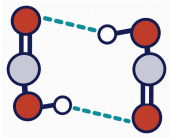
Carboxylic Acids and Derivatives Summary Map

Edexcel International A Level Chemistry · Unit 4 · Topic 15C Carboxylic Acids and Derivatives

1 Carboxylic acids

15.9, 15.10

- –COOH, names **-oic acid**
- **Dimers**: two hydrogen bonds
- Boil above alcohols of similar M_r
- Short chains mix with water



2 Making acids

15.11

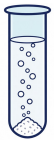
- Primary alcohol or aldehyde + [O]
- **Excess** $K_2Cr_2O_7/H^+$, **reflux**
- Nitrile + **dilute HCl**, reflux
- Nitrile route: one carbon longer

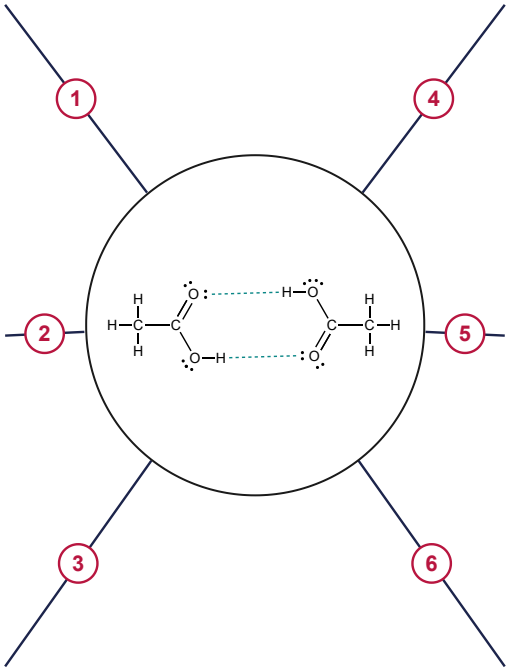


3 Reactions of acids

15.12

- NaOH: salt + water
- Carbonates: **CO_2**, fizzing
- $LiAlH_4$: primary alcohol
- PCl_5: acyl chloride + HCl fumes

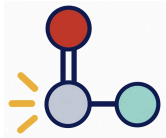




4 Acyl chlorides

15.13, 15.14

- –COCl, **-oyl chloride**: very δ+ C
- Water → acid; alcohol → ester
- NH_3 → amide; amine → N-substituted amide
- Room temperature, **HCl** fumes



5 Esters

15.13, 15.15

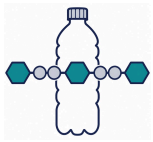
- Acid + alcohol ⇌ ester + water
- Name: **alkyl alkanoate**
- Acid hydrolysis: **reversible**
- NaOH(aq): salt + alcohol, **complete**



6 Polyesters

15.16

- Diacid + diol: **condensation**
- One H_2O lost per ester link
- Terylene (PET): fibres, bottles
- Ester links can be **hydrolysed**



Reagents and products from ethanoic acid

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	$LiAlH_4$ in dry ether	ethanol
ethanoic acid	PCl_5	ethanoyl chloride
ethanoyl chloride	conc. NH_3	ethanamide
ethyl ethanoate	NaOH(aq), heat under reflux	sodium ethanoate + ethanol

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**

Find the monomers

- –OC–C_6H_4–COO–CH_2CH_2–O–
- split each ester link
- **diacid + diol**

Acids, acyl chlorides and esters are identified by spectra in Topic 15D; amides return in Topic 19.

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