## CHEMISTRY STUDY MATERIALS FOR CLASS 12

# (NCERT Based Notes of Chapter - 11) GANESH KUMAR DATE: 16/09/2021

# Alcohols, Phenols and Ethers

### **Preparation of Alcohols**

- (i) From alkenes
  - (a) By acid catalyzed hydration in accordance with Markovnikov's rule.

$$C = C + H_2O \stackrel{H^+}{\rightleftharpoons} C - C$$

$$H OH$$

$$CH_3 - CH = CH_2 + H_2O \stackrel{H^+}{\rightleftharpoons} CH_3 - CH - CH_3$$

$$OH$$

#### Mechanism

**Step** I Protonation of alkene by attack of H<sub>3</sub>O<sup>+</sup>

**Step II Nucleophilic attack** 

Step III Deprotonation to form an alcohol

(b) By hydroboration-oxidation

#### (ii) From carbonyl compounds

(a) By reduction of aldehydes and ketones

$$R$$
—CHO + H<sub>2</sub>  $\xrightarrow{\text{Pd}}$   $R$ CH<sub>2</sub>—OH
$$R$$
CO $R'$   $\xrightarrow{\text{NaBH}_4}$   $R$ —CH— $R'$ 
OH

Aldehydes yield primary alcohols whereas ketones give secondary alcohols, when subjected to reduction.

(b) By reduction of carboxylic acids and ester

$$\begin{array}{ccc} R{\rm COOH} & \xrightarrow{\mbox{(i) LiAlH}_4} & R{\rm CH}_2{\rm OH} \\ \\ R{\rm COOR'} & \xrightarrow{\mbox{H}_2} & R{\rm CH}_2{\rm OH} + R'{\rm OH} \end{array}$$

Reduction of aldehyde, ketones and esters with No Alcohol is called Bouveault-blanc reduction.

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The reaction produces a primary alcohol with methanol, a secondary alcohol with aldehydes (except methanal) and tertiary alcohol with ketones

#### (iv) Hydrolysis of alkyl halides

$$R - X + KOH(aq) \rightarrow ROH + KX$$

To avoid dehydrohalogenation of RX, mild alkalies like moist Ease of hydrolysis of alkyl halides RI > R - Br > RCI > and t > s > p alkyl halides.

#### (v) Hydrolysis of ethers

$$R \longrightarrow C \longrightarrow R + H_2O \xrightarrow{H_2SO_4} 2ROH$$

(vi) From primary amines By treatment with nitrous acid.

$$RNH_2 + HONO \xrightarrow{(NaNO_2 + HCI)} ROH + N_2 + H_2O$$

Methylamine does not give methyl alcohol when treated with HNO<sub>2</sub>. It gives CH<sub>3</sub>OCH<sub>3</sub> and CH<sub>3</sub>ONO.

#### (vii) By alcoholic fermentation

$$\begin{array}{cccc} C_{12}H_{22}O_{11}+H_2O & \xrightarrow{\quad \text{Invertase} \quad} C_6H_{12}O_6 + C_6H_{12}O_6 \\ \text{sucrose} & \text{glucose} & \text{fructose} \\ \hline & C_6H_{12}O_6 & \xrightarrow{\quad \text{Zymase} \quad} & 2C_2H_5OH & + 2CO_2(g) \\ \text{glucose and fructose} & & \text{ethyl alcohol} \\ \end{array}$$

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