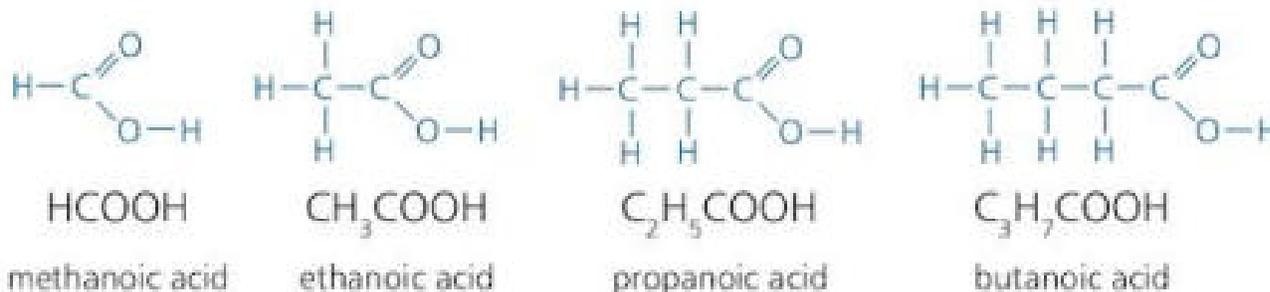


Carboxylic Acids

This is a homologous series of organic compounds with the general formula $C_NH_{2N+1}COOH$

As Carbon is mentioned twice in general formula so N will be one value lower than the total number of carbons.



For methanoic acid N is 0 in general formula

For ethanoic acid N is 1 in general formula

For propanoic acid N is 2 in general formula

For butanoic acid N is 3 in general formula

Oxidation of alcohols to carboxylic acids

The products of this reaction are different from products of combustion. Instead of CO₂ and H₂O, the products are a homologous series called **carboxylic acids**.

Alcohol	Carboxylic acid formed
Methanol	Methanoic acid
Ethanol	Ethanoic acid
Propanol	Propanoic acid
Butanol	Butanoic acid

Preparation of carboxylic acid

- Oxidation of alcohol by **bacterial oxidation using oxygen from the atmosphere** $C_2H_5OH + O_2 \longrightarrow CH_3COOH + H_2O$
- Gently heating (using a water bath) the alcohol with **acidified potassium dichromate(VI) or acidified potassium manganate(VII)**

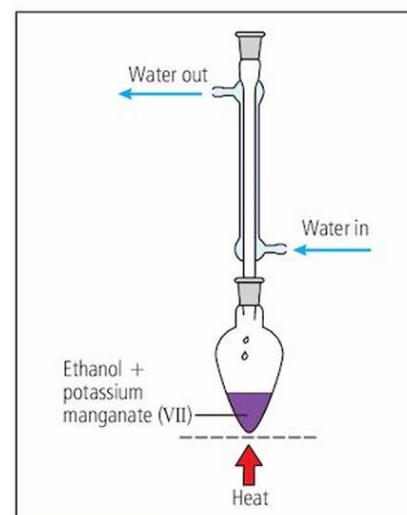
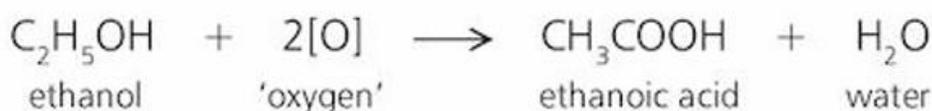


Figure 18.4.1 Refluxing a mixture

Why reflux is used?

- To prevent any **volatile reactants or products** from being lost through evaporation

1) Chemical oxidizing agents

- **Acidified potassium manganate(VII)** **purple to** → **colourless**
- **Acidified potassium dichromate(VI)** → **orange to green**

2) Bacterial oxidation during vinegar production

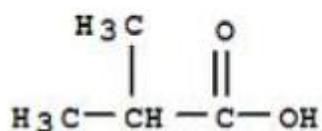
- The **microbial oxidation** (fermentation) of ethanol will produce a weak solution of vinegar (ethanoic acid)
- This occurs when a bottle of wine is opened as bacteria in the air (acetobacter) will use atmospheric oxygen from air to oxidise the ethanol in the wine

Structural isomer of butanoic acid

Here the position of the functional group cannot be changed but the CH₃ can be moved from a carbon to another

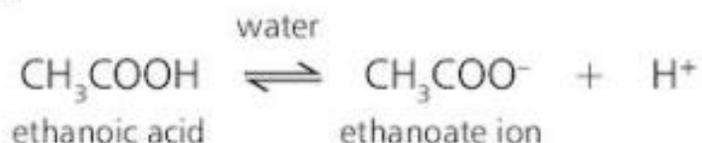
The name of the isomer of butanoic acid is **2-methylpropanoic acid**.

2-methyl propanoic acid



Carboxylic acids are typical weak acids

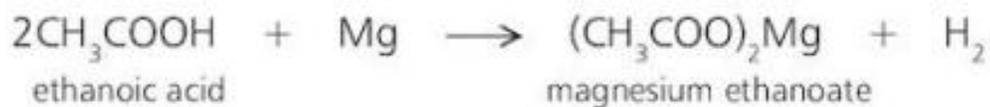
Carboxylic acids are only partly ionised in water. The hydrogen of the -COOH group is the only one that is responsible for the acidity of carboxylic acids:



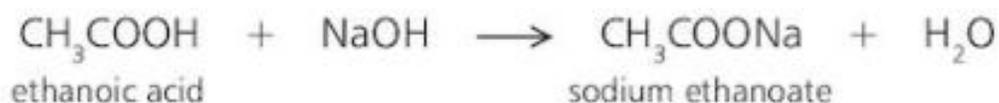
Salts of ethanoic acid are named by changing the -oic to -oate.

Carboxylic acids show many of the reactions of a typical acid.

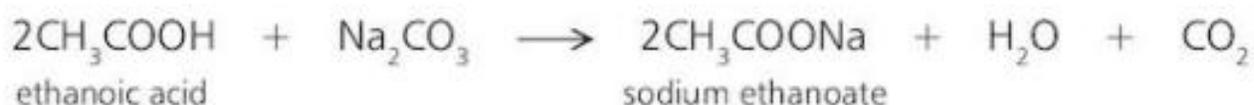
- They react with reactive metals to form a salt and hydrogen:



- They react with alkalis to form a salt and water:



- They react with metal carbonates to form a salt, water and carbon dioxide:



Aqueous propanoic acid reacts with magnesium carbonate.

Construct the equation for this reaction.

.....[1]

