

Alcohols

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Outline

- **Classification**
- **Nomenclature**
- **Synthesis**
- **Chemical Reaction**

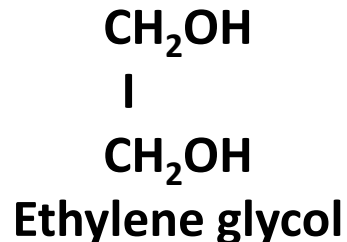
Classification

- Alcohols are defined as hydroxy derivatives of aliphatic hydrocarbons. Its general formula is R-OH, where R is alkyl group and –OH is functional group.

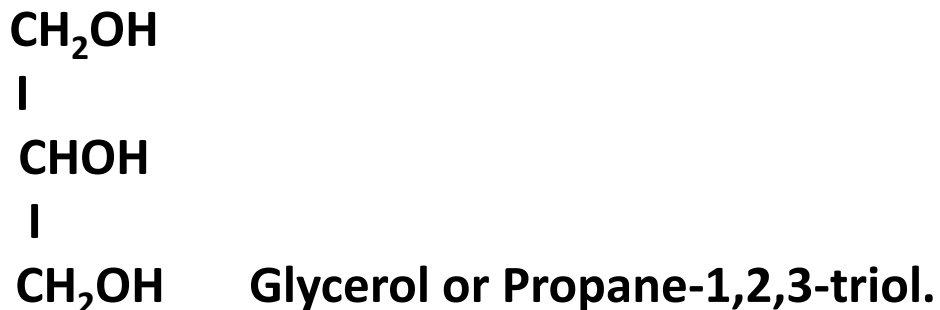
- Alcohols are classified as follow :

- Monohydric alcohol – Alcohols having one –OH gr. e. g. CH_3OH , $\text{C}_2\text{H}_5\text{OH}$

- Dihydric alcohol – Alcohols having two –OH grs. e.g.



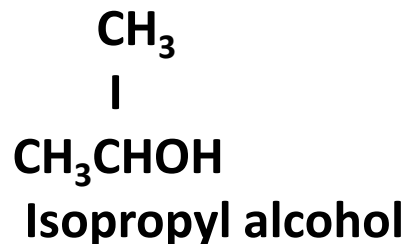
- Trihydric alcohol – Alcohols having three –OH gr. e.g.



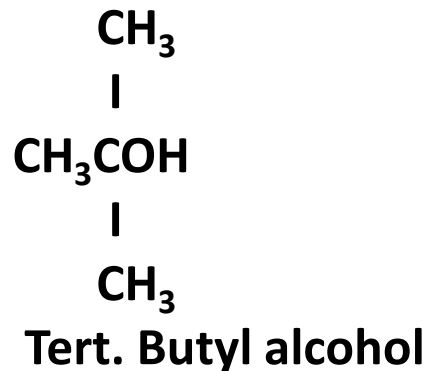
• Monohydric alcohols are further classified as

1. Primary alcohol - If -OH gr. is attached with primary carbon or one degree carbon atom e.g. CH_3OH , $\text{CH}_3\text{CH}_2\text{OH}$

2. Secondary alcohol – If -OH gr. Is attached with secondary carbon or two degree carbon atom e.g.



3. Tertiary alcohol – If -OH gr. Is attached with tertiary or three degree carbon atom. e.g.

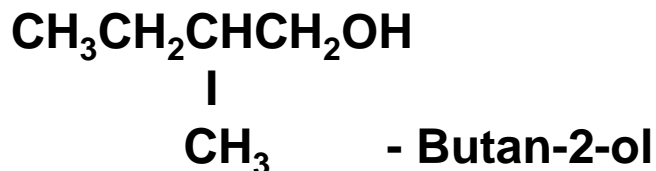
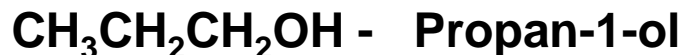


Nomenclature

1. **Common system** – Alcohols are called alkyl alcohol, adding the word alcohol to the name of the alkyl group.

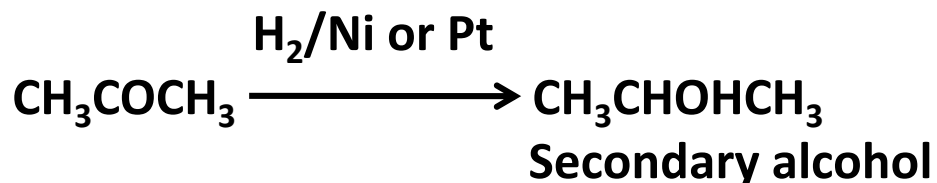
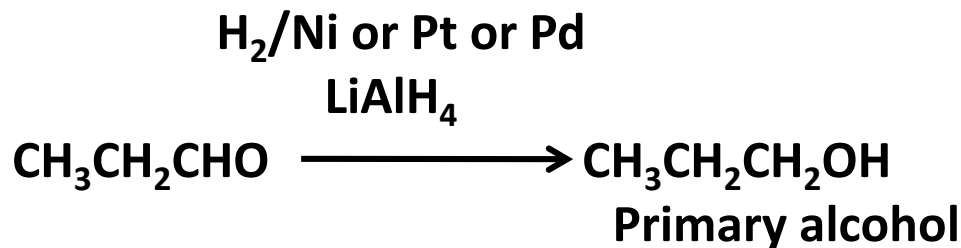


2. **IUPAC system** – In this system alcohols are called “**ALKANOLS**”, replacing ‘e’ of corresponding alkane by suffix – ol. The longest chain containing –OH gr is selected as parent chain and numbered in such a way that carbon containing –OH gr gets the smallest number.

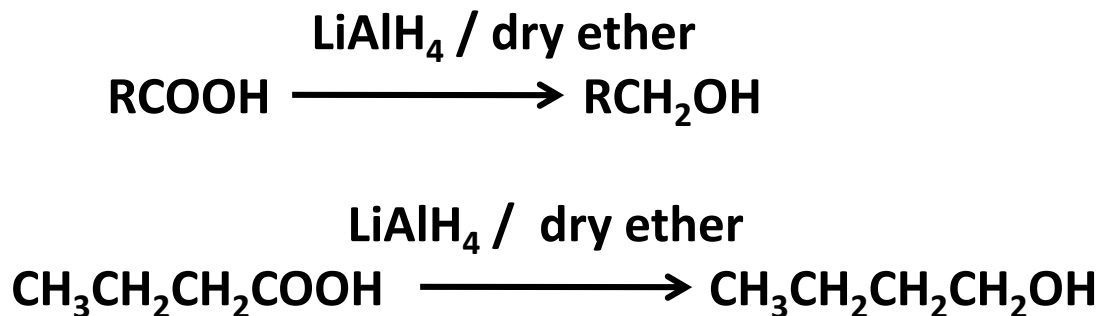


Synthesis

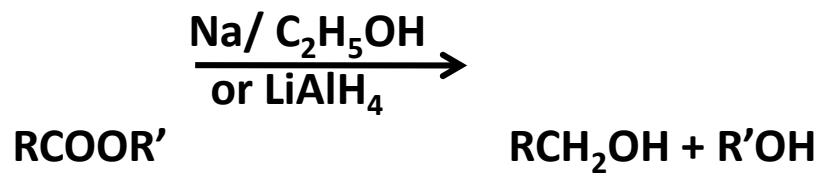
1. From aldehyde and ketone : By the process of reduction alcohols can be prepared from aldehydes and ketones.



2. From carboxylic acid : By reducing acid with LiAlH₄.

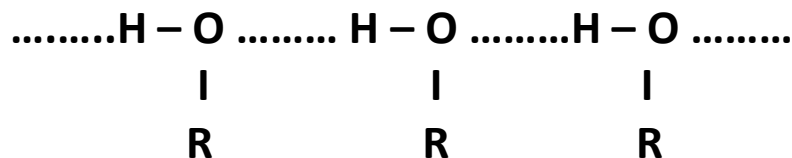


3. From ester : When esters are reduced with sodium in alcohol or LiAlH_4 / mixture of alcohols are obtained.

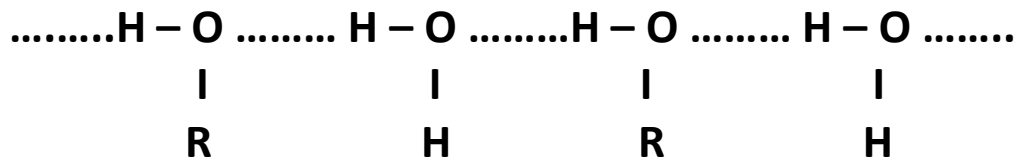


Properties

1. Boiling point of alcohols are higher than hydrocarbons of comparable molecular wt. because of the presence of inter molecular hydrogen bonding in molecules.

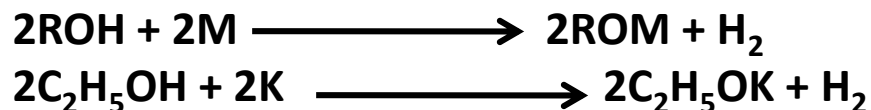


2. Alcohols are soluble in water because it forms inter molecular hydrogen bonding with water molecule.

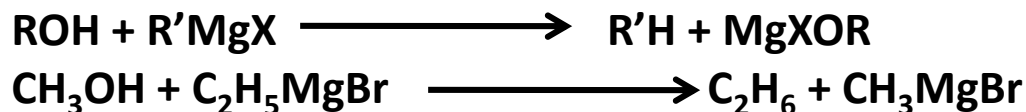


Properties continued

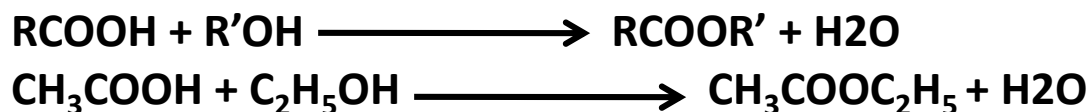
3. Acidic nature – Alcohols are weak acid because it ionises to give alkoxide ion and hydrogen ion because hydrogen is attached to the highly electronegative oxygen atom. This is why alcohols react with metals like Na, K, Mg, etc.



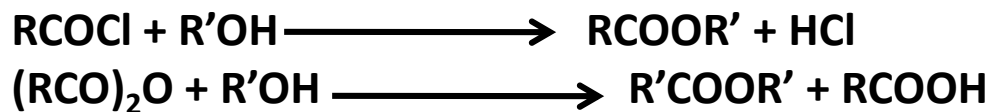
4. Reaction with Grignard reagent – It reacts with Grignard reagent to form alkanes.



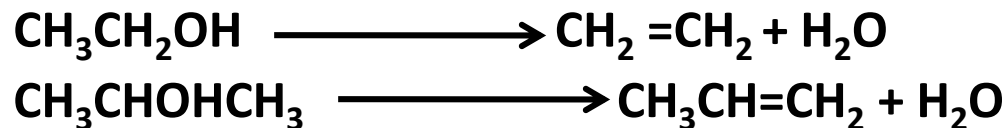
5. Reaction with acids – Alcohols react with carboxylic acid in presence of conc. Sulphuric acid to form esters.



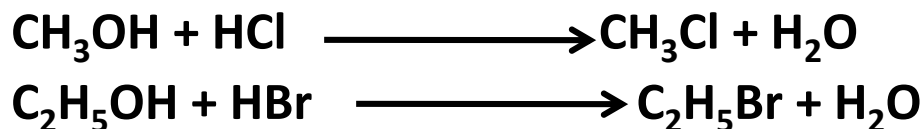
6. Reaction with acid chloride and acid anhydride – alcohols react with acid chloride or anhydride to produce esters.



7. Dehydration of alcohol – Alcohols after dehydration with H_2SO_4 or H_3PO_4 or alumina or lewis acid produce alkenes.

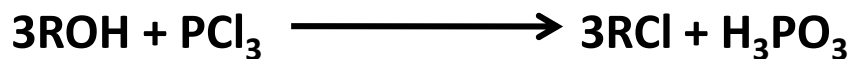


8. Reaction with halogen acid – Alcohols reacts with halogen acids to give haloalkanes in presence of Lewis acid or sulphuric acid. The order of reactivity of halogen acids are $\text{HI} > \text{HBr} > \text{HCl}$, because iodide ion is better nucleophile than bromide and chloride ion.



9. Reaction with phosphorus halides - Alcohol reacts with phosphorus halides to give alkyl halides.

Reaction continued

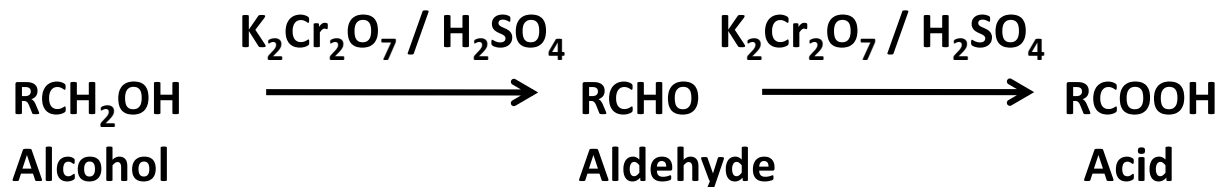


10. Reaction with thionyl chloride – Alcohols react with thionyl chloride in presence of tertiary amine to give alkyl chlorides.

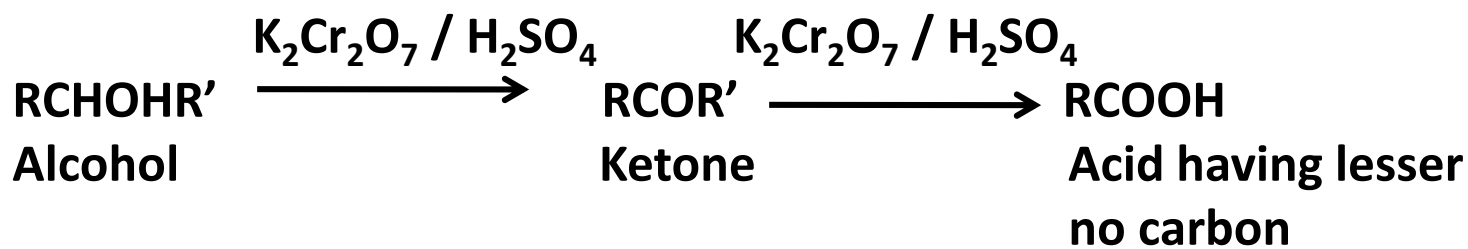


11. Oxidation reaction – On oxidation different alcohols gives different product.

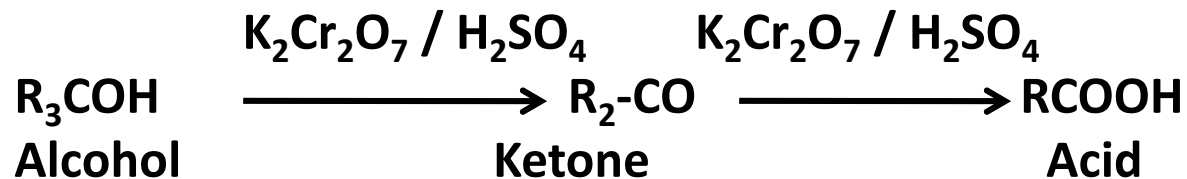
i) Primary alcohols



(ii) Secondary Alcohol



(iii) Tertiary Alcohol



THANK YOU