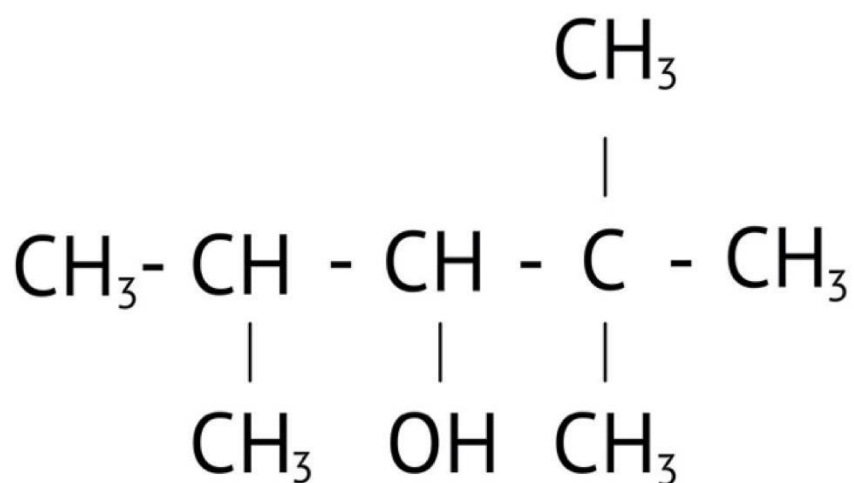


Important Questions for Class 12 Chemistry

Chapter 7: Alcohols, Phenols and Ethers

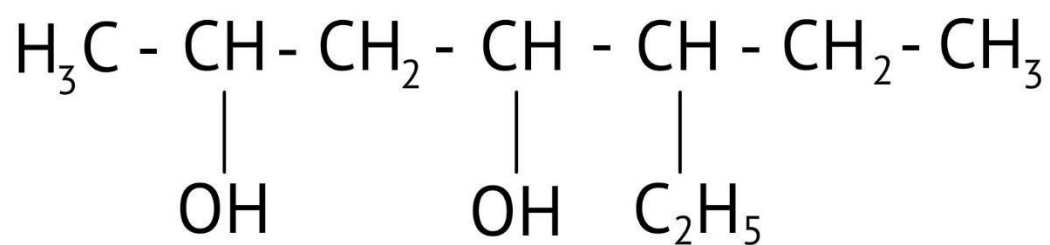
1. Write IUPAC names of the following compounds.

(i)



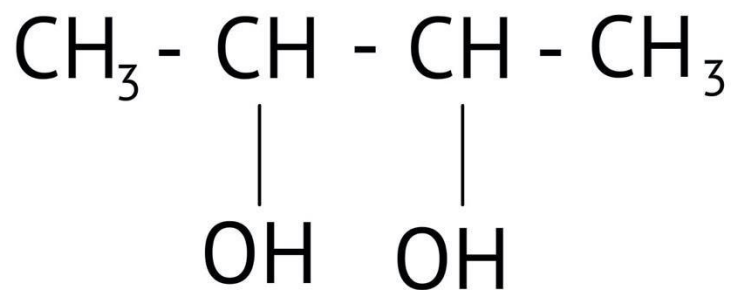
Ans: 2,2,4-Trimethylpentan-3-ol

(ii)



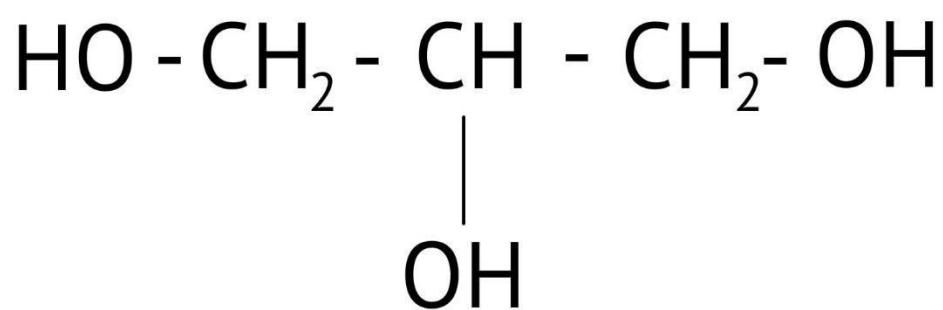
Ans: 5-Ethylheptane-2, 4-diol

(iii)



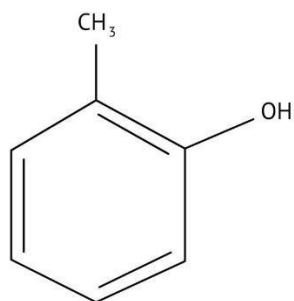
Ans: Butane-2, 3-diol

(iv)



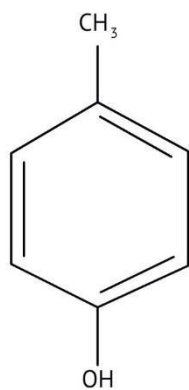
Ans: 2-hydroxypropan-1, 3-diol

(v)



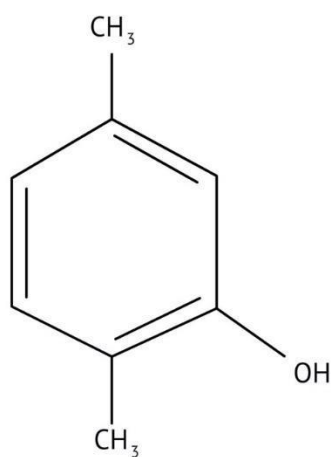
Ans: 2-Methylphenol

(vi)



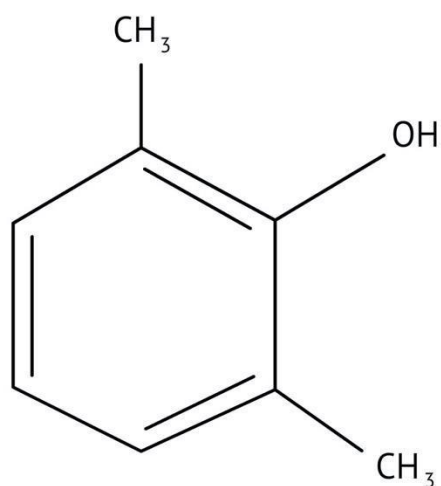
Ans: 4-Methylphenol

(vii)



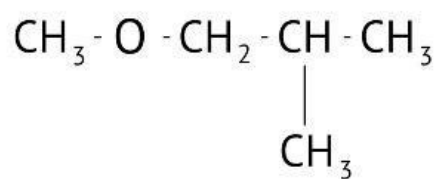
Ans: 2, 5 -Dimethylphenol

(viii)



Ans: 1, 5-dimethyl phenol

(ix)



Ans: 1 -Methoxy-2-methylpropane

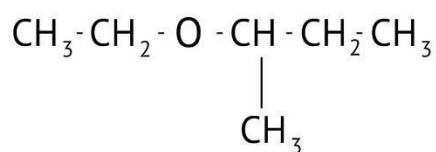
(x) $\text{CH}_3 - \text{O} - \text{C}_6\text{H}_5$

Ans: Ethoxybenzene

(xi) $\text{C}_6\text{H}_5 - \text{O} - \text{C}_2\text{H}_5$

Ans: 1-Phenoxyheptane

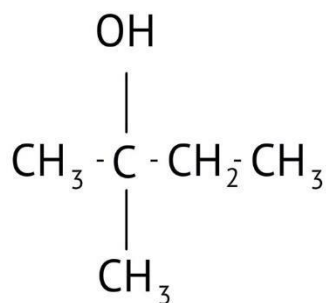
(xii)



Ans: 2-Ethoxybutane

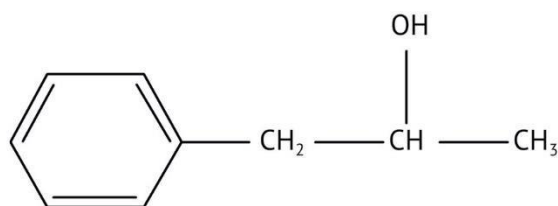
2. Write structures of the compounds whose IUPAC names are as follows:

(i) 2-Methylbutan-2-ol Ans:

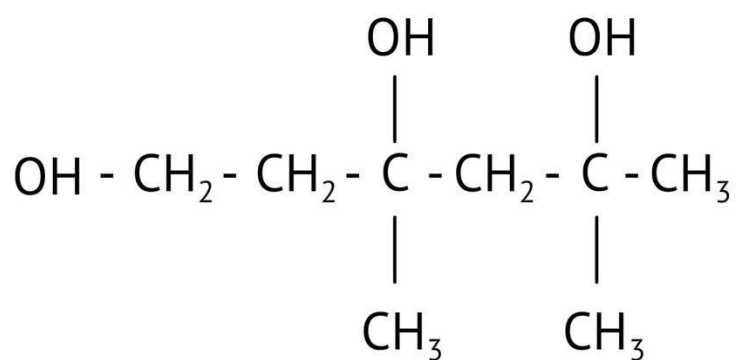


(ii) 1-Phenylpropan-2-ol

Ans:

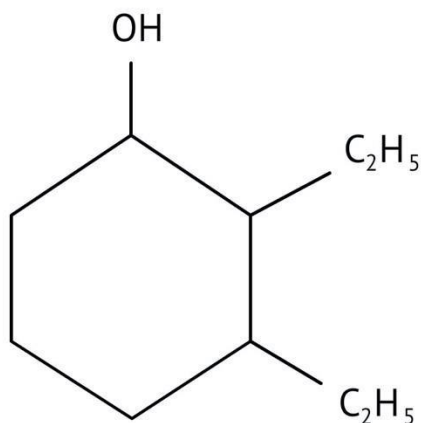


(iii) 3,5-Dimethylhexane-1,3,5-triol Ans:



(iv) 2,3-Diethylphenol

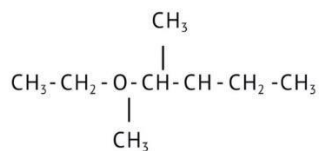
Ans:



(v) 1-Ethoxypropane

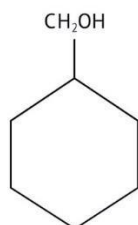
Ans: $\text{CH}_3 - \text{CH}_2 - \text{O} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$ 2 2 2 3

(vi) 2-Ethoxy-3-methylpentane Ans:

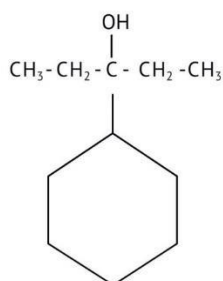


(vii) Cyclohexylmethanol

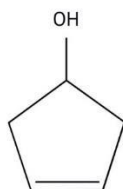
Ans:



(viii) 3-Cyclohexylpentan-3-ol Ans:

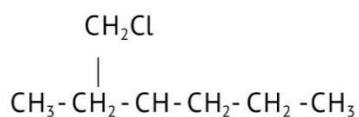


(ix) Cyclopent-3-en-1-ol Ans:



(x) 3-Chloromethylpentan-1-ol.

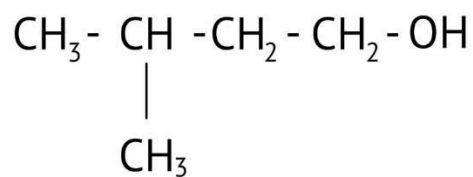
Ans:



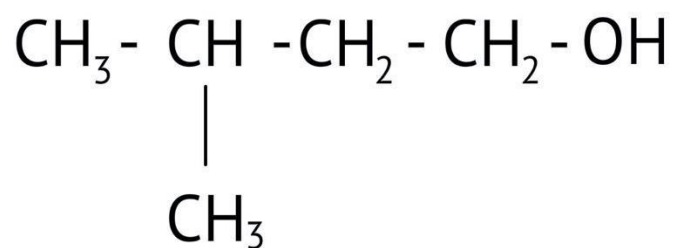
3. (i) Draw the structures of all isomeric alcohols of molecular formula $\text{C}_5\text{H}_{12}\text{O}$ and give their IUPAC names.

Ans: a. All the isomeric alcohols corresponding to $\text{C}_5\text{H}_{12}\text{O}$

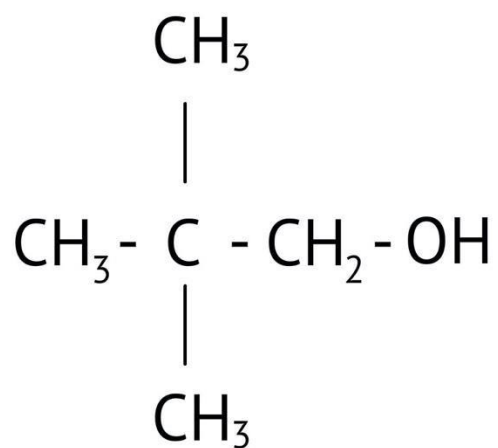
b. molecular formula are given below: pentan - 1 - ol $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$



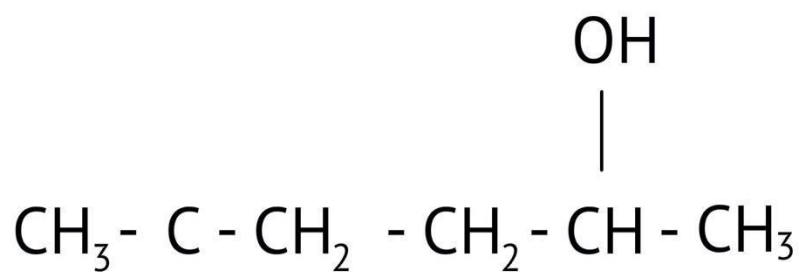
2- Methylbutan-1-ol (1°)



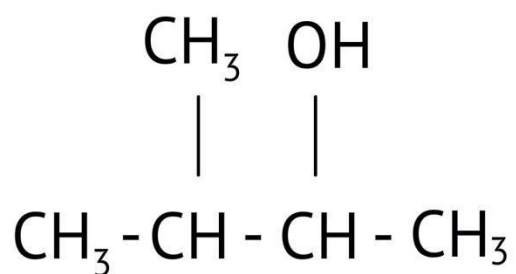
3-Methylbutan-1-ol (1°)



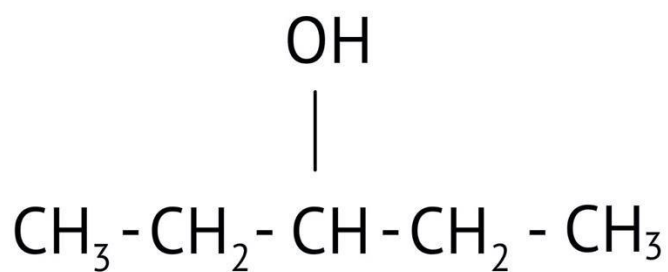
2,2-Dimethylpropan-1-ol (1°)



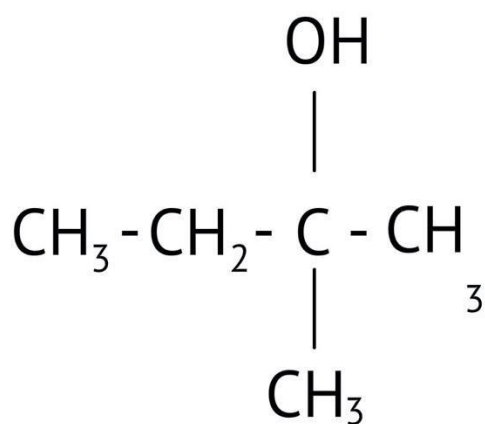
Pentan-2-ol (2°)



3-Methylbutan-2-ol (2°)



Pentan-3-ol (2°)



c. Primary alcohol: Pentan-1-ol; 2-Methylbutan-1-ol; 3-Methylbutan-1-ol; 2,2 - Dimethylpropan- 1-ol Secondary alcohol: Pentan-2-ol;3-Methylbutan-2-ol; Pentan-3-ol Tertiary alcohol: 2-methylbutan-2-ol.

(ii) Classify the isomers of alcohols in question 11.3 (i) as primary, secondary and tertiary alcohols.

Ans: An alcohol in which the hydroxy group is attached to a primary carbon atom is referred to as a primary alcohol.

A secondary alcohol is a molecule in which a hydroxy group, OH, is connected to a saturated carbon atom that is also bonded to two additional carbon atoms.

A hydroxy group, OH, is connected to a saturated carbon atom that has three additional carbon atoms attached to it in a tertiary alcohol.

Primary alcohol: pentan-1-ol; 2-Methylbutan-1-ol; 3-Methylbutan-1-ol; 2,2-Dimethylpropan-1-ol

Secondary alcohol: Pentan-2-ol; 3-Methylbutan-2-ol; Pentan-3-ol

Tertiary alcohol: 2-methylbutan-2-ol.

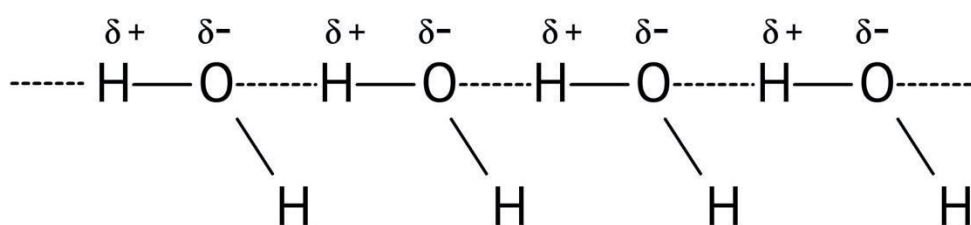
4. Explain why propanol has a higher boiling point than that of the hydrocarbon, butane?

Ans: Because of the -OH group, propanol undergoes intermolecular H-bonding. Butane, while on the other hand, does not. As a consequence, it takes more energy to break hydrogen bonds. Propanol has a greater boiling point than the hydrocarbon butane as a result of this.

5. Alcohols are comparatively more soluble in water than hydrocarbons of comparable molecular masses. Explain this fact.

Ans: Due to the presence of the -OH group, alcohols create H-bonds with water. Hydrocarbons, on the other hand, cannot form H-bonds with water. As a result,

alcohols have a higher water solubility than hydrocarbons with similar molecular weights.

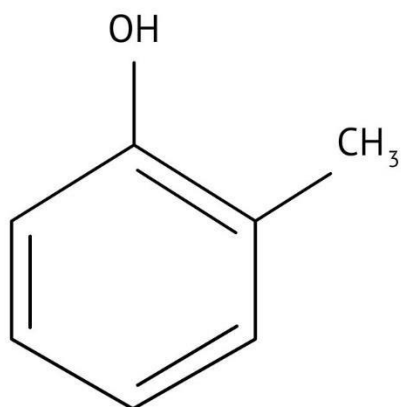


6. What is meant by hydroboration-oxidation reaction? Illustrate it with an example.

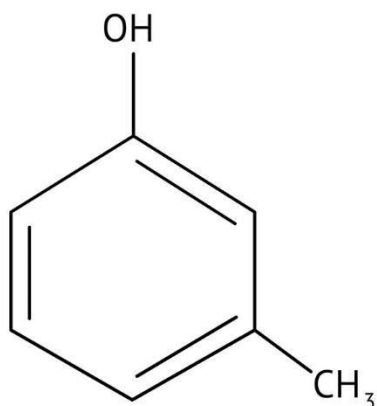
Ans: The hydroboration-oxidation reaction is outlined because the addition of borane followed by oxidation; for instance, the hydroboration-oxidation reaction of propylene produces propan-1-ol. propylene combines with B_2H_6 diborane to make trialkylborane as an additional product during this method. Within the presence of binary compound hydrated oxide, oxide oxidises this addition product to alcohol.



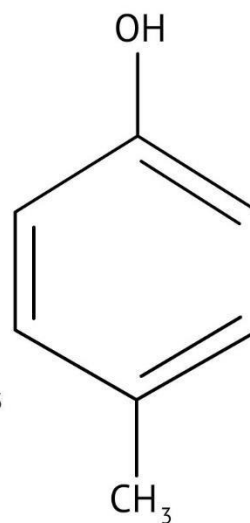
Ans:



2-Methylphenol
(o-Cresol)



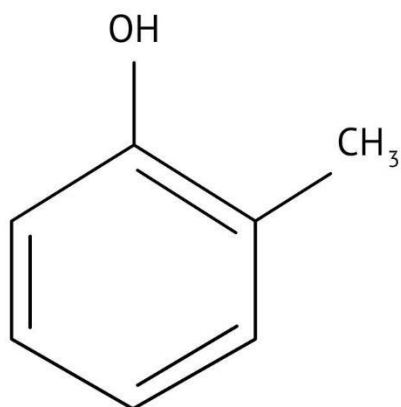
3-Methylphenol
(m-Cresol)



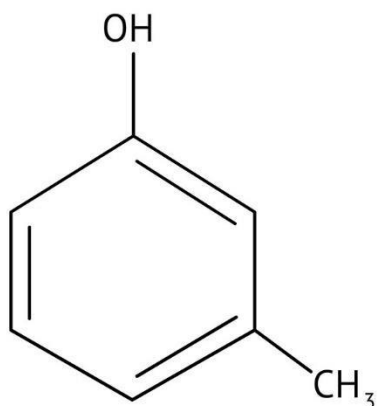
4-Methylphenol
(p-Cresol)

8. While separating a mixture of ortho and para nitrophenols by steam distillation, name the isomer which will be steam volatile. Give a reason.

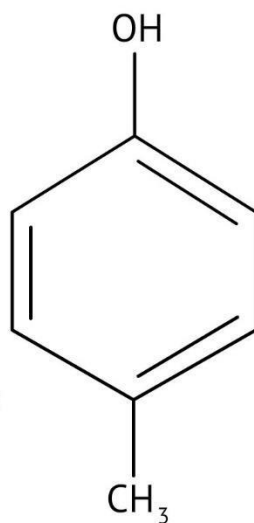
Ans: o-nitrophenol and p-nitrophenol both have intramolecular H-bonding. Because of the presence of intermolecular bonding in p-nitrophenol, the molecules are tightly bound together. As a result, o-nitrophenol is a steam volatile compound.



2-Methylphenol
(o-Cresol)



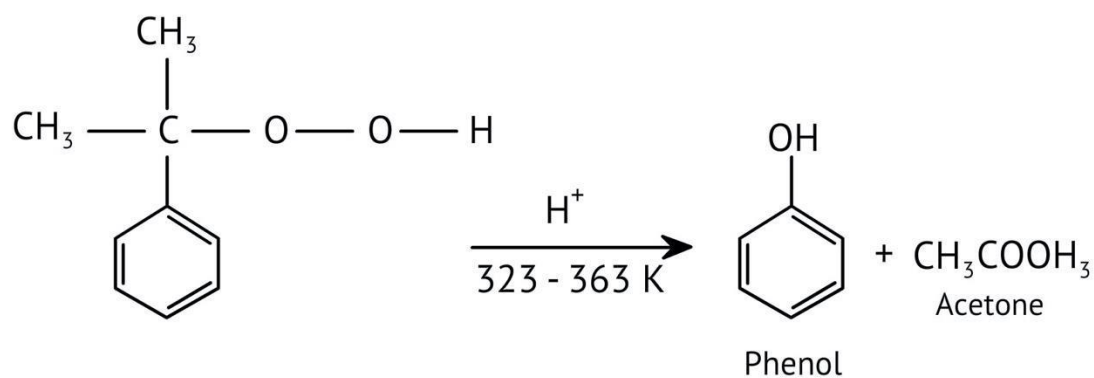
3-Methylphenol
(m-Cresol)



4-Methylphenol
(p-Cresol)

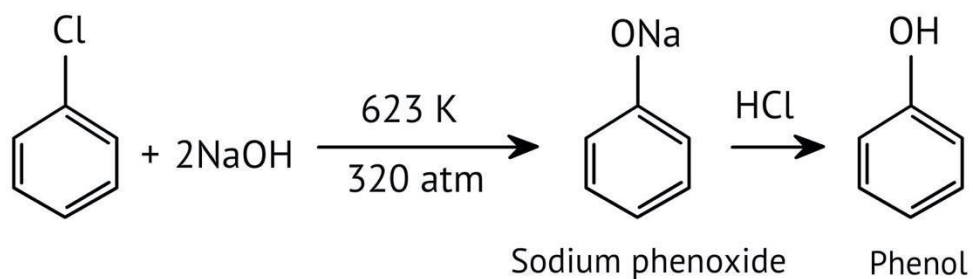
9. Give the equations of reactions for the preparation of phenol from cumene.

Ans: Cumene is first oxidised in the presence of air to produce cumene hydro peroxide, which is then used to make phenol. Cumene hydroxide is then treated with dilute acid, yielding phenol and acetone as by-products.



10. Write chemical reaction for the preparation of phenol from chlorobenzene.

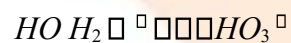
Ans: When chlorobenzene is combined with NaOH, sodium phenoxide is formed, which when acidified yields phenol. (at 623K and 320atm pressure)

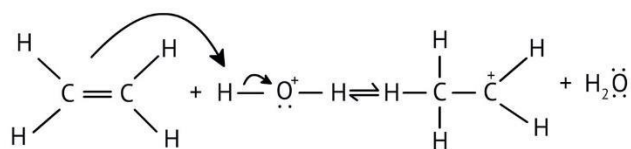


11. Write the mechanism of hydration of ethene to yield ethanol.

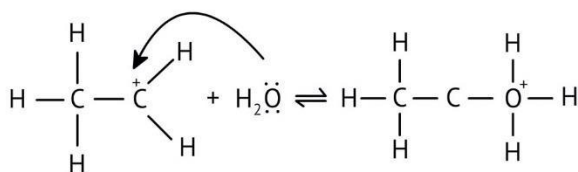
Ans: Three processes are involved in the hydration of ethene to generate ethanol are as follows:

Step 1: Electrophilic reaction of hydronium ion protonates ethene to create carbocation:

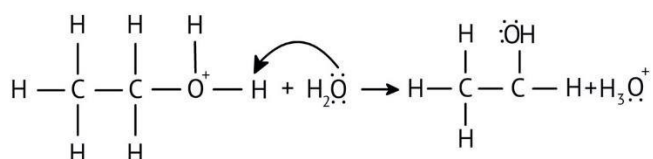




Step 2: Water's nucleophilic action on carbocation:

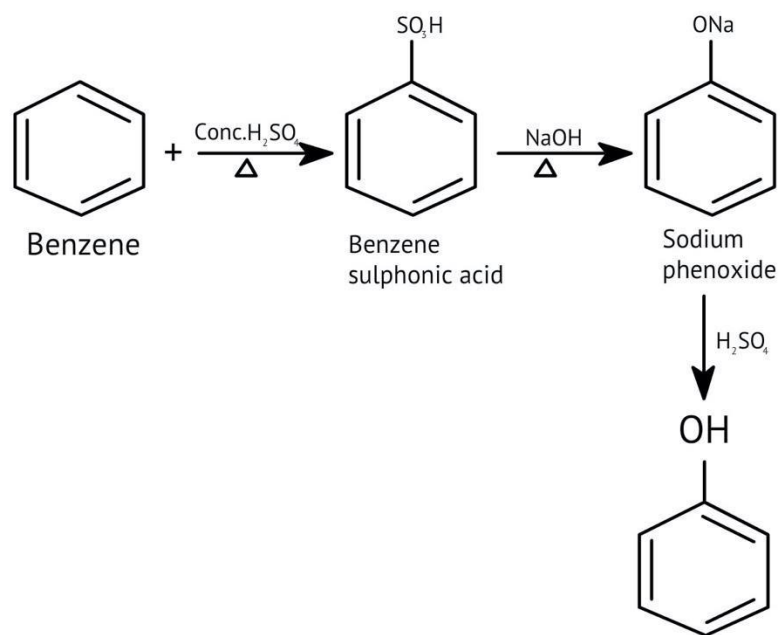


Step 3: Ethanol formation by deprotonation:



12. You are given benzene, conc. H_2SO_4 and NaOH . Write the equations for the preparation of phenol using these reagents.

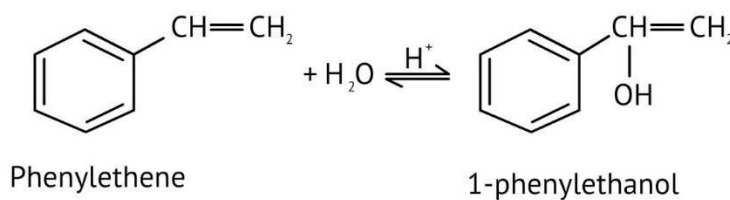
Ans:



13. Show how will you synthesize:

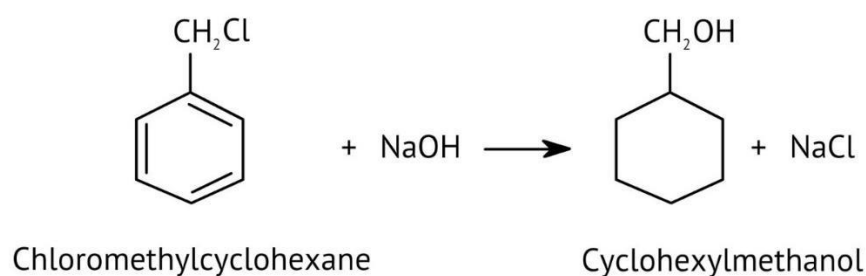
(i) 1-phenylethanol from a suitable alkene.

Ans: 1-phenylethanol can be made by acid-catalysed hydration of ethylbenzene (styrene)



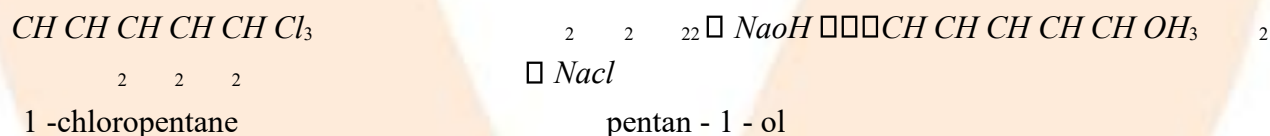
(ii) cyclohexylmethanol using an alkyl halide by an S_N^2 reaction.

Ans: cyclohexylmethanol can be made by treating chloromethylcyclohexane with sodium hydroxide.



(iii) pentan-1-ol using a suitable alkyl halide

Ans: Pentan-1-ol is generated when 1-chloropentane is treated with NaOH.



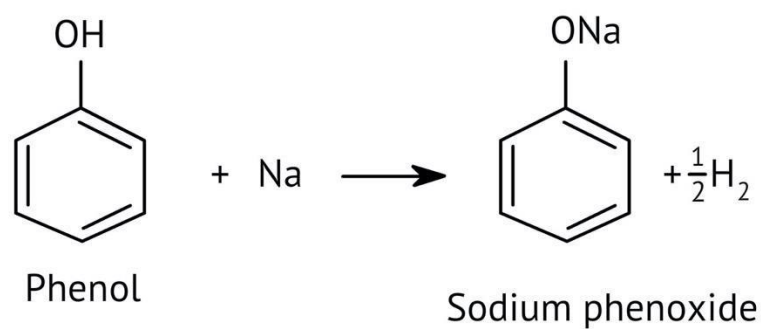
14. Give two reactions that show the acidic nature of phenol. Compare acidity of phenol with that of ethanol.

Ans:

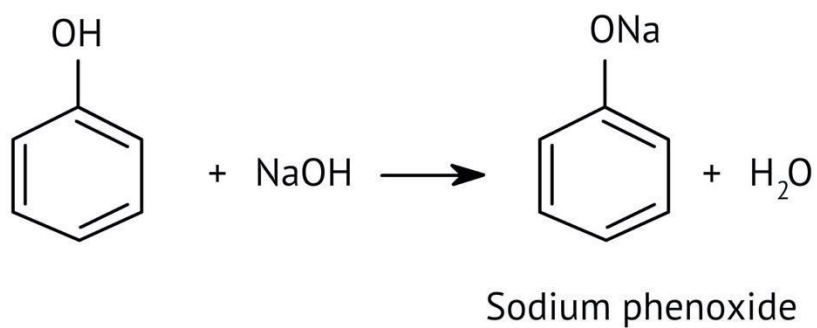
The following two reactions can be used to show phenol's acidic nature:

(I) When phenol combines with sodium, sodium phenoxide is formed, releasing H_2 .

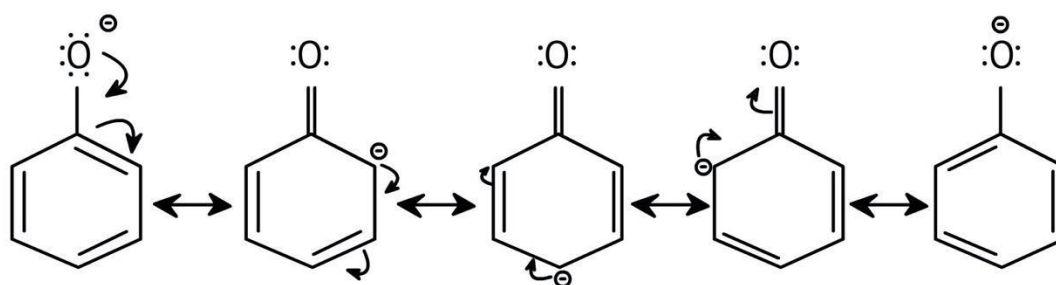
.



(II) When phenol interacts with sodium hydroxide, sodium phenoxide and water are produced as by-products.



Phenol's acidity is higher than that of ethanol. This is because the phenoxide ion undergoes resonance and remains stable after losing a proton, whereas the ethoxide ion does not.

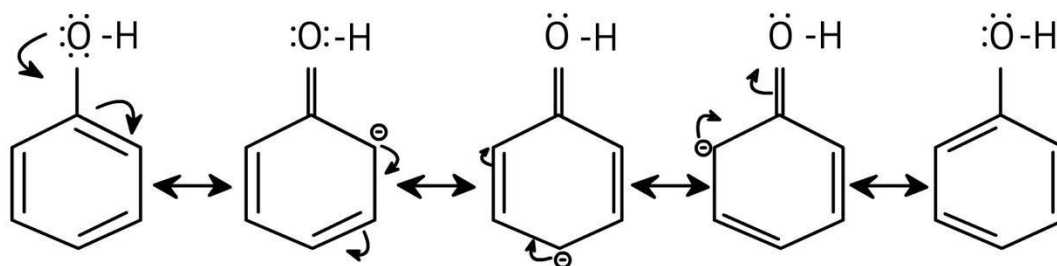


15. Explain why ortho nitrophenol is more acidic than ortho methoxyphenol?

Ans: Nitro-group is an electron withdrawing group. The electron density in the O—H bond is reduced when this group is in the ortho position. As a result, losing a proton is easier. Resonance also stabilises the o-nitrophenoxide ion produced after protons are lost. As a result, ortho-nitrophenol is a more powerful acid. The methoxy group, on the other hand, is an electron-releasing group. As a result, the electron density in the O—H bond increases, making it difficult to give off the proton. As a result, ortho-nitrophenol is acidic in comparison to ortho-methoxyphenol.

16. Explain how the -OH group attached to a carbon of benzene ring activates it towards electrophilic substitution?

Ans: The -OH group is a group that donates electrons. As demonstrated in the phenol resonance structure, this raises the electron density in the benzene ring. As a result, the benzene ring is activated, making it more susceptible to electrophilic substitution.



17. Give equations of the following reactions:

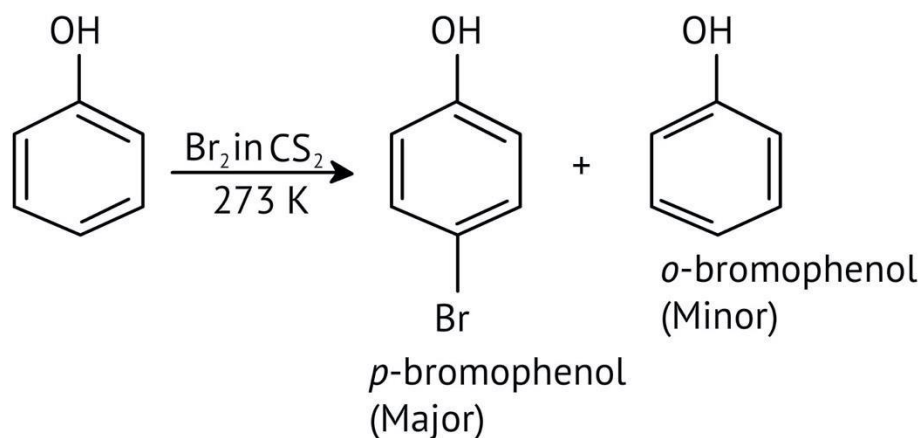
(i) Oxidation of propan-1-ol with alkaline KMnO_4 solution

Ans: KMnO_4 oxidises primary alcohols to carboxylic acids extremely effectively under regulated circumstances. Therefore, the propanol gets converted to propanoic acid.



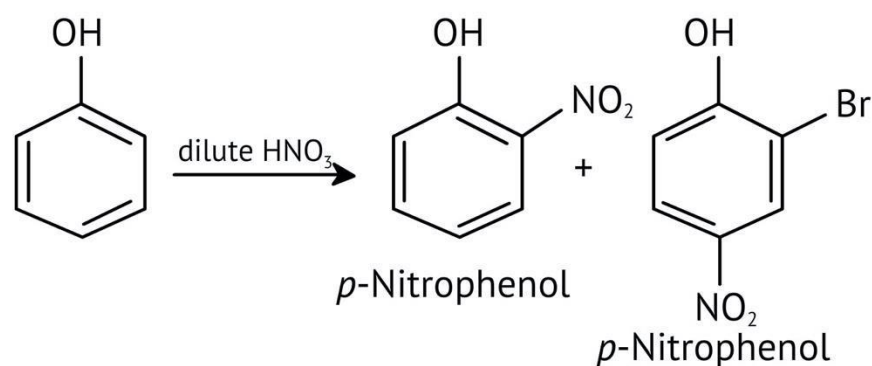
(ii) Bromine in CS₂ with phenol

Ans: reaction of phenol with bromine in CS₂ yields brominated products. As -OH is an ortho/para directed groups. The products obtained are p-bromophenol and obromophenol.



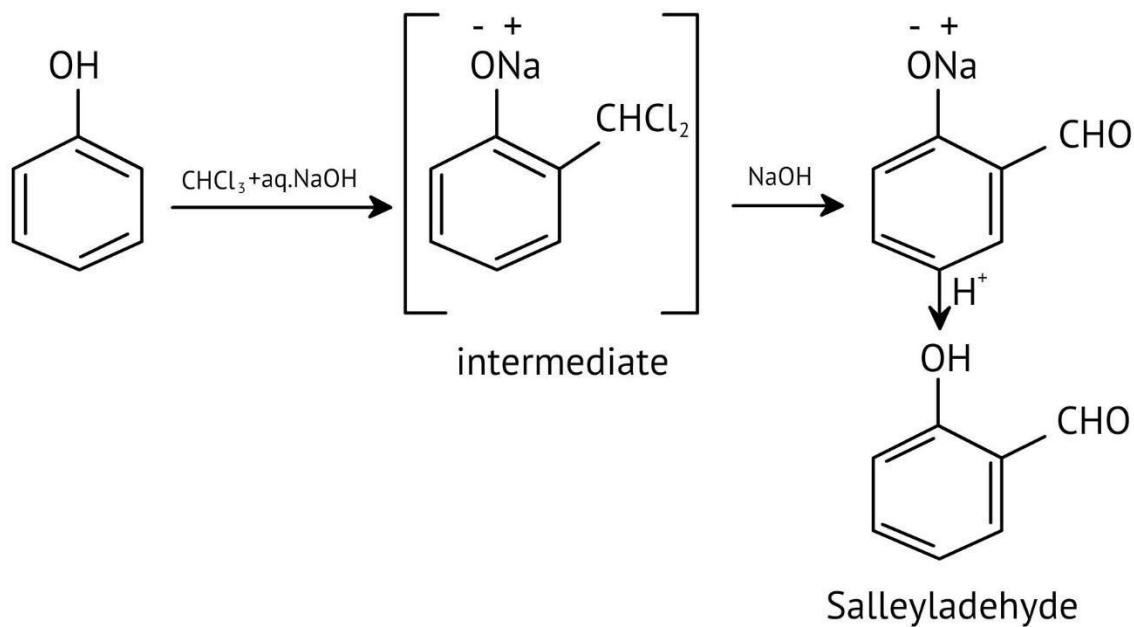
(iii) Dilute HNO₃ with phenol

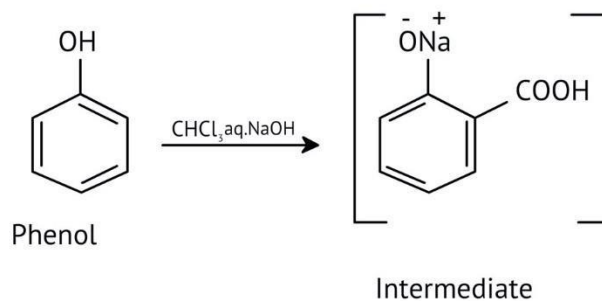
Ans: Here, process of nitration will take place with dilute HNO₃.



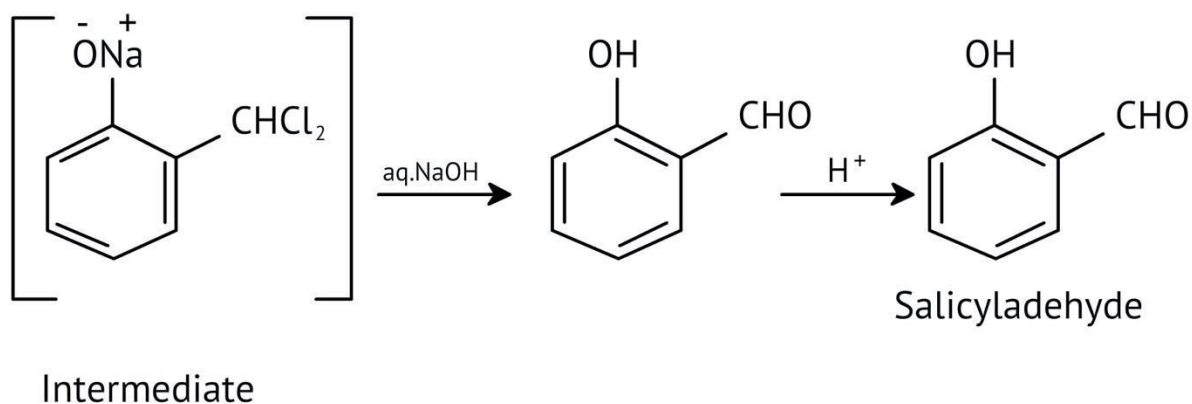
(iv) Treating phenol with chloroform in presence of aqueous NaOH

Ans: Name reaction: Reimer-Tiemann reaction.





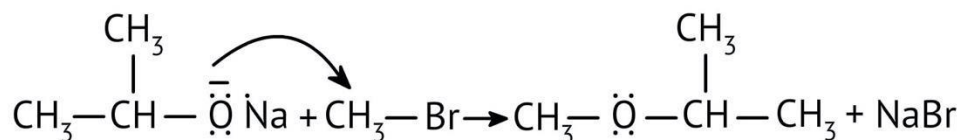
The Reimer-Tiemann reaction is the name for this reaction. In the presence of alkalis, the intermediate is hydrolyzed to create salicylaldehyde.



(iii) Williamson ether synthesis.

Ans: Williamson ether synthesis:

The Williamson ether synthesis method involves permitting alkyl group halides to react with sodium alkoxides within the workplace to yield symmetrical and unsymmetrical ethers. This reaction includes the alkoxide particle offensive the organic compound via SN^2 mechanism. within the case of primary alkyl group halides, higher results are obtained. If the organic compound is secondary or tertiary, substitution prioritises over elimination.



(iv) Unsymmetrical ether

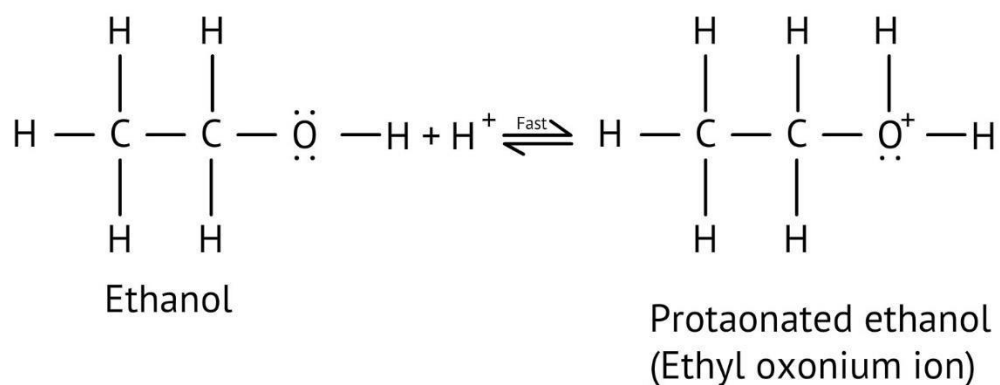
Ans: Unsymmetrical ether:

Unsymmetrical ethers have two groups on opposite sides of an oxygen atom that vary (i.e., have an unequal number of carbon atoms) like ethyl methyl ether $\text{CH}_3\text{OCH}_2\text{CH}_3$.

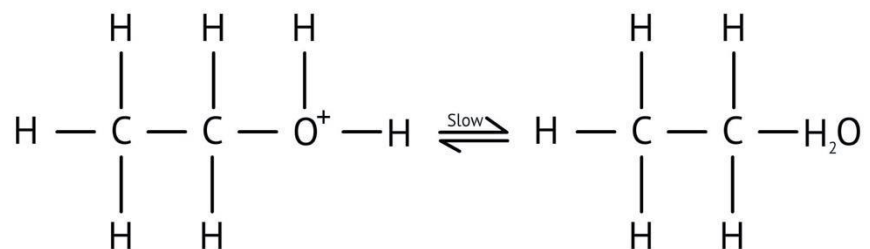
19. Write the mechanism of acid-catalyzed dehydration of ethanol to yield ethene.

Ans: The three processes involved in acid dehydration of ethanol to produce ethene are as follows:

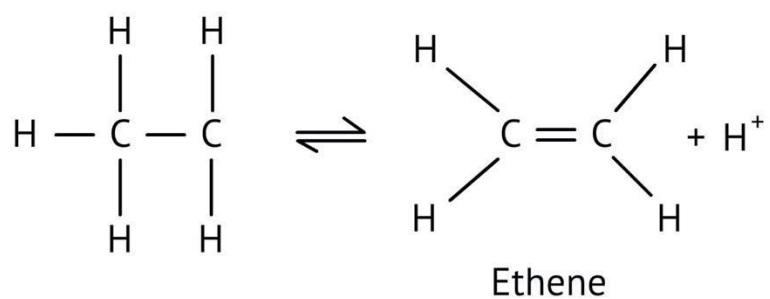
Step 1: Ethanol protonation to generate the ethyl oxonium ion:



Step 2: Carbocation formation (rate determining step)



Step 3: Forming ethene by removing a proton:

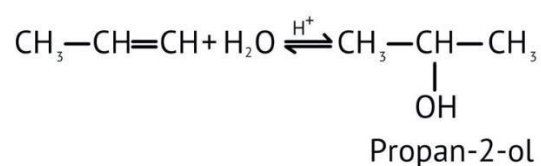


In Step 3, the acid taken in Step 1 is released. Following the creation of ethene, it is eliminated in order to shift the equilibrium forward.

20. How are the following conversions carried out?

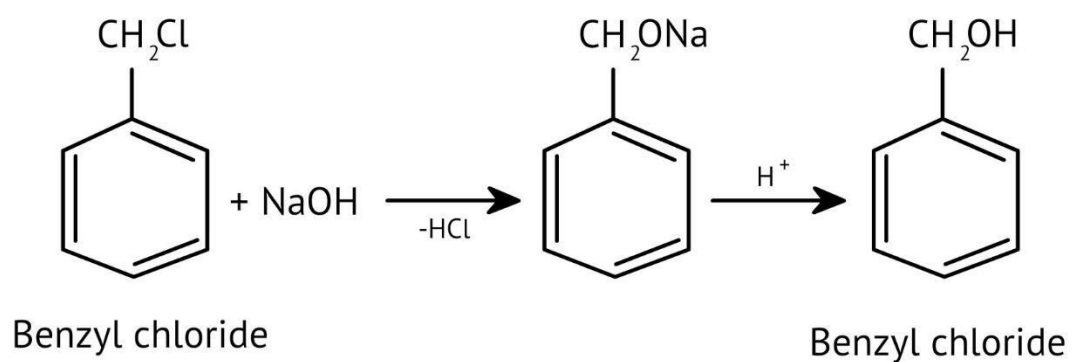
(i) Propene \rightarrow Propan-2-ol

Ans: Propan-2-ol is produced by allowing propene to react with water in the presence of an acid as a catalyst.



(ii) Benzyl chloride \rightarrow Benzyl alcohol

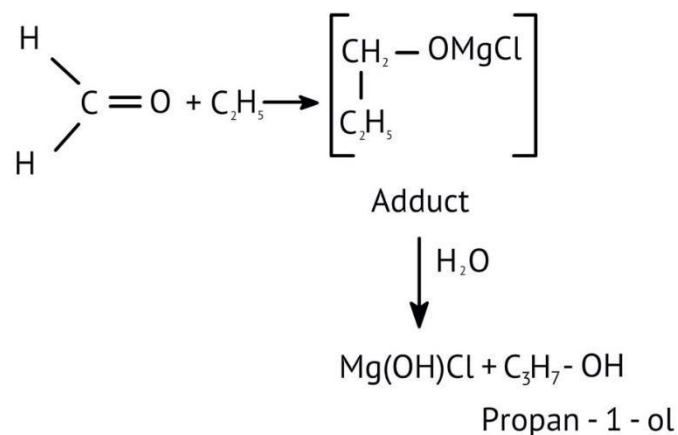
Ans: When benzyl chloride is treated with (and then acidified), benzyl alcohol is formed.



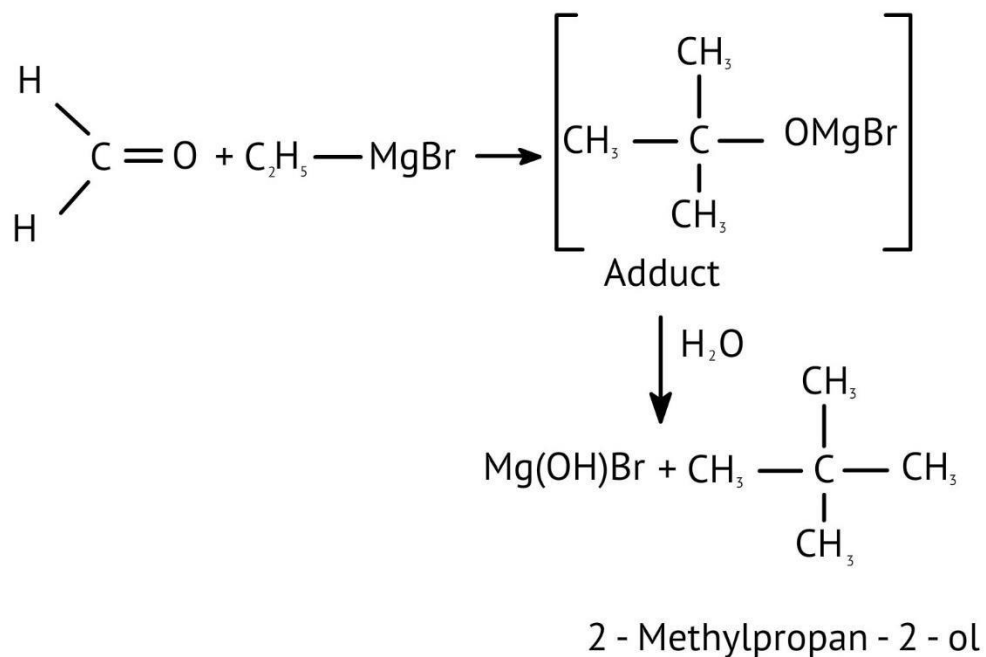
(iii) Ethyl magnesium chloride □ Propan-1-ol

Ans: When ethyl magnesium chloride is treated with methane, an adduct is formed, which when hydrolyzed yields propan-1-ol.

(iv) Methyl magnesium bromide □ 2-Methylpropan-2-ol Ans:



When methyl magnesium bromide is combined with propane, an adduct is formed, which when hydrolyzed yields 2-methylpropan-2-ol.



21. Name the reagents used in the following reactions:

(i) Oxidation of a primary alcohol to carboxylic acid.

Ans: Acidified potassium permanganate

(ii) Oxidation of a primary alcohol to aldehyde.

Ans: Pyridinium chlorochromate (PCC)

(iii) Bromination of phenol to 2,4,6-tribromophenol.

Ans: Bromine water

(iv) Benzyl alcohol to benzoic acid.

Ans: Acidified potassium permanganate

(v) Dehydration of propan-2-ol to propene.

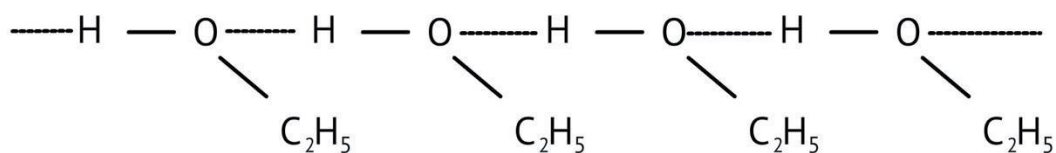
Ans: 85% phosphoric acid at 440 K

(vi) Butan-2-one to butan-2-ol.

Ans: NaBH_4 or LiAlH_4

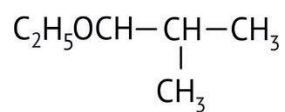
22. Give reason for the higher boiling point of ethanol in comparison to methoxymethane.

Ans: Because of the presence of -OH group, ethanol undergoes intermolecular Hbonding, resulting in molecule attachment. Breaking these hydrogen bonds necessitates more energy. Methoxymethane, on the other hand, does not form Hbonds. As a result, ethanol has a greater boiling point than methoxymethane.



23. Give IUPAC names of the following ethers:

(i)



Ans: 1-Ethoxy-2-methylpropane

(ii) $\text{CH}_3\text{OCH}_2\text{CH}_2\text{Cl}$

Ans: 2-Chloro-1-methoxyethane

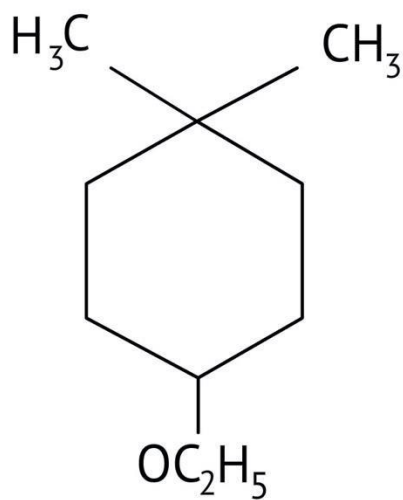
(iii) $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{OCH}_3$

Ans: 4-Nitroanisole

(iv) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_3$

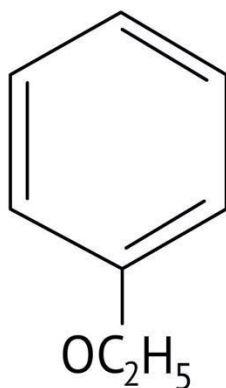
Ans: 1-Methoxypropane

(v)



Ans: 1-Ethoxy-4, 4-dimethylcyclohexane

(vi)



Ans: Ethoxybenzene

24. Write the names of reagents and equations for the preparation of the following ethers by Williamson's synthesis:

(i) 1-Propoxypropane

Ans: 1-Propoxypropane

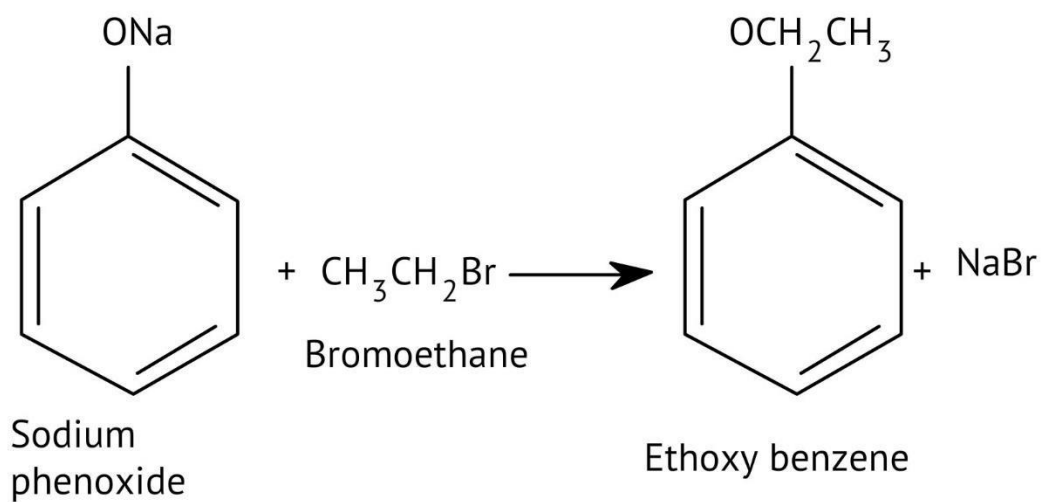


Sodium propoxide

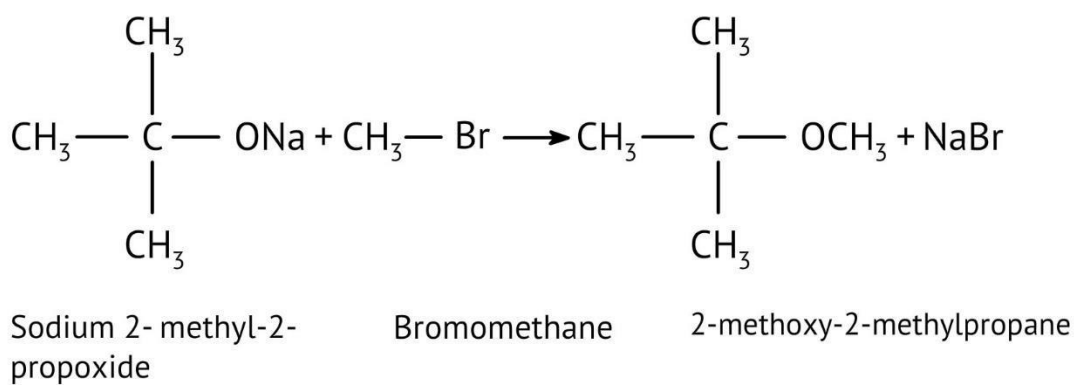
1 - bromopropane

1 - propoxypropane

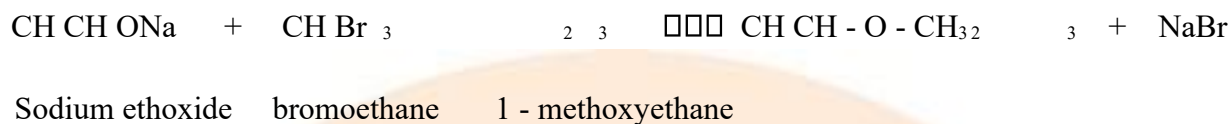
(ii) Ethoxybenzene



(iii) 2 -Methoxy-2-methylpropane



(iv) 1-Methoxyethane



25. Illustrate with examples the limitations of Williamson synthesis for the preparation of certain types of ethers.

Ans: The reaction of Williamson synthesis involves $\text{S}_{\text{N}}2$ attack of an alkoxide ion on a primary alkyl halide.

However, if secondary or tertiary alkyl halides are used instead of primary alkyl halides, substitution will win out over elimination. Alkenes would be generated as a result. This is due to the fact that alkoxides are both nucleophiles and strong bases. As a result, they react with alkyl halides, leading to an elimination reaction.

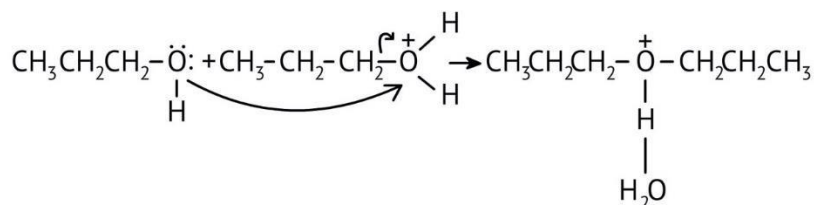
26. How is 1-propoxypropane synthesised from propan-1-ol? Write the mechanism of this reaction.

Ans: Dehydration can be used to make 1-propoxypropane from propan-1-ol. In the presence of protic acids, propan-1-ol dehydrates to yield 1-propoxypropane.

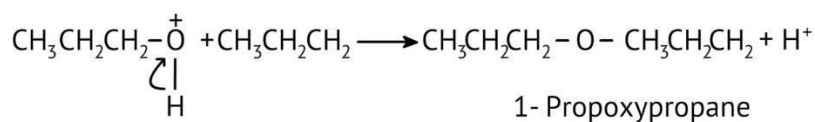
The three steps that make up the mechanism of this reaction are as follows:

Protonation is the first step.

Step two is the nucleophilic action.



Deprotonation is the third step.



27. Preparation of ethers by acid dehydration of secondary or tertiary alcohols is not a suitable method. Give reason.

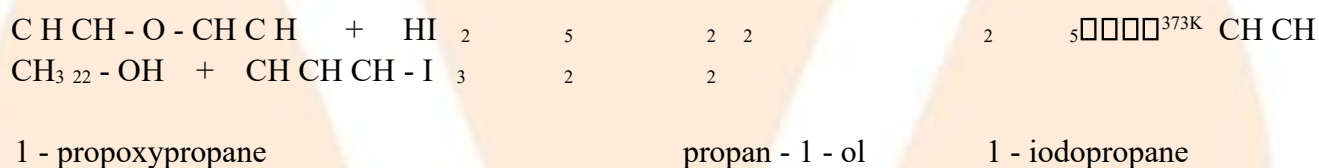
Ans: Dehydration of alcohol results in the creation of ethers, which is a bimolecular process $\text{S}_\text{N}2$ in which an alcohol molecule attacks a protonated alcohol molecule. The alkyl group should be free in the procedure. The alkyl group is inhibited in

secondary or tertiary alcohols. As a result, elimination takes precedence over substitution. As a result, alkenes are produced instead of ethers.

28. Write the equation of the reaction of hydrogen iodide with:

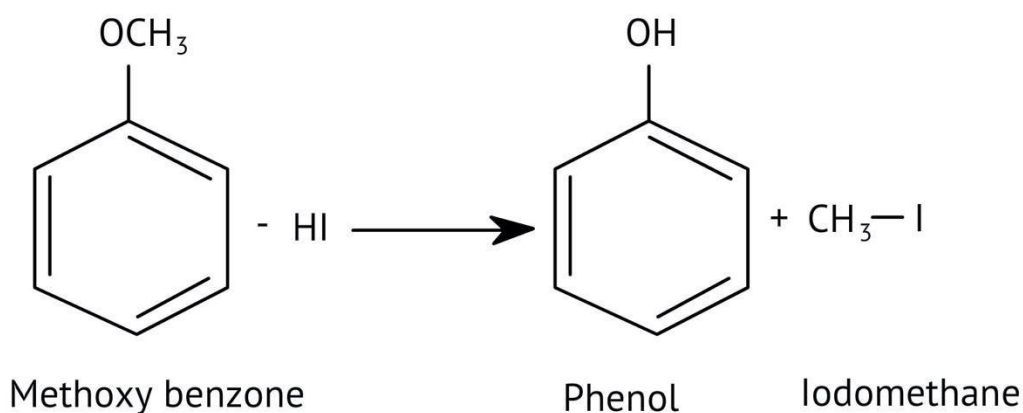
(i) 1-propoxypropane

Ans: 1-propoxypropane



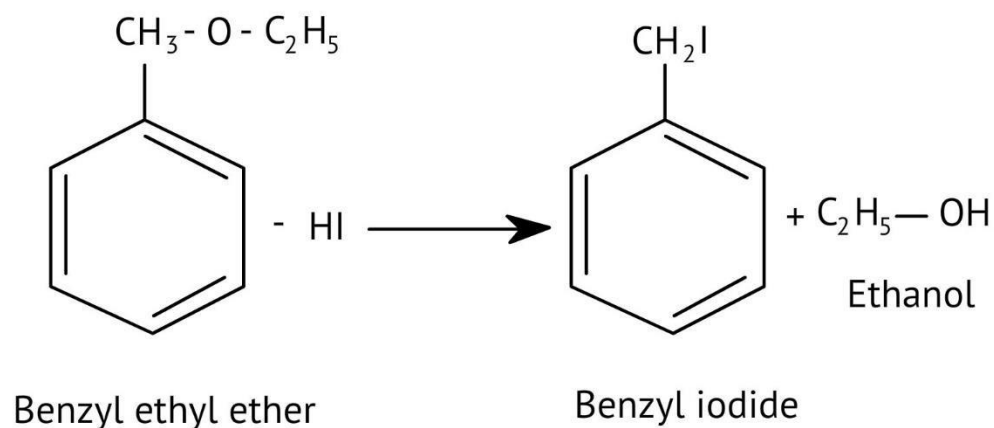
(ii) Methoxybenzene

Ans:



(iii) Benzyl Ethyl Ether

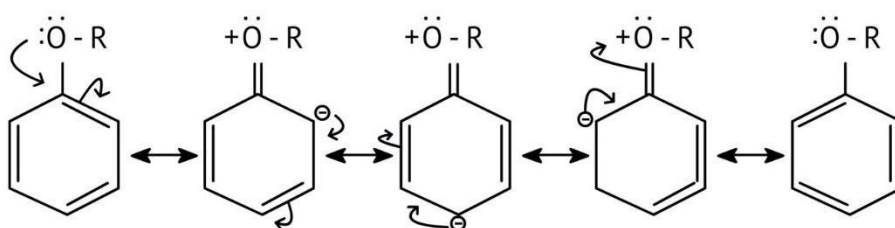
Ans:



29. Explain the fact that in aryl alkyl ethers.

(i) The alkoxy group activates the benzene ring towards electrophilic substitution and

Ans: Aryl alkyl ether in aryl alkyl ethers, the electron density in the benzene ring increases due to the impact of the alkoxy group, as illustrated in the resonance structure below.



The alkoxy group thus activates benzene towards electrophilic substitution.

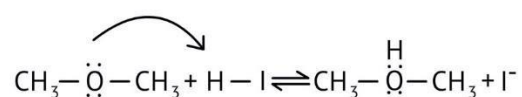
(ii) It directs the incoming substituents to ortho and para positions in benzene ring.

Ans: The electron density grows higher in the ortho and para locations than at the meta position, as can be seen from the resonance structures. As a result, the arriving substituents are directed to the benzene ring's ortho and para locations.

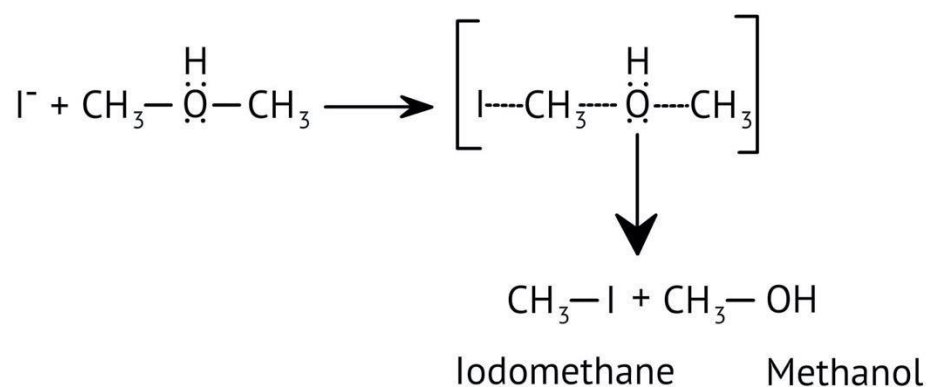
30. Write the mechanism of the reaction of HI with methoxymethane.

Ans: The following steps are involved in the reaction of HI with methoxymethane:

Protonation of methoxymethane is the first step.

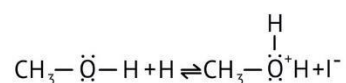


Step two includes I^- . Iodide ion's nucleophilic approach as it is a good nucleophile.



Iodide ion is a good nucleophile. It attacks the least substituted carbon of the oxonium ion formed in step 1 and displaces an alcohol molecule by $\text{S}_{\text{N}}2$ reaction.

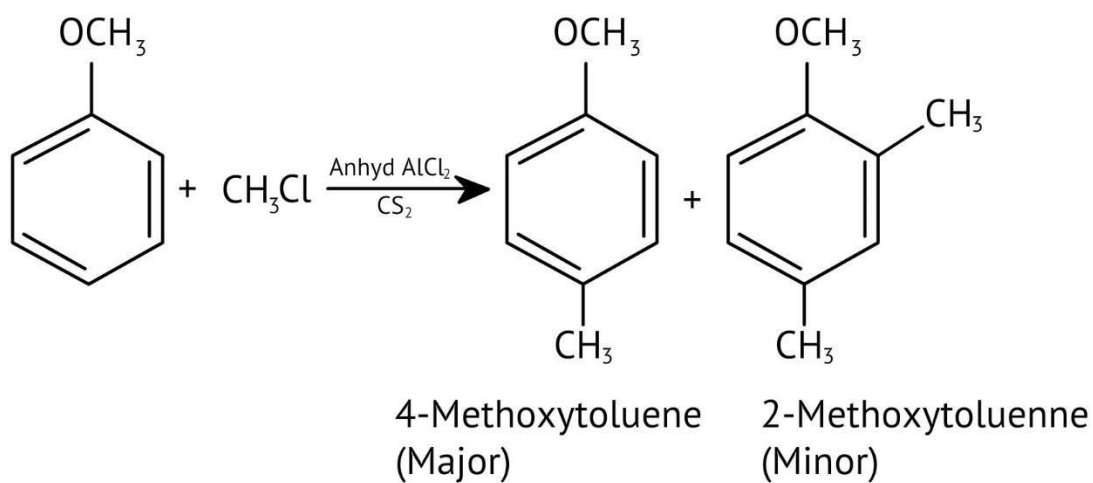
Step three, when there is an excess of HI and the reaction is carried out at a high temperature, the methanol produced in the second step combines with another HI molecule to make methyl iodide.



31. Write equations of the following reactions:

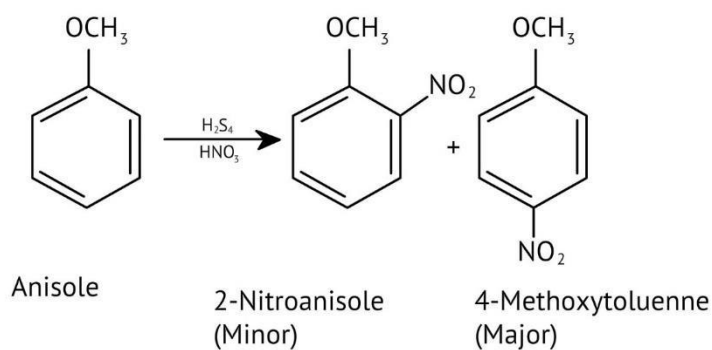
(i) Friedel-Crafts reaction - alkylation of anisole.

Ans:



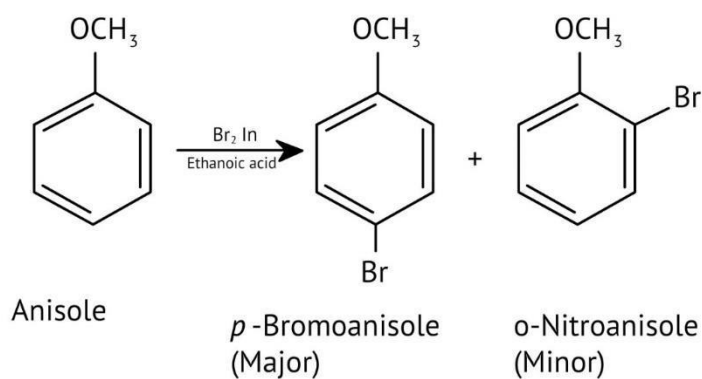
(ii) Nitration of anisole.

Ans:



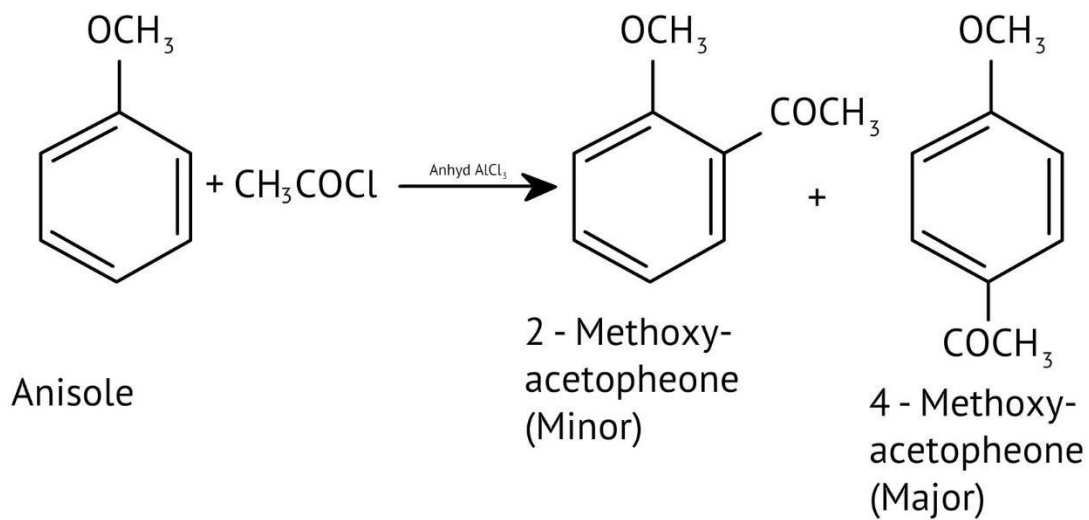
(iii) Bromination of anisole in ethanoic acid medium.

Ans:



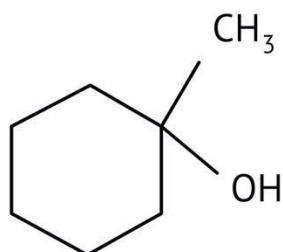
(iv) Friedel-Craft's acetylation of anisole.

Ans:

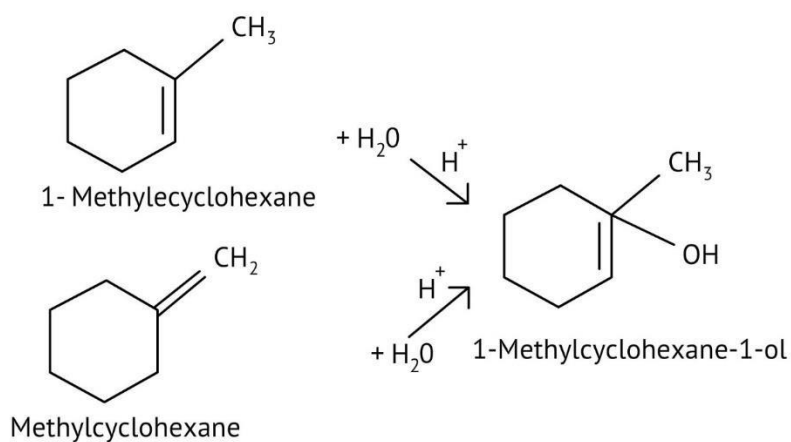


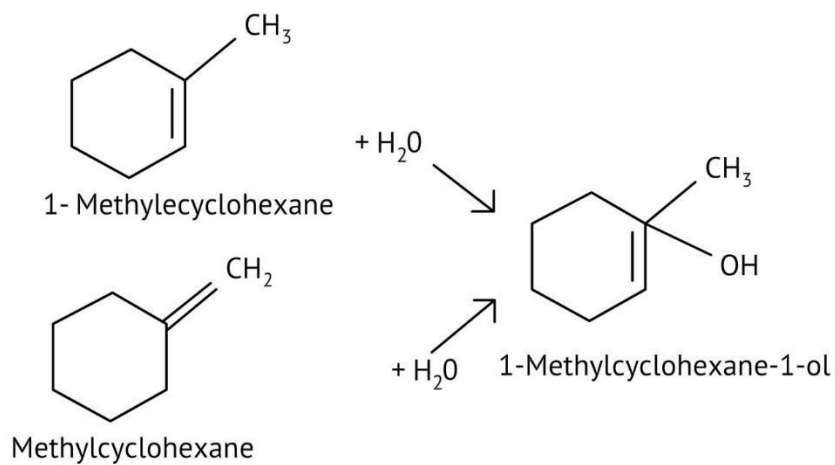
32. Show how would you synthesize the following alcohols from appropriate alkenes?

(i)

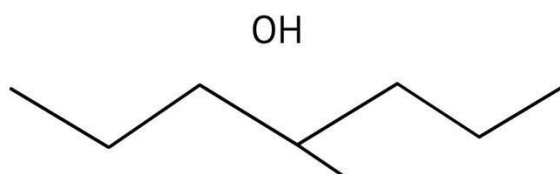


Ans: Markovnikov's rule of acid-catalyzed hydration of appropriate alkenes can be used to synthesis the specified alcohols.

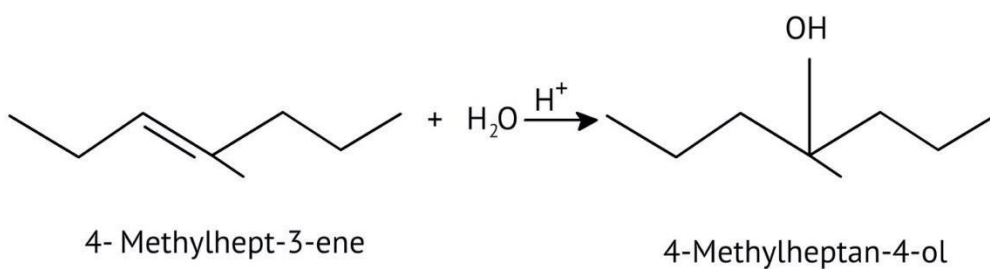




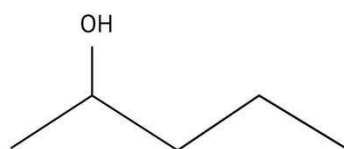
(ii)



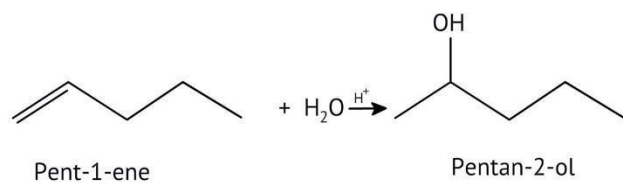
Ans:



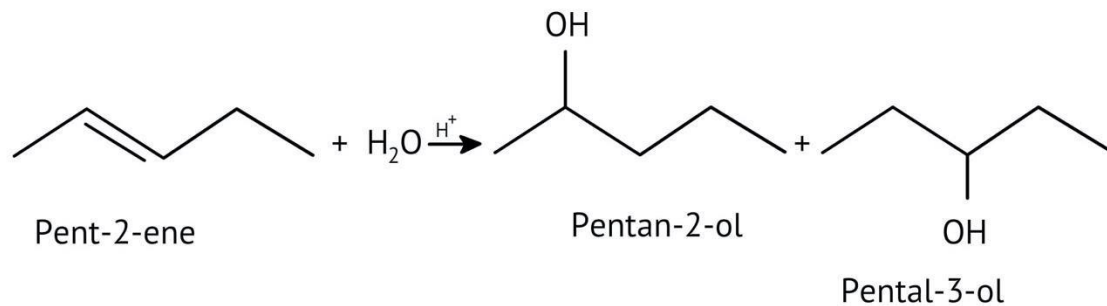
(iii)



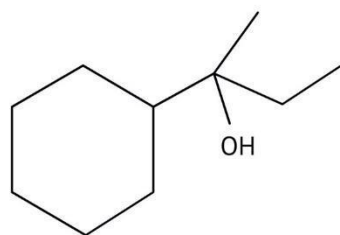
Ans:



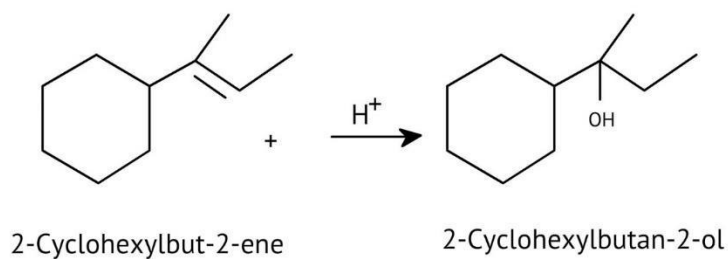
The hydration of pent-2-ene with acid gives pentan-2-ol as well as pentan-3-ol.



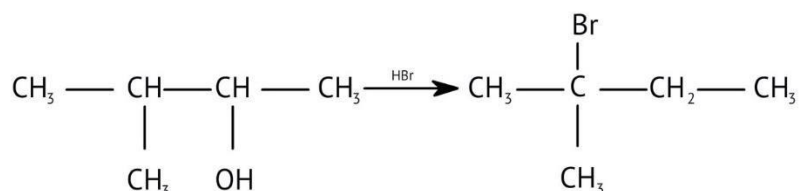
To obtain pentan-2-ol, the first reaction is preferred over the second. (iv)



Ans:



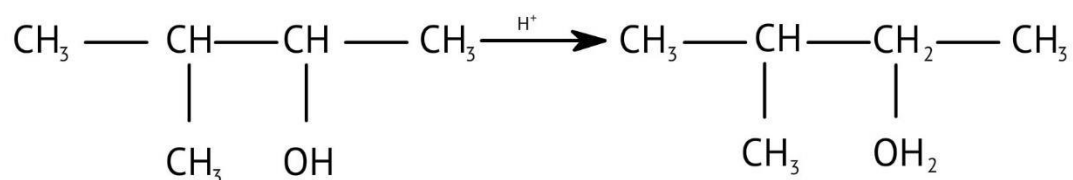
33. When 3 -methylbutan-2-ol is treated with HBr, the following reaction takes place:



Give a mechanism for this reaction. (Hint: The secondary carbocation formed in step II rearranges to a more stable tertiary carbocation by a hydride ion shift from 3rd carbon atom.)

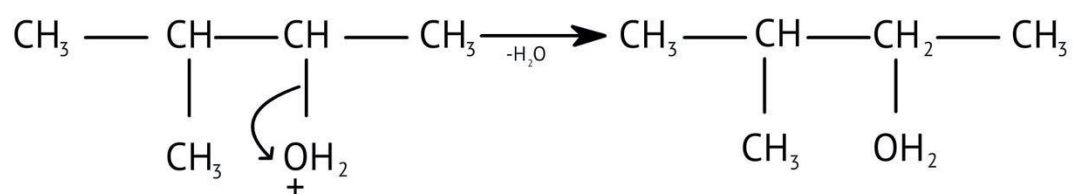
Ans: The following steps make up the mechanism of the given reaction:

Protonation is the first step.



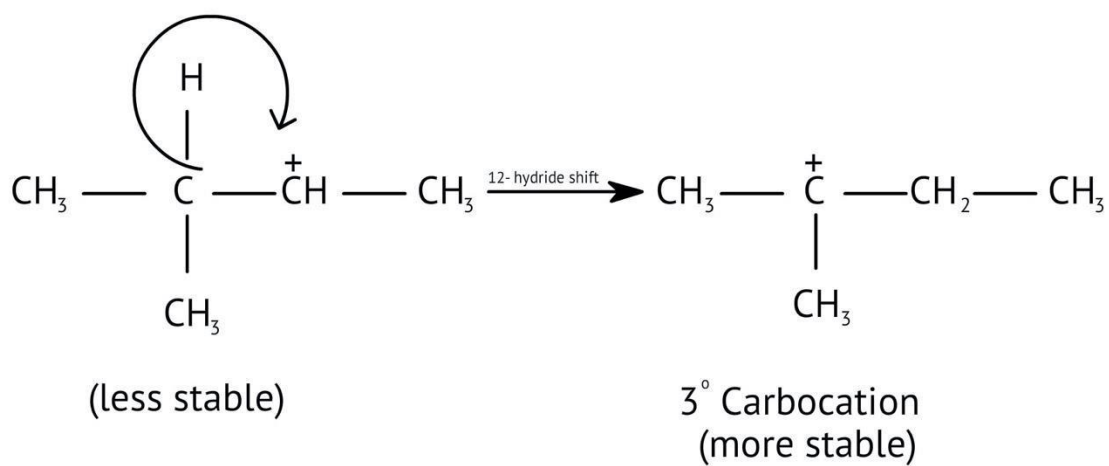
3-Methylbutan-2-ol

Step two carbocation is formed by the removal of a water molecule.

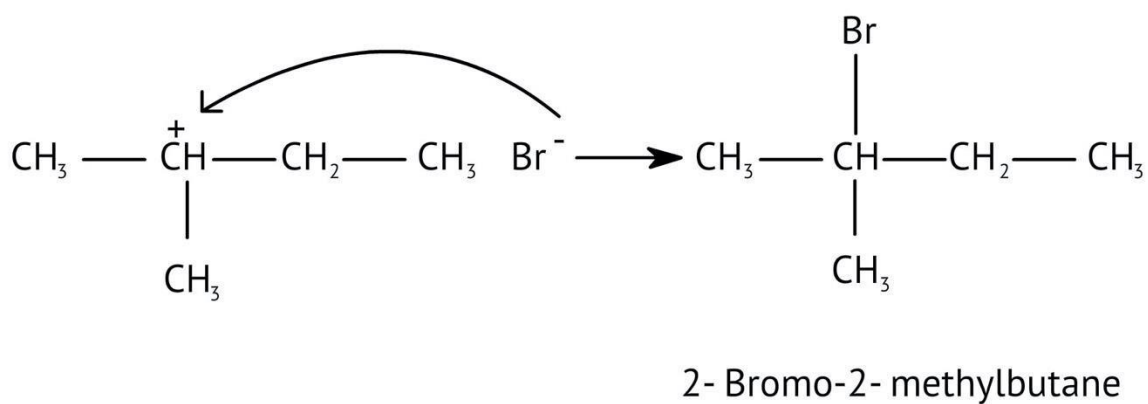


2° Carbocation

Step three includes Hydride-ion shift reorganization



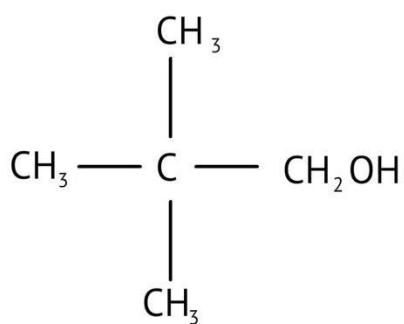
Nucleophilic action is the last step four.



Text Solutions

1. Classify the following as primary, secondary and tertiary alcohols:

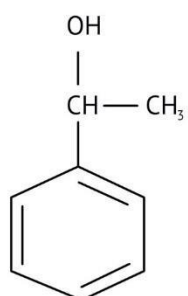
(i)



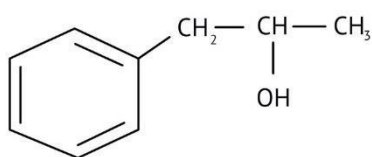
(ii) $\text{H}-\text{C}_2\text{H}_5-\text{CH}-\text{CH}_2-\text{OH}$

(iii) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{OH}$

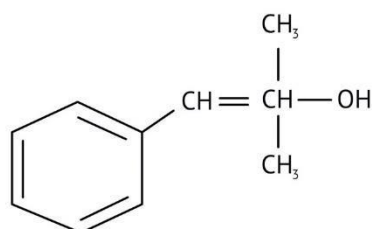
(iv)



(v)



(vi)



Ans: A primary alcohol is an alcohol in which the hydroxy group is linked to a primary carbon atom.

Primary alcohol □ (i), (ii), (iii)

A secondary alcohol is a molecule that has a hydroxy group, OH, attached to a saturated carbon atom that is also linked to two other carbon atoms.

Secondary alcohol □ (iv), (v)

In a tertiary alcohol, a hydroxy group, OH, is linked to a saturated carbon atom that has three more carbon atoms attached to it.

Tertiary alcohol □ (vi)

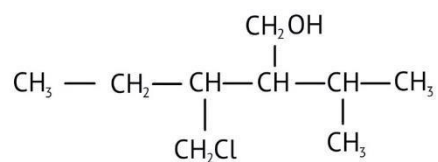
2. Identify allylic alcohols in the above examples.

Ans: In an allylic alcohol, the carbon atom that connects the double bond to the hydroxy group is also linked to one other carbon and one hydrogen.

The alcohols in answer 1 (ii) and (vi) are allylic alcohols.

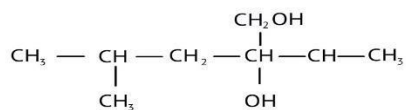
3. Name the following compounds according to IUPAC system.

(i)



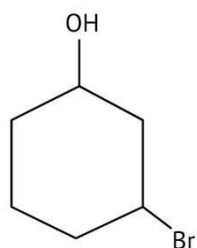
Ans: 3-Chloromethyl-2-isopropyl pentan- 1-ol

(ii)

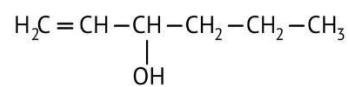


Ans: 2,5 -Dimethylhexane-1, 3 -diol

(iii) 3-Bromocyclohexanol Ans:

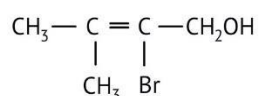


(iv)



Ans: Hex-1-en-3-ol

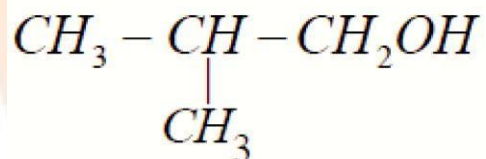
(v)



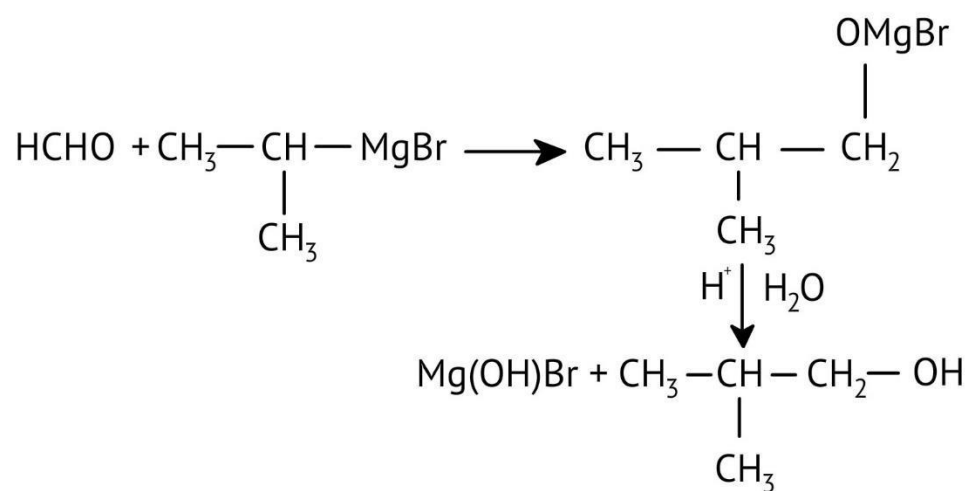
Ans: 2-Bromo-3-methylbut-2-en-1-ol

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

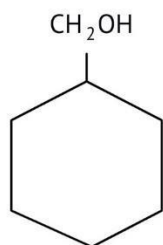
(i)



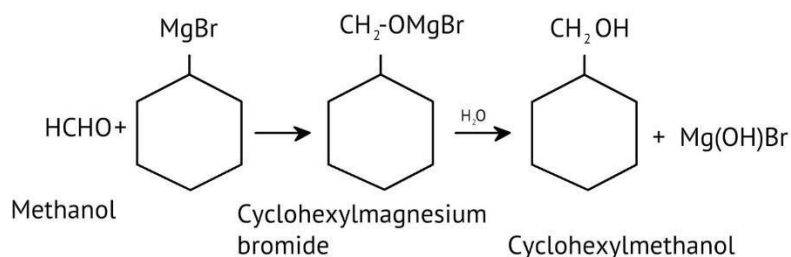
Ans: The given compound; 2-methyl propan-1-ol can be prepared using grignard reagent. The Grignard reaction is an organometallic chemical process in which a carbonyl group in an aldehyde or ketone is substituted with alkyl, allyl, vinyl, or aryl-magnesium halides (Grignard reagent). The creation of carbon-carbon bonds is dependent on this process.



(ii)



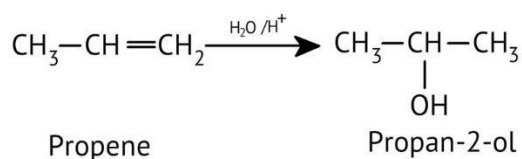
Ans:



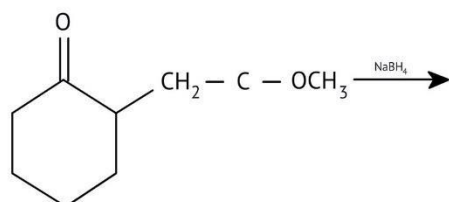
5. Write structures of the products of the following reactions:



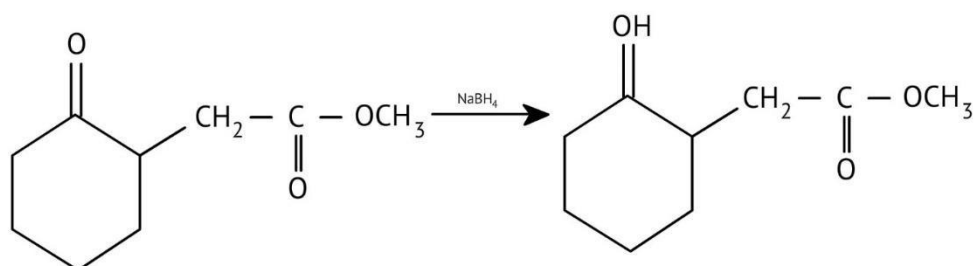
Ans: An Additional reaction is taking place according to the markovnikov's rule. Where, the negative portion of reagent attaches to that double bonded carbon having less number of hydrogen atoms.



(ii)



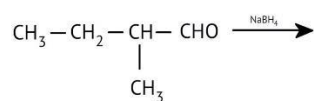
Ans:



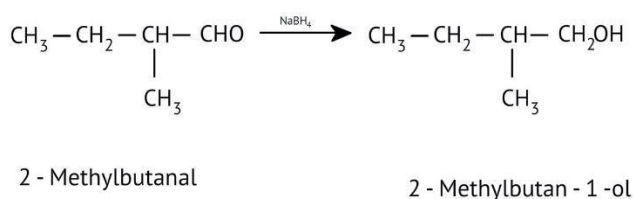
Methyl(2-oxocyclohexyl)
ethanoate

Methyl (2-hydroxycyclohexyl)
ethanoate

(iii)



Ans: oxidation reaction takes place. The aldehyde gets converted to the alcohol product.



6. Give structures of the products you would expect when each of the following alcohol reacts with (a) HCl-ZnCl₂ (b) HBr and (c) SOCl₂.

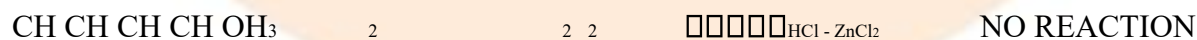
(i) Butan-1-ol

(ii) 2-Methylbutan-2-ol

Ans: (a) HCl-ZnCl₂

(i) Butan-1-ol

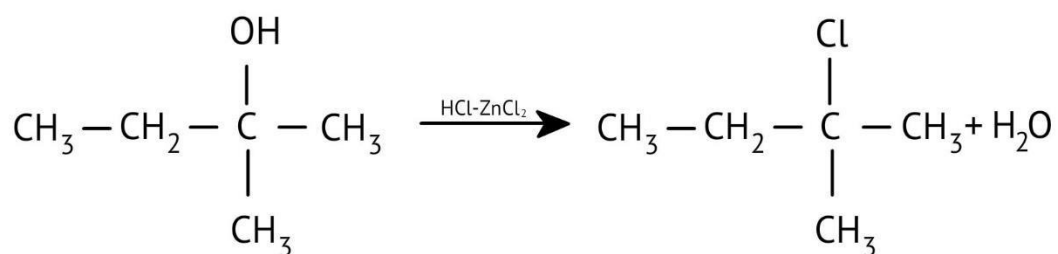
No reaction



At room temperature, primary alcohols have very little reaction with Lucas' reagent.



(ii) 2-Methylbutan-2-ol



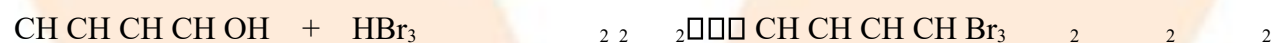
2 - Methylbutan - 2 - ol (3°)

2 - chloro - 2 - Methylbutane
(white turbidity)

The lucas' reagent reacts immediately with tertiary alcohols.

(b) HBr

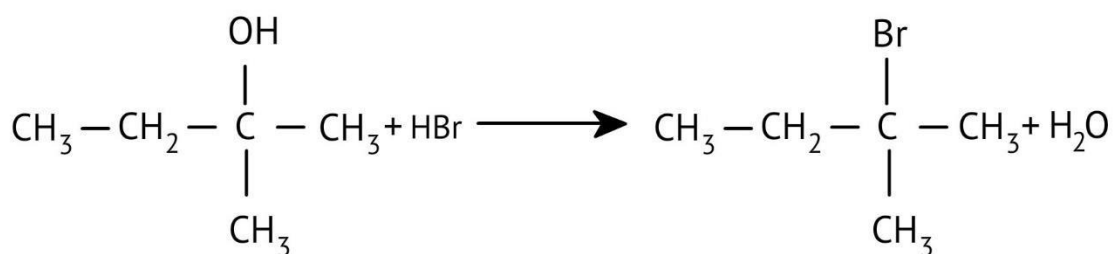
(i) Butan-1-ol



Butanol

Bromobutane

(ii) 2-Methylbutan-2-ol



2 - Methylbutan - 2 - ol (3°)

2 - Bromo - 2 - Methylbutane

(c) SOCl_2

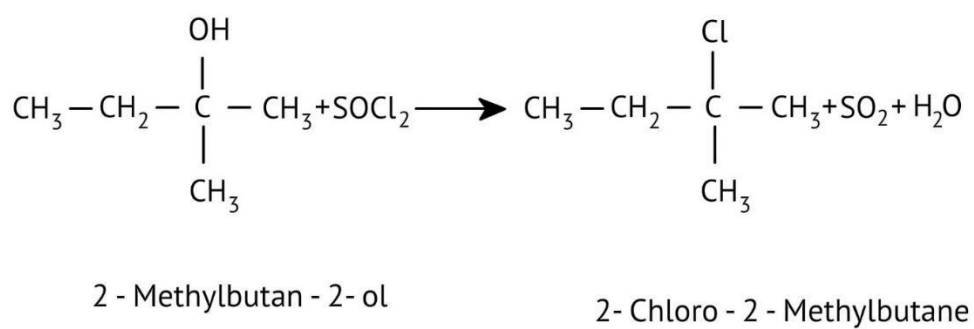
(i) Butan-1-ol



Butanol

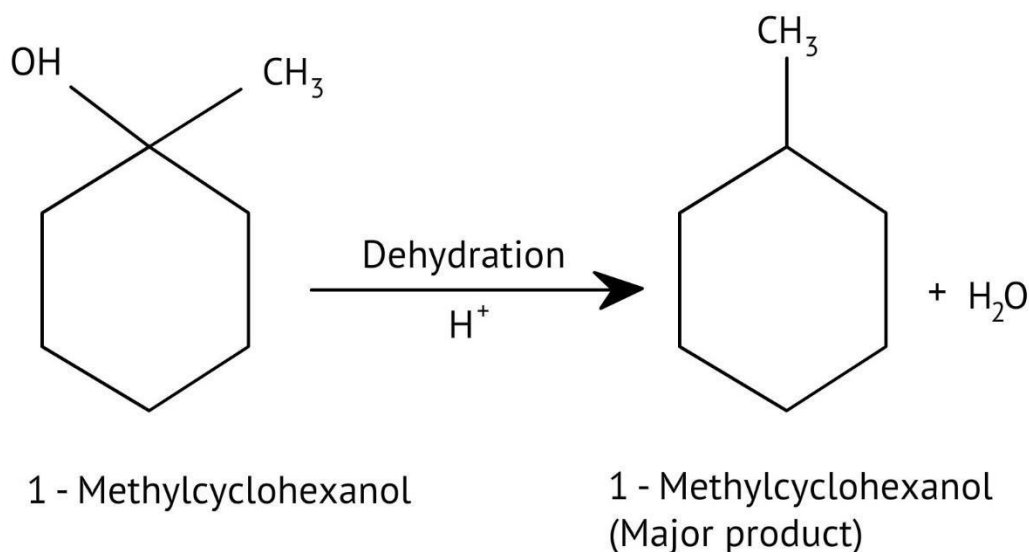
Chlorobutane

(ii) 2-Methylbutan-2-ol



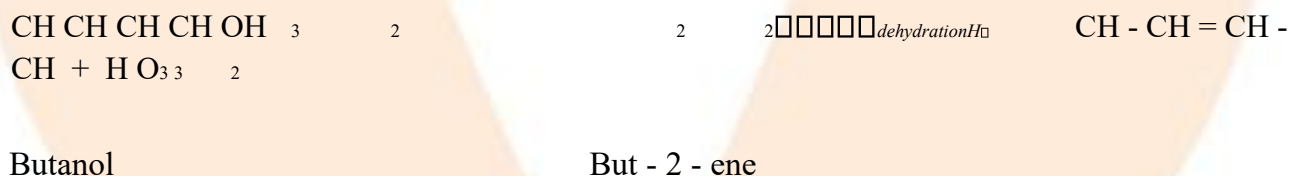
7. Predict the major product of acid catalyzed dehydration of
(i) 1-methylcyclohexanol and

Ans: Elimination reaction takes place.



(ii) butan-1-ol

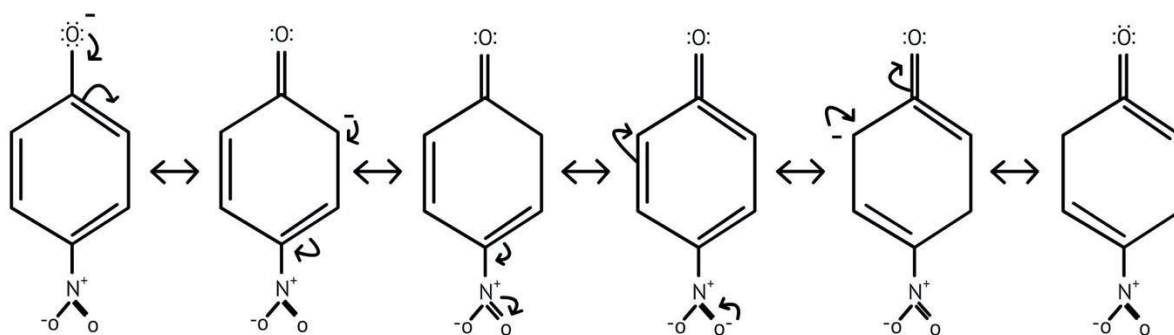
Ans: Elimination reaction takes place.



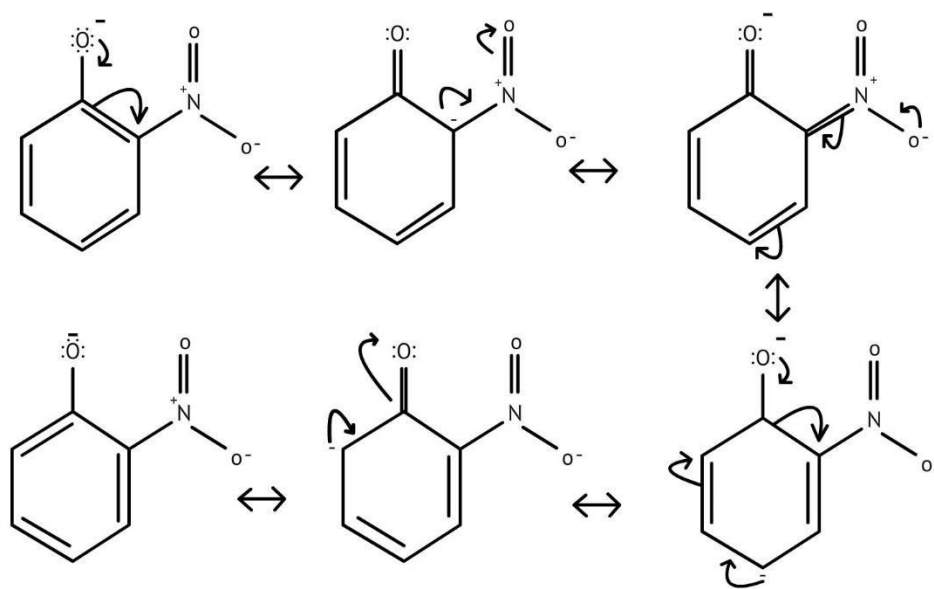
8.Ortho and para nitrophenols are more acidic than phenol. Draw the resonance structures of the corresponding phenoxide ions.

Ans: The inclusion of nitro groups increases the stability of phenoxide ion, as can be seen.

(i) Resonance structure of p-nitrophenoxide ion.



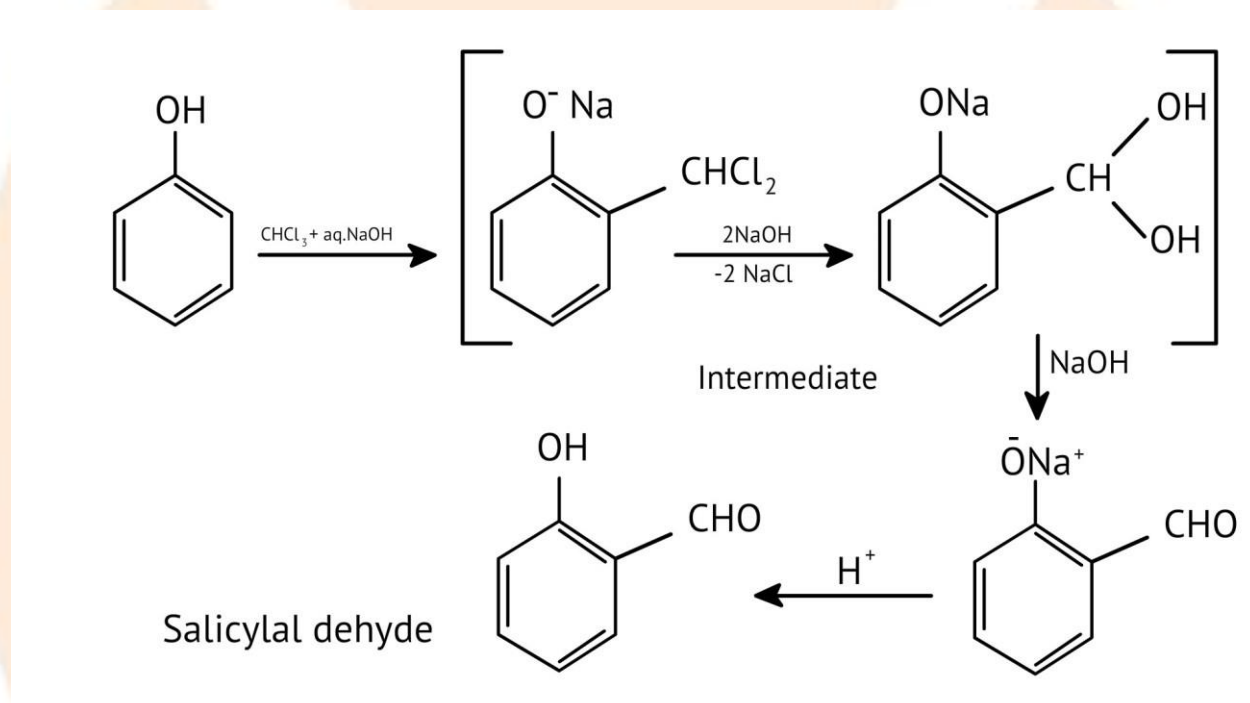
(ii) Resonance structure of o-nitrophenoxide ion.



9. Write the equations involved in the following reactions:

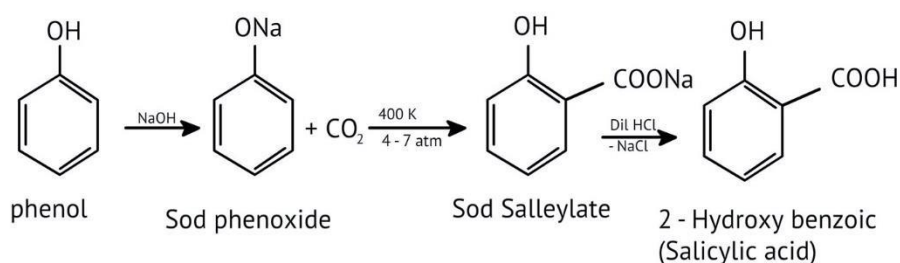
(i) Reimer-Tiemann reaction

Ans: Reimer-Tiemann reaction: The Reimer–Tiemann reaction is a chemical process that converts phenol to salicylaldehyde via ortho-formylation of phenols.



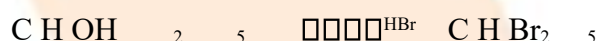
(ii) Kolbe's reaction

Ans: Kolbe's reaction: Salicylic acid is made by boiling a combination of sodium phenoxide and carbon dioxide at $180 - 200^\circ\text{C}$ under pressure.



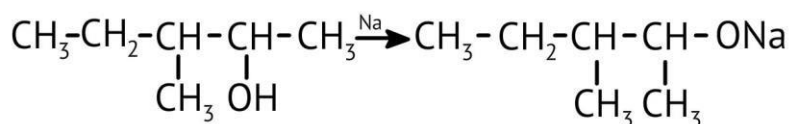
10. Write the reactions of Williamson synthesis of 2 -ethoxy-3-methylpentane starting from ethanol and 3-methylpentan-2-ol

Ans: An alkyl halide reacts with an alkoxide ion in the Williamson synthesis. It's also a $\text{S}_{\text{N}}2$ reaction. Alkyl halides should be used first in the reaction since they have the least steric barrier. As a result, ethanol yields an alkyl halide, while 3-methylpentan-2-ol yields an alkoxide ion.



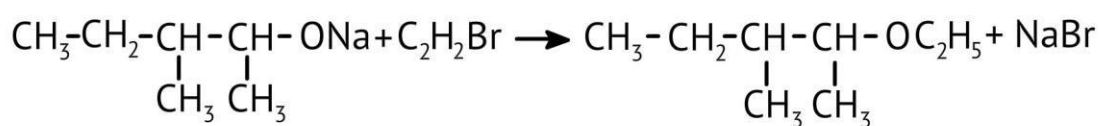
ethanol

Bromoethane



3-Methylpentan-2-ol

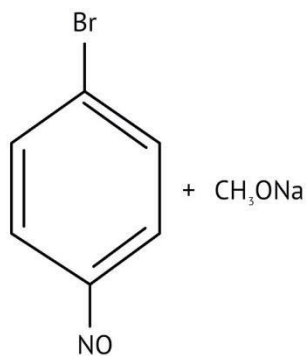
Sodium 3-methylpentan-2-oxide



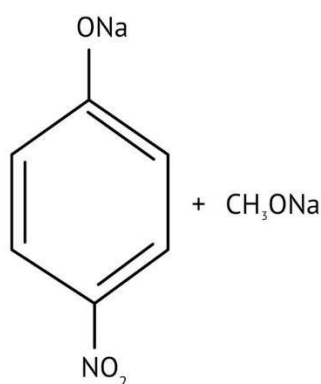
2-Ethoxy-3-methylpentane

11. Which of the following is an appropriate set of reactants for the preparation of 1-methoxy-4-nitrobenzene and why?

(i)



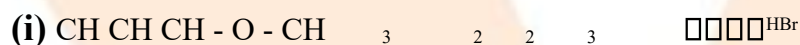
(ii)



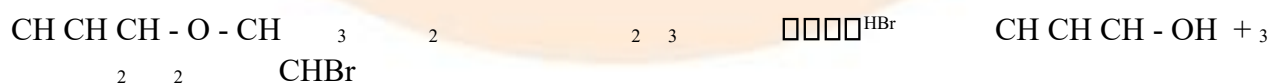
Ans: For the preparation of 1-methoxy-4-nitrobenzene, set (ii) is an appropriate set of reactants.

Methoxy-4-nitrobenzene, Sodium methoxide $\square\text{CH ONa}_3$ is both a strong nucleophile and a strong basic in set (i) As a result, the elimination reaction takes precedence over the substitution reaction.

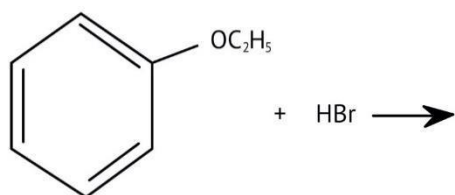
12. Predict the products of the following reactions:



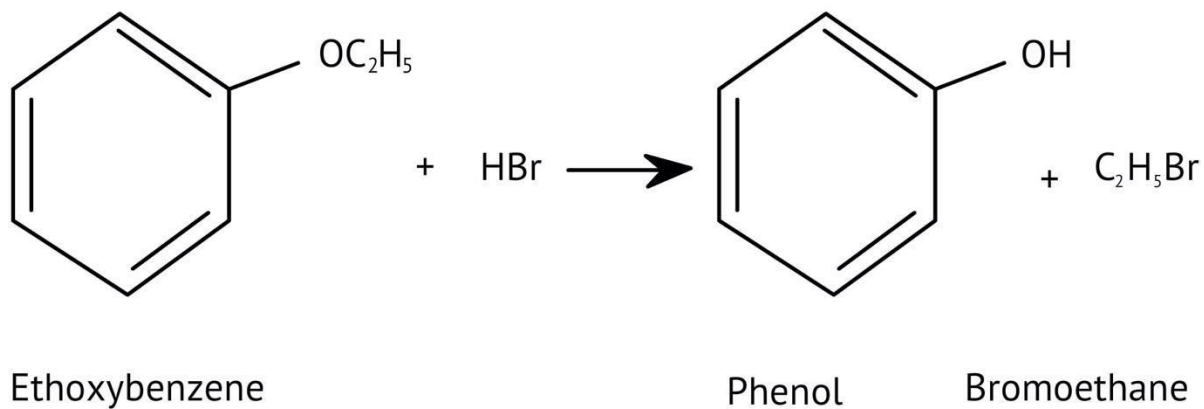
Ans: In a nucleophilic substitution like to that of alcohols, the strong acids HBr cut alkyl ethers. The ethereal oxygen protonation produces a suitable leaving group, a neutral alcohol molecule.



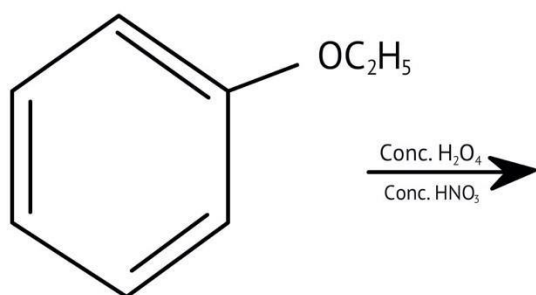
(ii)



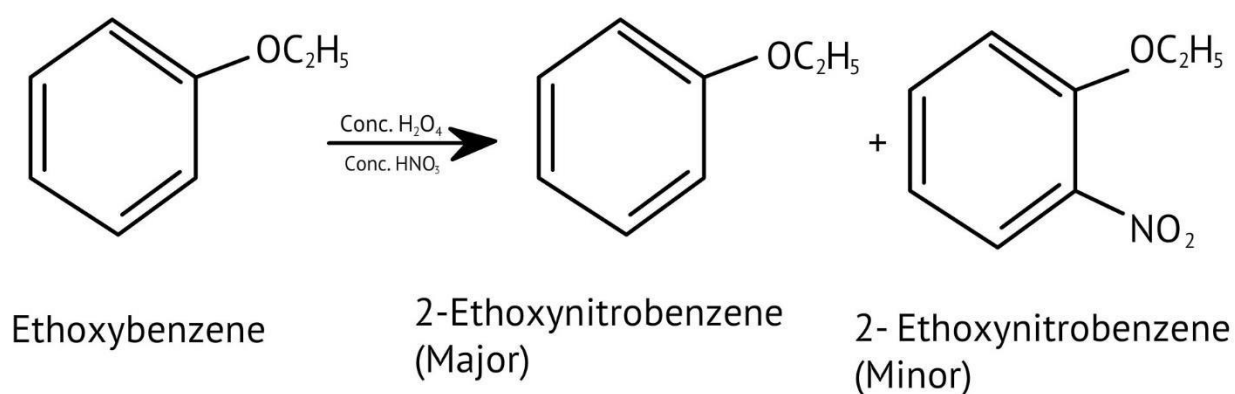
Ans: In a nucleophilic substitution like to that of alcohols, the strong acids HBr cut alkyl ethers. The ethereal oxygen protonation produces a suitable leaving group, a neutral alcohol molecule.



(iii)

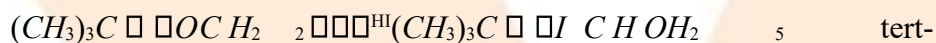


Ans: Nitration reaction will occur. As $-\text{OC}_2\text{H}_5$ is a meta directing group. Therefore, meta substituted products are obtained.



(iv) $(\text{CH}_3)_3\text{C}-\text{O}-\text{CH}_2\text{CH}_3 \xrightarrow{\text{HI}}$

Ans: In a nucleophilic substitution like to that of alcohols, the strong acids HI cut alkyl ethers. The ethereal oxygen protonation produces a suitable leaving group, a neutral alcohol molecule.



Butylethylether tert-Butyliodide ethanol