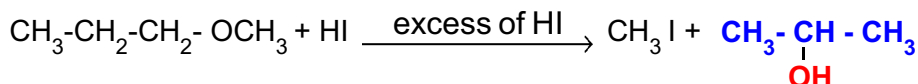


1. Identify the product (s) is / are formed when 1 – methoxy propane is heated with excess HI.
Name the mechanism involved in the reaction

The carbon-oxygen bond in ethers can be cleaved by heating with HI to form an alcohol and an alkyl halide at 373K. In case of unsymmetrical ethers which contain two different alkyl groups, the site of cleavage is such that the halide is formed from the alkyl group which is smaller in size.

Thus the products formed in this case are iodomethane and **Propan-2-ol**



- i) Name the mechanism involved in the reaction - $\text{S}_{\text{N}}1$ reaction.

In the presence of conc. HI I think $(\text{CH}_3)_2\text{CH-OH}$ changes to $(\text{CH}_3)_2\text{CH-I}$. Also since a secondary carbon is present $\text{S}_{\text{N}}1$ mechanism may occur then the products are different (CH_3OH and $(\text{CH}_3)_2\text{CH-I}$).

2. Draw the major product formed when 1-ethoxyprop-1-ene is heated with one equivalent of HI

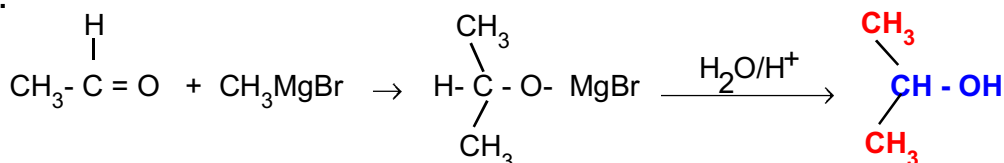
1-Ethoxyprop-1-ene reacts with HI to form iodoethane and prop-1-en-1-ol.



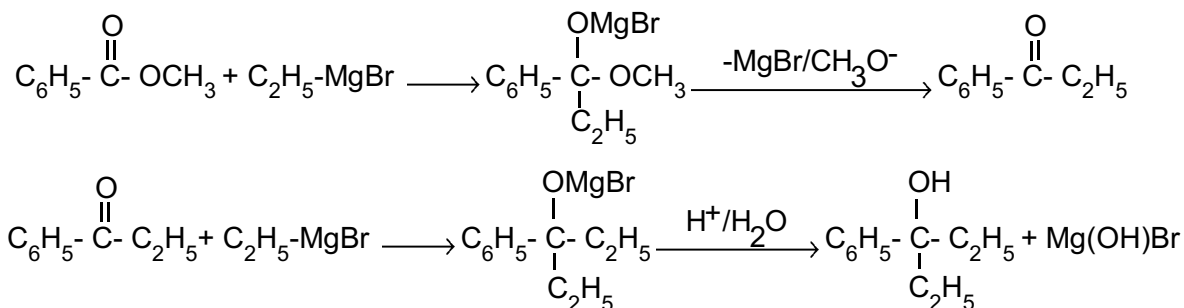
Not easy to break this bond as it is engaged in resonance so



3. Suggest a suitable reagent to prepare secondary alcohol with identical group using Grignard reagent.



4. What is the major product obtained when two moles of ethyl magnesium bromide is treated with methyl benzoate followed by acid hydrolysis.

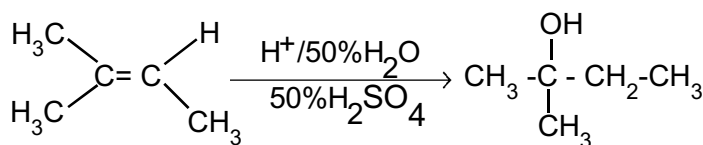


3-phenyl-pentan-3-ol

5. Predict the major product, when 2-methyl but -2-ene is converted into an alcohol in each of the following methods.

(i.) Acid catalysed hydration (ii.) Hydroboration (iii.) Hydroxylation using bayers reagent

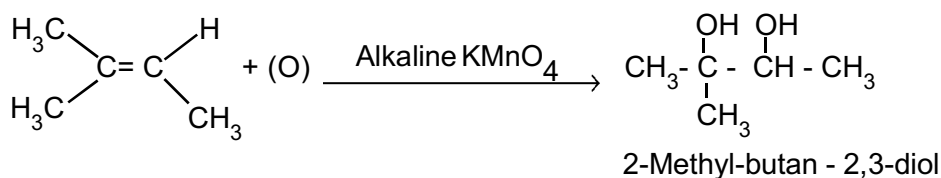
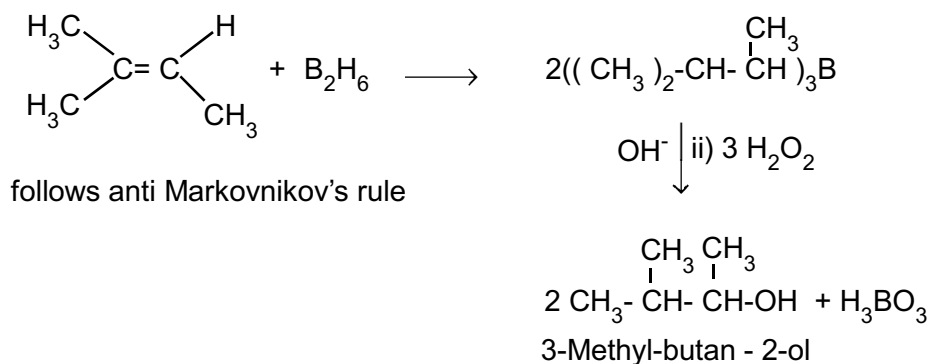
i) 2-methyl but -2-ene is converted into an alcohol in Acid catalysed hydration



follows Markovnikov's rule

2-Methyl-butan - 2-ol

ii) 2-methyl but -2-ene is converted into an alcohol in Hydroboration



iii) 2-methyl but -2-ene is converted into an alcohol in Hydroxylation using bayers reagent

6. Arrange the following in the increasing order of their boiling point and give a reason for your ordering

(i) Butan – 2- ol, Butan -1-ol, 2 –methylpropan -2-ol

(ii) Propan -1-ol, propan -1,2,3-triol, propan -1,3 – diol, propan -2-ol

a) Among isomeric alcohols primary alcohols have higher boiling point and the tertiary alcohols have lower boiling points

b) The boiling points of alcohols and phenols increase with increase in the number of carbon atoms (increase in van der Waals forces). In alcohols, the boiling points decrease with increase of branching in carbon chain (because of decrease in van der Waals forces with decrease in surface area).

i) increasing order of their boiling point

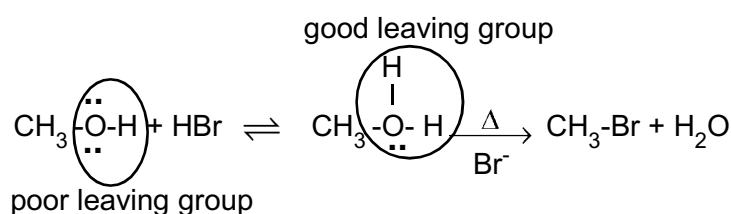
2 –methyl propan -2-ol < Butan – 2- ol < Butan -1-ol

ii) increasing order of their boiling point

propan -2-ol < Propan -1-ol < propan -1,3 – diol < propan -1,2,3-triol

7. Can we use nucleophiles such as NH_3 , CH_3O^- for the Nucleophilic substitution of alcohols

Because the OH group of the alcohol must be protonated before it can be displaced by a nucleophile, only weakly basic nucleophiles (I^- , Br^- , Cl^-) can be used in the substitution reaction. Moderately and strongly basic nucleophiles (NH_3 , RNH_2 , and CH_3O^-) cannot be used because they too would be protonated in the acidic solution and, once protonated, would no longer be nucleophiles ($+\text{NH}_4^+$, RNH_3^+) or would be poor nucleophiles (CH_3OH).

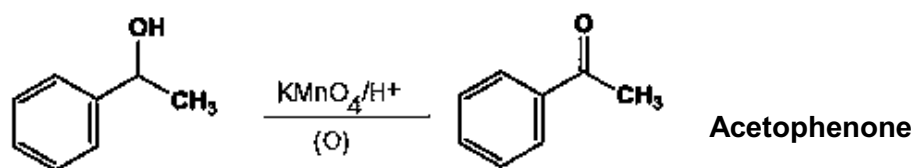


i) Tertiary alcohol does not allow for their oxidation because of **absence α -hydrogen** atom.

ii) This is why tertiary alcohols are said to be resistant to oxidation

But at elevated temperatures it **possible to oxidise**, under strong oxidising agent like acidified $K_2Cr_2O_7 / H^+$ cleavage of C – C bond takes place to give a mixture of carboxylic acid like formic acid and acetic acid

9. What happens when 1-phenyl ethanol is treated with acidified $KMnO_4$.

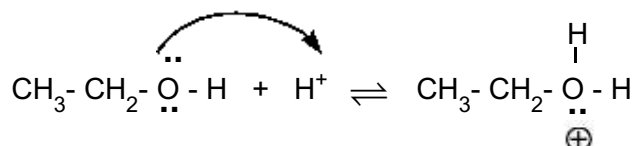


10. Write the mechanism of acid catalysed dehydration of ethanol to give ethene.

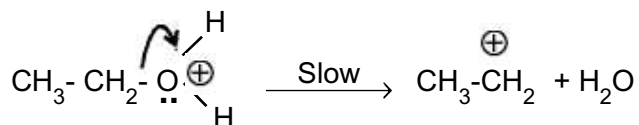
The mechanism of acid dehydration of ethanol to yield ethene involves the following three steps:

Primary alcohols undergo dehydration by E_2 mechanism

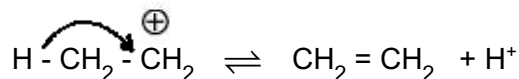
Step 1: Protonation of ethanol to form ethyl oxonium ion:



Step 2: Formation of carbocation (rate determining step):



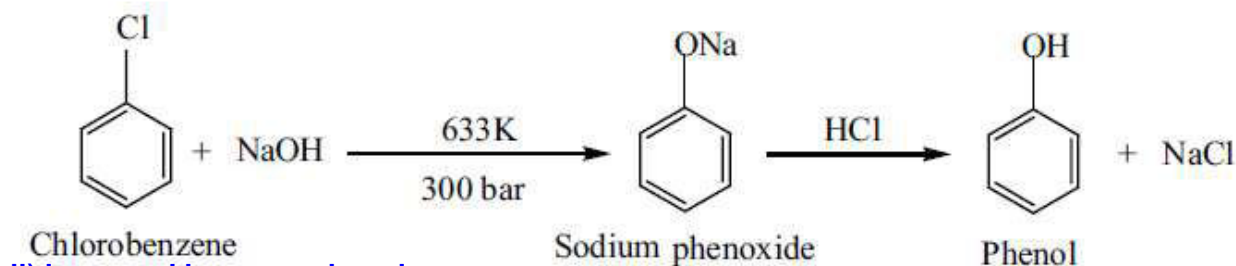
Step 3: Elimination of a proton to form ethene:



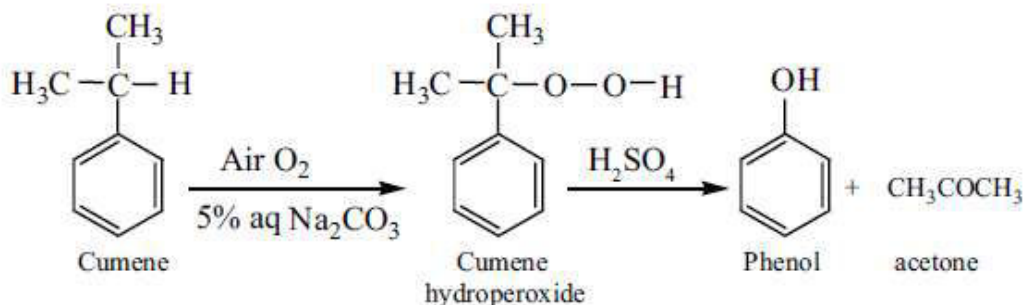
11. How is phenol prepared from

i) chloro benzene ii) isopropyl benzene

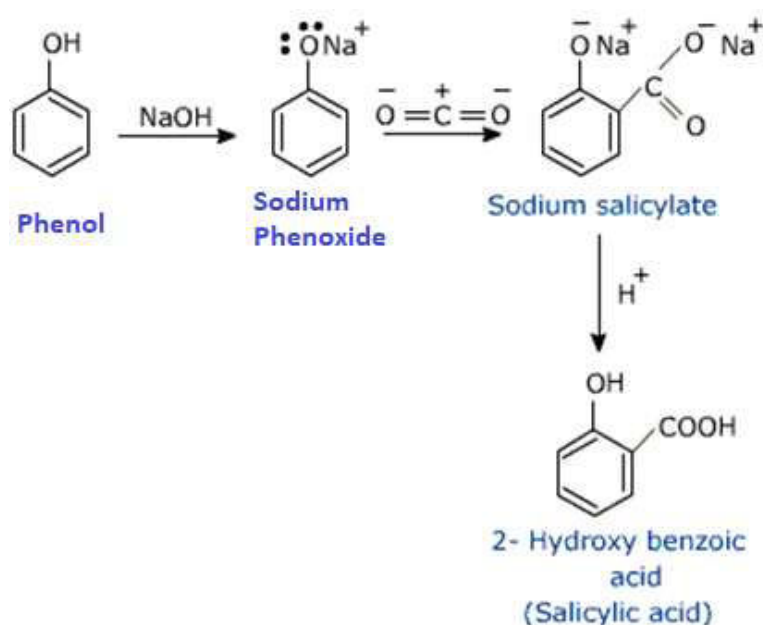
i) chloro benzene to phenol



ii) isopropyl benzene phenol

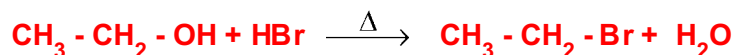


12. Explain Kolbe's reaction

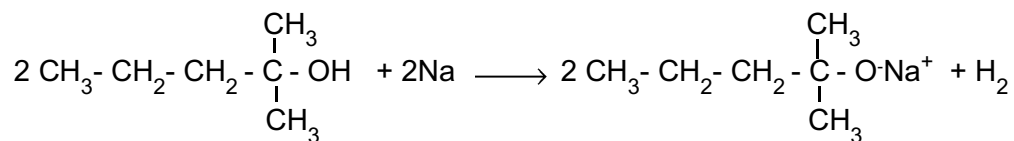


13. Write the chemical equation for Williamson synthesis of 2-ethoxy – 2- methyl pentane starting from ethanol and 2 – methyl pentan -2-ol

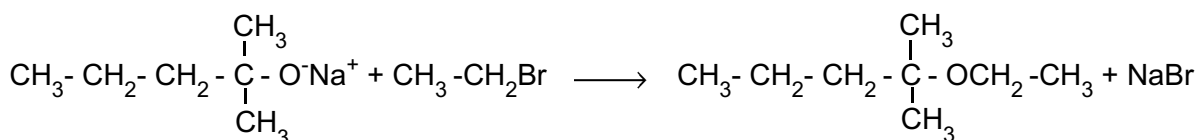
Step 1 : alcohol into alkylhalide



Step 2 : 2 – methyl pentan -2-ol into sodium alkoxide

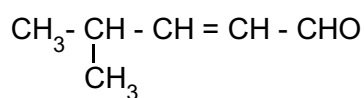


Step 3 : sodium alkoxide into 2-ethoxy – 2- methyl pentane

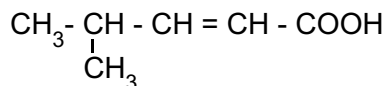


14. Write the structure of the aldehyde, carboxylic acid and ester that yield 4- methylpent-2-en-1-ol.

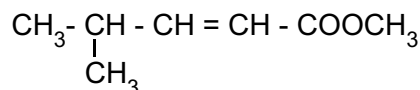
i) aldehyde yield 4- methylpent-2-en-1-ol



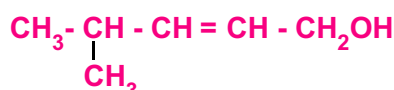
ii) carboxylic acid yield 4- methylpent-2-en-1-ol



iii) ester yield 4- methylpent-2-en-1-ol



aldehyde, carboxylic acid and ester undergoes reduction that yield 4- methylpent-2-en-1-ol



15. What is metamerism? Give the structure and IUPAC name of metamers of 2-methoxy propane**Metamerism :**

It is a special isomerism in which molecules with same formula, same functional group, differing only in the nature of the alkyl group attached to oxygen.

For example an ether having molecular formula $C_4H_{10}O$ exhibits following **metamers**

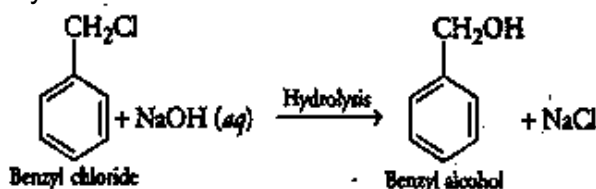
	Common Name	IUPAC name
$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{O}-\text{CH}-\text{CH}_3 \end{array}$	Methyl isopropyl ether	2- methoxy propane
$\text{CH}_3\text{CH}_2-\text{O}-\text{CH}_2\text{CH}_3$	diethyl ether	ethoxy ethane
$\text{CH}_3-\text{O}-\text{CH}_2\text{CH}_2\text{CH}_3$	methyl propyl ether	1 - methoxy propane

Ethoxy ethane and 1 - methoxy propane are metamers 2- methoxy propane

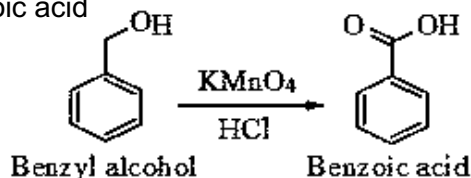
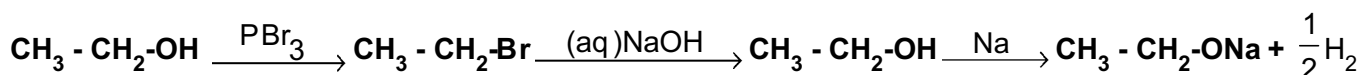
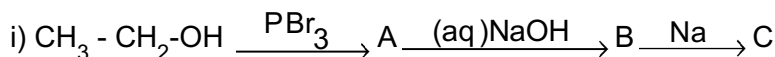
16. How are the following conversions effected

i) benzylchloride to benzylalcohol ii) benzyl alcohol to benzoic acid

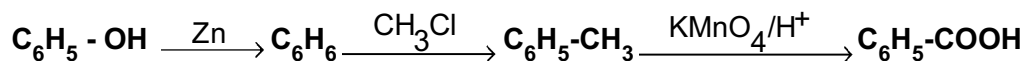
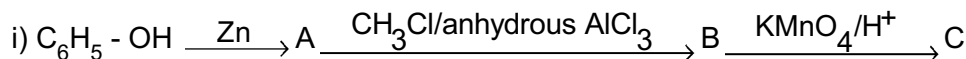
i) benzylchloride to benzylalcohol :



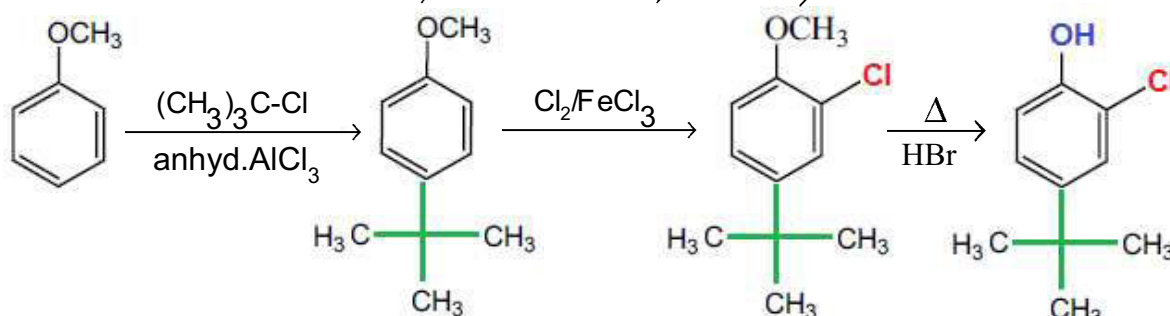
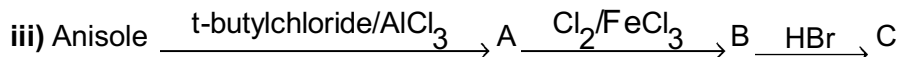
ii) benzyl alcohol to benzoic acid

**17. Complete the following reactions**

A - ethyl bromide B - ethanol C - Sodium ethoxide



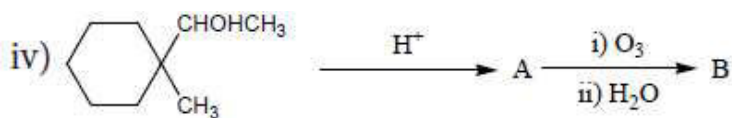
A - benzene B - Toluene C - Benzoic acid



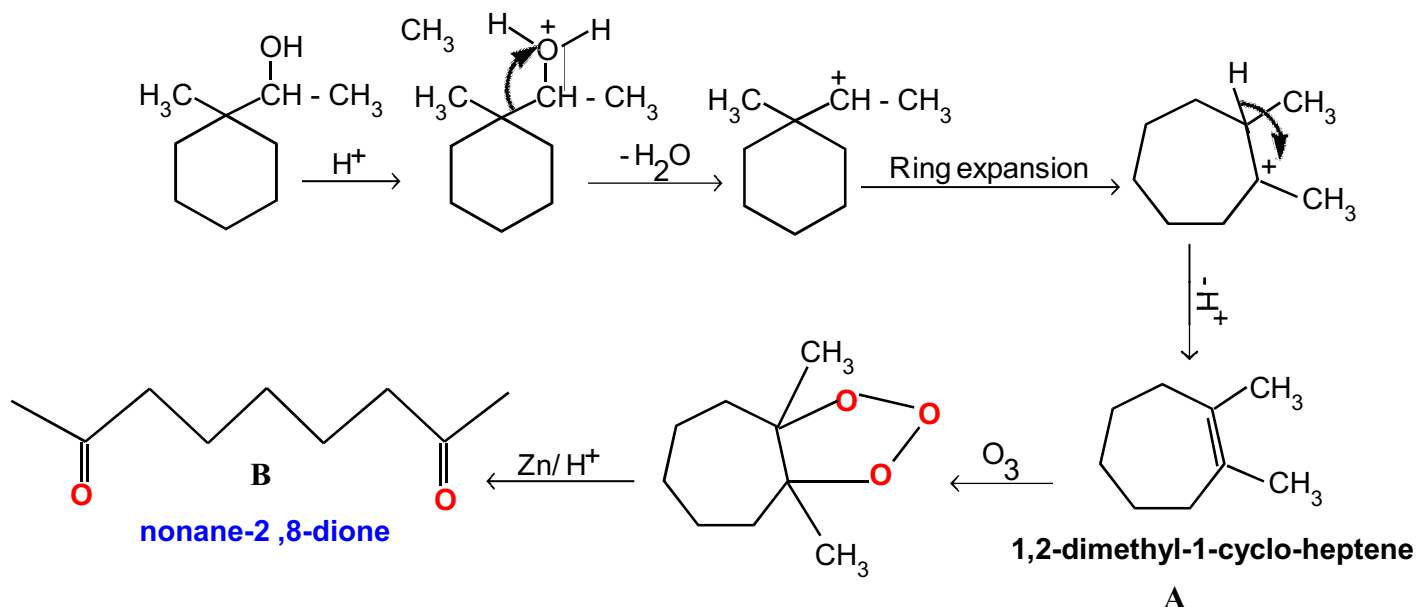
A - 4-tert-butyl-1-anisole

B - 2-chloro-4-tert-butyl-1-anisole

C - 2-chloro-4-tert-butyl-1-phenol



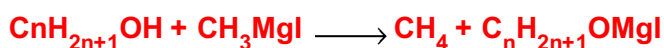
1-(1-methyl-cyclohexyl)-ethanol to nonane-2,8 -dione



18. 0.44g of a monohydric alcohol when added to methyl magnesium iodide in ether liberates at STP 112 cm^3 of methane with PCC the same alcohol form a carbonyl compound that answers silver mirror test. Identify the compound.



Monohydric alcohol means a alcohol which contains one hydroxyl group. PCC is an oxidising agent which convert alcohols to aldehyde or ketones. Aldehydes show silver mirror test not ketones. So, aldehyde is formed and primary alcohols give aldehyde on oxidation. Secondary alcohols give ketones. Consider the formula of monohydric alcohol is $\text{C}_n\text{H}_{2n+1}\text{OH}$. Alcohols react with grignard reagent form alkyl magnesium halide with the evolution of alkane.



112 cm^3 of methane is produced from 0.44 g of alcohol

$$22400 \text{ cm}^3 \text{ of methane is produced from } = \frac{22400 \times 0.44}{112} = 88 \text{ g}$$

This is the molar mass of alcohol as 1 mole of alcohol which is equivalent to molar mass produces 22400 cm^3 of gas at STP.

Molar mass of alcohol = 81 g

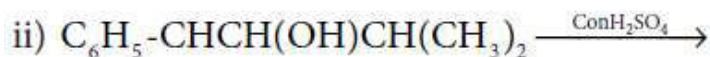
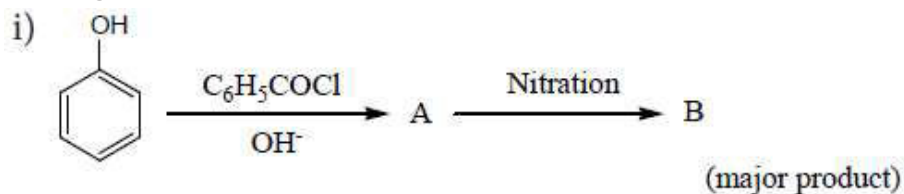
Subtract the mass of hydroxyl group from it = $88 - (16 + 1) = 71 \text{ g}$

$$\text{C}_n\text{H}_{2n+1} = 71 \text{ g}$$

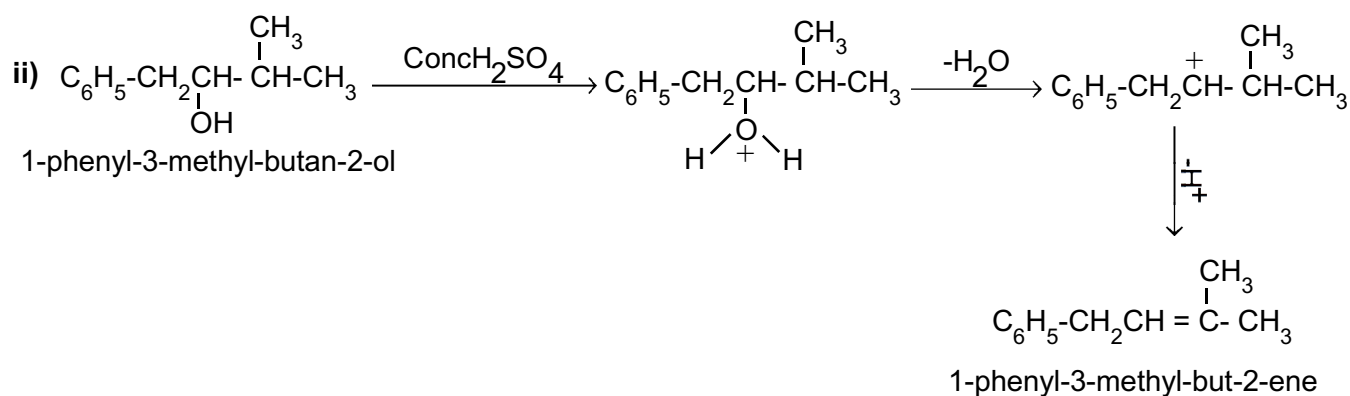
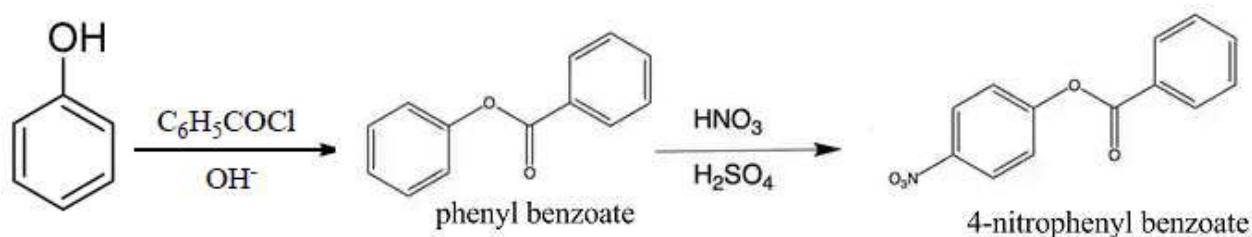
Number of carbon can be possible with this molar mass is 5 which comprises mass 60 g and the rest mass is the mass of hydrogen.

So, the formula of alcohol is $\text{C}_5\text{H}_{11}\text{OH}$.

19. Complete the following reactions

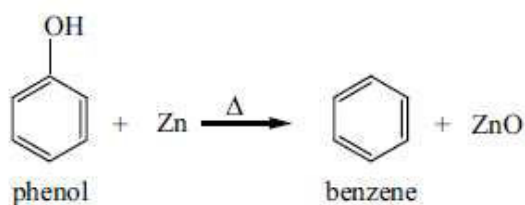


- i) Phenol on treatment with acid chlorides gives esters. The acetylation and benzylation of phenol are called **Schotten-Baumann reaction**.



20. Phenol is distilled with Zn dust followed by Friedel-Crafts alkylation with propyl chloride to give a compound B, B on oxidation gives (c) Identify A, B and C.

i) Phenol to benzene

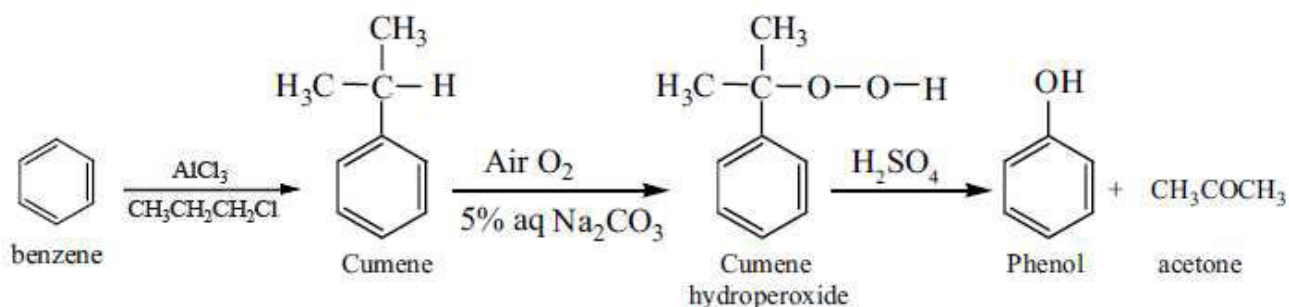


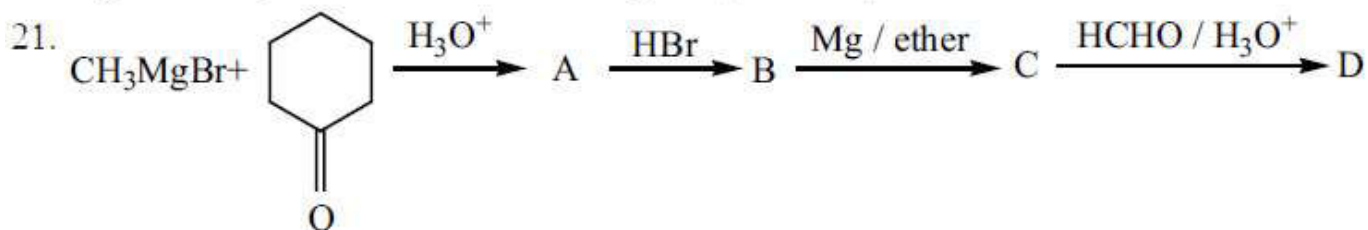
A- benzene

B- Cumene

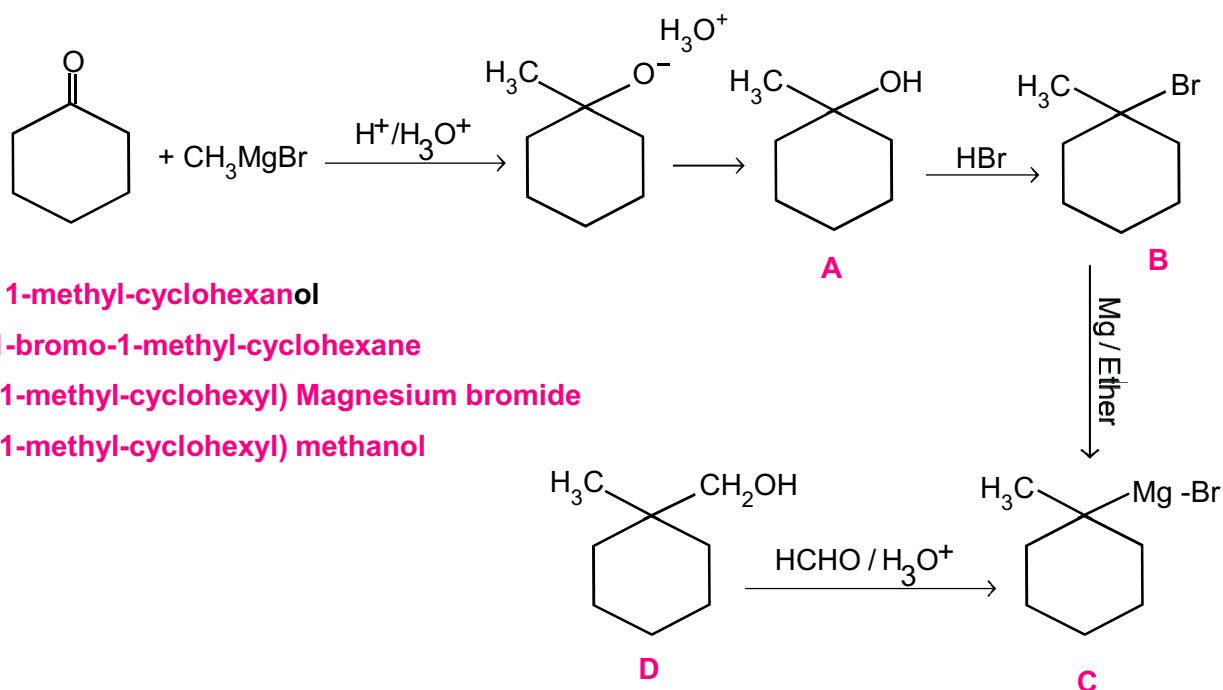
C- Cumene hydro peroxide

ii) benzene to phenol





Identify A,B,C,D and write the complete equation



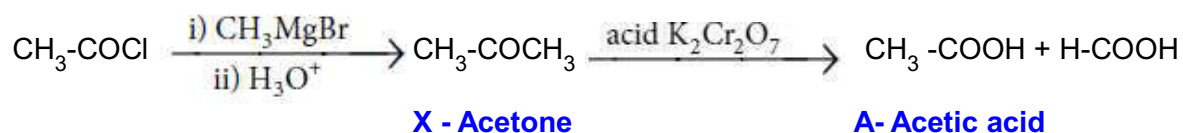
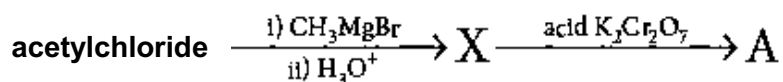
A- 1-methyl-cyclohexanol

B-1-bromo-1-methyl-cyclohexane

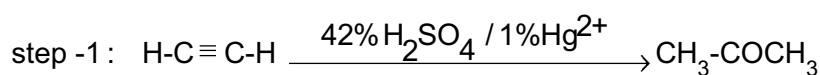
C-(1-methyl-cyclohexyl) Magnesium bromide

D-(1-methyl-cyclohexyl) methanol

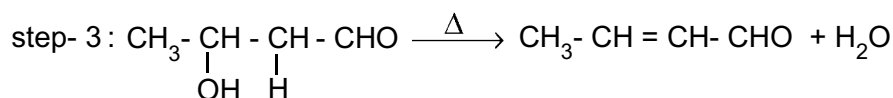
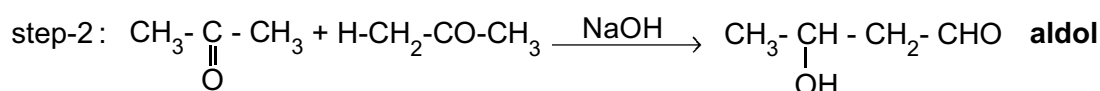
22. What will be the product (X and A) for the following reaction



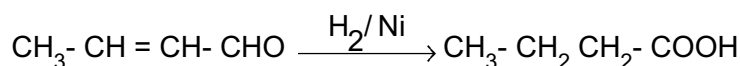
23. How will you convert acetylene into n-butyl alcohol.



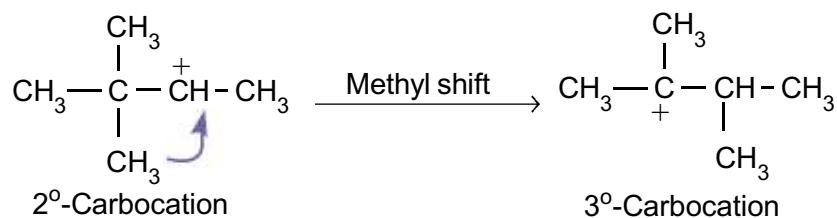
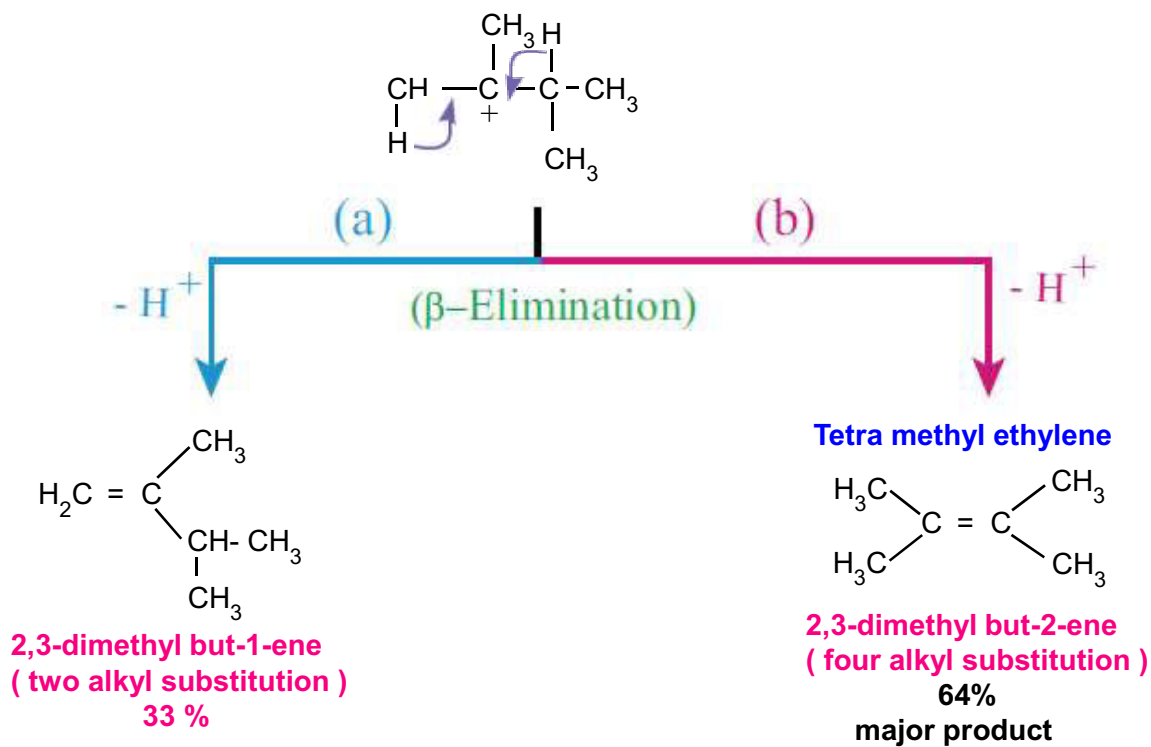
Aldol condensation



step-4 Reduction of crotonaldehyde to n-butyl alcohol.



3) Conversion of 2 degree carbonium to 3 degree carbonium by methyl shift:

4) Removal of H⁺ ion to form a double bond:

PDF Creator &
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S.SHANMUGAM PG Assistant

St.John's M.H.S.S porur Chennai -116

Mob: 9841945665