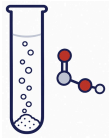
Carboxylic Acids and Esters Summary Map

OCR A Level Chemistry A · 6.1.3 Carboxylic acids and esters

1 Carboxylic acids

6.1.3(a)–(b)

- –COOH: **hydrogen bonds** with water
- Short chains dissolve
- Carbonates: **CO_2**, fizzing
- Metals: H_2; oxides, alkalis: salt + water



2 Esterification

6.1.3(c)

- Acid + alcohol ⇌ ester + water
- **Conc. H_2SO_4** catalyst, warm
- Name: **alkyl alkanoate**
- Reversible: limited yield

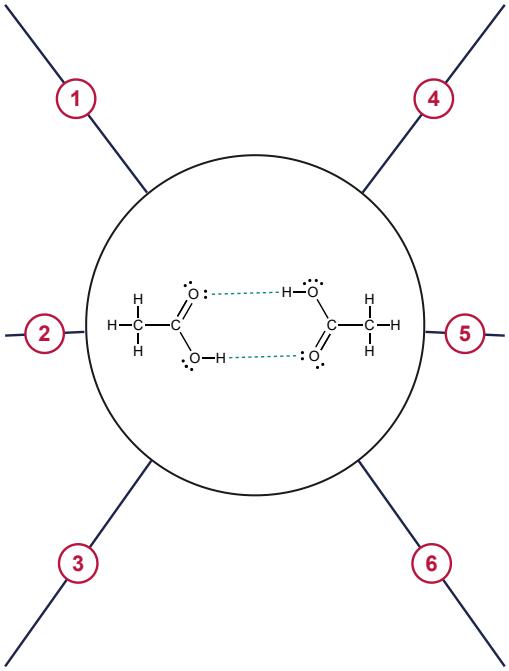


3 Ester hydrolysis

6.1.3(d)

- Hot aqueous acid: **reversible**
- Hot aqueous alkali: **complete**
- Gives the carboxylate + alcohol
- Add acid to free the RCOOH





4 Acid anhydrides

6.1.3(c)

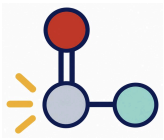
- $(CH_3CO)_2O$ + alcohol → **ester**
- By-product: **CH_3COOH**
- Not reversible
- Gentler than an acyl chloride



5 Acyl chlorides

6.1.3(e)

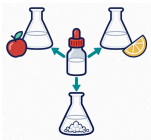
- RCOOH + **$SOCl_2$** → RCOCl
- By-products SO_2 and HCl: **gases**
- –COCl, **-oyl chloride**: very δ+ C
- Fume in moist air: HCl



6 Acyl chlorides in synthesis

6.1.3(f)

- Water → **carboxylic acid**
- Alcohol → **ester**
- NH_3 → **primary amide**
- Amine → **secondary amide**



Reagents and products

room temperature unless a condition is given

Starting compound	Reagent and conditions	Organic product
ethanoic acid	$NaHCO_3(aq)$	sodium ethanoate (+ CO_2)
ethanoic acid	C_2H_5OH, conc. H_2SO_4, warm	ethyl ethanoate
ethanoic acid	$SOCl_2$	ethanoyl chloride (+ SO_2, HCl)
ethyl ethanoate	NaOH(aq), heat under reflux	sodium ethanoate + ethanol
ethanoyl chloride	CH_3NH_2	N-methylethanamide
ethanoic anhydride	CH_3OH, warm	methyl ethanoate + CH_3COOH

Worked examples

Name the ester

- $CH_3CH_2COOCH_3$
- alcohol part: methyl
- **methyl propanoate**

Two equivalents

- $CH_3COCl + 2NH_3$
- → CH_3CONH_2
- **+ NH_4Cl**

Make the acyl chloride

- $CH_3CH_2COOH + SOCl_2$
- → CH_3CH_2COCl
- **+ SO_2 + HCl**

Acids and esters are identified by NMR in 6.3.2; polyesters and polyamides follow in 6.2.3.

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