# **CHEMISTRY STUDY MATERIALS FOR CLASS 10**

### ( **Based on NCERT:** Carbon and its compounds)

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#### OXIDATION

- Carbon compounds can be oxidised.
- Alcohols on oxidation are converted to carboxylic acids.
- Alkaline  $KMnO_4$  or acidified  $K_2Cr_2O_7$  are used as oxidising agents.

 $CH_3 - CH_2 - OH$ 

Alkaline KMnO4 +Heat

or Acidified K<sub>2</sub>Cr2O7

CH<sub>3</sub>COOH Ethanoic acid

Ethanol

### **ADDITION REACTION**

- This reaction occurs only in unsaturated compounds, where there are double or triple bonds.
- The addition of hydrogen to an unsaturated hydrocarbon to obtain a saturated hydrocarbon is called hydrogenation.

**For example:** Ethene, on heating with hydrogen, in the presence of a nickel or palladium catalyst forms ethane.

 $CH_2 = CH_2 + H_2 \xrightarrow{Ni (Catalyst)} CH_3 - CH_3$ 

Ethene Hydrogen gas Heat Ethane

 The process of hydrogenation is used in industries to prepare vegetable ghee (or vanaspati ghee) from vegetable oils.

#### SUBSTITUTION REACTION

- The reaction in which one or more hydrogen atoms of a hydrocarbon are replaced by atoms of other elements is called a substitution reaction.
- Substitution reactions are a characteristic property of saturated hydrocarbons.

For example: Methane reacts with chlorine in the presence of sunlight to form chloromethane and hydrogen chloride.

 $CH_4 + CI_2 \xrightarrow{Sunlight} CH_3CI + HCI$ Methane Chlorine Chloromethane Hydrogen chloride

Some Important Carbon Compounds – Ethanol & Ethanoic Acid

#### **Properties of Alcohols**

 Reaction with Sodium: Sodium reacts steadily with ethanol to form sodium ethoxide along with the evolution of hydrogen gas.

 $\begin{array}{rcl} 2C_2H_5OH & + & 2Na \rightarrow & 2C_2H_5ONa + & H_2\uparrow \\ \mbox{Ethanol} & & \mbox{Sodium} & & \mbox{Hydrogen gas} \\ & & \mbox{ethoxide} \end{array}$ 

**Dehydration:** Ethanol, on heating with excess of conc. H<sub>2</sub>SO<sub>4</sub> at 170°C gets

dehydrated to form ethene.

 $\begin{array}{c} 2C_2H_5OH \\ \text{Ethanol} \end{array} \xrightarrow[170°C]{\text{conc. H2SO4}} CH_2 = CH_2 + H_2O \\ \text{Ethene} \end{array}$ 

### Properties of Ethanoic acid/ Acetic acid

• Esterification: Ethanoic acid reacts with alcohols in the presence of a little conc. sulphuric acid to form esters.

 $C_2H_5OH + CH_3COOH \xrightarrow{conc. H2SO4} CH_3COOC_2H_5 + H_2O$ Ethanol Ethanoic acid Ethyl ethanoate Water

The ester, on treating with a base such as NaOH

is converted back to alcohol and sodium salt of carboxylic acid. This reaction

is known as Saponification because it is used in the manufacture of soap.

 $\begin{array}{cccc} CH_{3}COOC_{2}H_{5} + NaOH \longrightarrow & C_{2}H_{5}OH + CH_{3}COONa \\ Ethyl & Sodium \\ ethanoate & hydroxide & Ethanol & Sodium \\ ethanoate & ethanoate & ethanoate \\ \end{array}$ 

• Reaction with a base: Ethanoic acid reacts with a base such as sodium

hydroxide to form a salt and water.

CH₃COOH	+ NaOH ·	 CH₃COONa	+ H <sub>2</sub> O
Acetic acid	Sodium hydroxide	Sodium ethanoate	Water

• **Reaction with Carbonates & bicarbonates:** Acetic acid reacts with carbonates and bicarbonates to form salt, water and carbon dioxide.

$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$					
Acetic	Sodium	Sodium	Water	Carbon	
acid	carbonate	acetate		dioxide gas	
CH <sub>3</sub> COOH	+ NaHCO3	→ CH <sub>3</sub> COONa	+ H <sub>2</sub> O	+ CO <sub>2</sub>	
Acetic	Sodium	Sodium	Water	Carbon	
acid	bicarbonate	acetate		dioxide gas	

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