+ From alkenes

From alkenes, by acid Catalysed Hydration:

Eg.
$$CH_3$$
- CH = CH_2 + H_2O \longrightarrow CH_3 - CH - CH_3 \mid OH

/

METHODS OF PREPARATION OF ALCOHOLS

+From Hydroboration Oxidation

$$CH_{3}-CH=CH_{2}+(H-BH_{2})_{2}\longrightarrow CH_{3}-CH-CH_{2}$$

$$H BH_{2}$$

$$CH_{3}-CH_{2}-CH_{2})_{3}B CH_{3}-CH-CH_{2}$$

$$CH_{3}-CH_{2}-CH_{2})_{2}BH$$

$$CH_{3}-CH-CH_{2}$$

$$CH_{3}-CH-CH_{2}$$

$$CH_{3}-CH-CH_{2}$$

$$CH_{3}-CH-CH_{2}$$

$$CH_{3}-CH-CH_{2}$$

$$CH_{3}-CH-CH_{2}$$

+ Reduction of Aldehyde, Ketone and Carboxylic Acid

$$R - CHO + H_2 \xrightarrow{Pd} R - CH_2OH$$

$$RCOR' \xrightarrow{NaBH_4} R - CH - R$$
 OH

$$\mathsf{RCOOH} \xrightarrow[\mathsf{H}_2\mathsf{O}]{\mathsf{LiAlH}_4} \mathsf{R} - \mathsf{CH}_2 - \mathsf{OH}$$

+ From Grignard reagent

$$C = O + R^{\delta-} MgX^{\delta}$$

$$\begin{bmatrix} C - O - Mg - X \end{bmatrix}$$

$$Mg(OH)X + C - OH$$

8. ALCOHOLS, PHENOLS AND ETHERS

ALCOHOLS

R - OH

where R=alkyl group

PHYSICAL PROPERTIES /

- → Soluble in water due to H-bonding.
- **→** M.P. and B.P. \propto Molecular mass.
- **→** Colorless with characteristic smell.

+ Reaction involving cleavage of -OH bond.

R - OH + HCl
$$\xrightarrow{\text{anh. ZnCl}_2}$$
 R-Cl + H₂O turbidity

rate: 3° alcohol > 2° alcohol > 1° alcohol



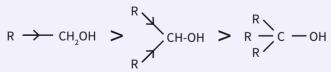
+ Esterification

$$R - OH + RCOOH \xrightarrow{H+} ROCOR + H_2O$$

$$R - OH + (R'CO)_2 O \xrightarrow{H^+} ROCOR' + R'COOH$$

$$R - OH + R'COCl \xrightarrow{Pyridine} ROCOR' + Hcl$$

+Acidity: Due to the presence of polar-OH group.



1° alcohol

2° alcohol

3° alcohol

+Oxidation

$$R-CH2OH \xrightarrow{Oxidation} R-C=O \xrightarrow{[O]} R-C-OH$$
Aldehyde Carboxylic Acid

+ Dehydration Reaction

$$\begin{array}{c|c}
 & I & I \\
-I & -I & H^{+} \\
I & I & Heat
\end{array}$$

$$C = C + H_{2}O$$

METHODS OF PREPARATION OF PHENOL

+ From Diazonium Salts

$$\begin{array}{c|c} NH_2 & N=NCl & OH \\ \hline & NaNO_2 & Marm \\ \hline & H_2O & Warm \\ \hline & Benzene \\ Diazonium \\ salt \\ \end{array}$$

+ From Benzene Suplhonic Acid

+ Dow's Process

Chlorobenzene + NaOH
$$\xrightarrow{1) 623K, 300atm}$$
 Phenol

+ From Cumene

$$\begin{array}{c|cccc} CH_3 & CH_3 & OH \\ \hline \\ CH & CH_3 & O_2 & C-O-OH \\ \hline \\ CH_3 & CH_3 & C-O-OH \\ \hline \\ CH_3 & CH_3 & COCH_3 \\ \hline \\ CH_3 & COCH_3 & COCH_3 \\ \hline \\ CH_3 & COCH_$$

PREPARATION OF ETHER

+ Williamson Synthesis

$$R-X + R-O-Na \longrightarrow R-O-R+NaX$$

+ By Dehydration of Alcohols

$$2CH_3-CH_2-OH \xrightarrow{H_2SO_4} C_2H_5-O-C_2H_5$$

ETHER

R-0-R'

where R and R' can be same or different alkyl group.

PHYSICAL PROPERTIES /

- → Colourless crystalline solid or Liquid
- → Higher boiling point due to Hydrogen Bonding

PHENOL

CHEMICAL PROPERTIES

+ Electrophilic Aromatic Substitution

$$OH \qquad OH \qquad Br \qquad Br \qquad + 3HBr$$

+ Nitration

+ Oxidation of Phenol

$$\begin{array}{c}
OH \\
\hline
Na_2Cr_2O_7 \\
H_2SO_4
\end{array}$$

$$\begin{array}{c}
O \\
O \\
O \\
Benzoquinone$$

+ Reimer-Tiemann reaction:

+ Cleavage of C-O Bond

CHEMICAL PROPERTIES

$$R-O-R + HX \longrightarrow R-X + ROH$$

 $R-O-R' + HX \longrightarrow R'-X + ROH$

For Tertiary Group:In Case of excess HI

$$\begin{array}{c} \mathsf{CH_3} \\ \mathsf{CH_3} - \overset{\mathsf{C}}{\mathsf{C}} - \mathsf{OCH_3} + \mathsf{HI} \longrightarrow \mathsf{CH_3} \mathsf{OH} + \mathsf{CH_3} - \overset{\mathsf{C}}{\mathsf{C}} - \mathsf{I} \\ \overset{\mathsf{C}}{\mathsf{CH_3}} \\ & \overset{\mathsf{(excess)}}{\mathsf{CH_3}} \end{array}$$

+ Electrophilic Substitution

+ Halogenation

+ Friedel-craft Reaction