Carbon & its Compounds Ethanoic Acid

*** ETHANOIC ACID**

PROPERTIES OF ETHANOIC ACID:

Ethanoic acid is commonly called acetic acid and belongs to carboxylic acid group. 5-8% solution of acetic acid in water is called vinegar and is used widely as a preservative in pickles.

The melting point of pure ethanoic acid is 290 K and hence it often freezes during winter in cold climates. This gave rise to its name glacial acetic acid.

The group carboxylic acids are obviously characterised by a special acidity.

However, unlike mineral acids like HCl, which are completely ionised, carboxylic acids are weak acids because they do not ionised completely.



Formation of ester

PHYSICAL PROPERTIES:

- (i) Ethanoic acid is a colouless liquid with sour taste and typical vinegar smell.
- (ii) It is miscible with water in all proportions.
- (iii)The acid boils at 391 K (118°C).

(iv)On cooling, pure ethanoic acid freezes to form ice like flakes. They look like a glacial. Due to this property, pure ethanoic acid is often called glacial ehtanoic acid or glacial acetic acid.

Pure, water-free acetic acid (glacial acetic acid) is a colourless liquid that attracts water from the environment (hygroscopy), and freezes below 16.7°C (62°F) to a colouless crystalline solid. Acetic acid is one of the simplest carboxylic acids (the second-simplest, next to formic acid). Acetic acid is corrosive, and its vapour causes irritation to the eyes, dry and burning nose, sore throat and congestion to the lungs.

• CHEMICAL PROPERTIES :

The hydrogen (H) atom in the carboxyl group (–COOH) in carboxylic acids such as acetic acid can be given off as an H^+ ion (proton), giving them their acidic character. Acetic acid is a weak, effectively monoprotic acid in aqueous solution. Acetic acid is corrosive to metals including iron, magnesium and zinc forming hydrogen gas and metal salts called acetates.

REACTIONS OF ETHANOIC ACID

(i) Esterification reaction: Esters are most commonly formed by reaction of an acid and an alcohol. Ethanoic acid reacts with absolute ethanol in the presence of an acid catalyst to give an ester -

 $CH_{3}COOH + CH_{3} \longrightarrow CH_{2}OH \xrightarrow{H_{2}SO_{4}} H_{3}C - C - O - CH_{2} - CH_{3} + H_{2}O$ (Ethanoic acid) (Ethanol) O (Ester - Ethyl ethanoate)

Uses of Ester :

 Esters are sweet-smelling substances. These are used in making perfumes and flavouring agents. Class-X

 (ii) Esters react in the presence of an acid or a base to give back the alcohol and carboxylic acid. This reaction is known as **saponification** because it is used in the preparation of soap.

 $CH_3COOC_2H_5 \xrightarrow{NaOH} C_2H_5OH + CH_3COONa$

(ii) Reaction with a base: Like mineral acids, ethanoic acid reacts with a base such as sodium hydroxide to give a salt (sodium ethanoate is commonly called sodium acetate) and water and heat is evolved.

 $NaOH + CH_3COOH \rightarrow CH_3COONa + H_2O$

(iii) Reaction with carbonates and hydrogencarbonates: Ethanoic acid reacts with carbonates and hydrogencarbonates to give a salt, carbon dioxide and water. The salt producing is commonly called sodium acetate.

$$2CH_{3}COOH + Na_{2}CO_{3} \rightarrow 2CH_{3}COONa + H_{2}O + CO_{2} \uparrow$$
$$CH_{3}COOH + NaHCO_{3} \rightarrow CH_{3}COONa + H_{2}O + CO_{2} \uparrow$$

• USES : Ethanoic acid or acetic acid is used :

- (i) as a solvent in industry as well as in laboratory.
- (ii) for making dyes, perfumes and medicines.
- (iii) for making synthetic vinegar.
- (iv) for making basic copper acetate $[Cu(CH_3COO)_2, Cu(OH)_2]$ which is used in green paints.
- (v) for making aluminium acetate $[(CH_3COO)_3 Al]$ used in preparing water proof fabrics.
- (vi) as a laboratory reagent for carrying chemical reactions.

It is an important chemical reagent and industrial chemical that is used in the production of polyethylene terephthalate mainly used in soft drink bottles; cellulose acetate, mainly for photographic film; and polyvinyl acetate for wood

glue, as well as synthetic fibres and fabrics. In households diluted acetic acid is often used in descaling agents. In the food industry acetic acid is used under the food additive code E260 as an acidity regulator.