

32.1 Alcohols (esters from acyl chlorides)

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on the **A2 reaction of alcohols** 醇—making an **ester** 酯 from an alcohol and an **acyl chloride** 酰氯.

You must be able to:

- give the product of an alcohol with an acyl chloride
- compare this route with esterification using a carboxylic acid
- write the equation and name the products

1 Worked examples

■ Ester from an acyl chloride



An acyl chloride reacts with an alcohol faster and more completely than a carboxylic acid does, giving the ester + HCl fumes



the $-\text{OH}$ (acid) and $-\text{H}$ (alcohol) leave as **water**; the $\text{C}-\text{O}-\text{C}$ ester link forms
(concentrated H_2SO_4 catalyst; reversible)

Esters from acyl chlorides and alcohols

- **alcohol + acyl chloride** $\rightarrow$ **ester + HCl**, at room temperature.
- e.g. ethanol + ethanoyl chloride $\rightarrow$ ethyl ethanoate + HCl.
- this is **faster and more complete** than using a carboxylic acid (which is reversible and needs an acid catalyst + heat).

2 Practice

2.1 Name the ester formed from ethanol and ethanoyl chloride. [1]

2.2 Name the other product (the fumes) given off. [1]

3 Exam-style questions

3.1 Compared with using ethanoic acid, making an ester from ethanoyl chloride is: [1]

- **A** slower and reversible
- **B** faster and more complete
- **C** only possible with a catalyst
- **D** impossible at room temperature

3.2 Which product is given off as fumes when an alcohol reacts with an acyl chloride? [1]

- **A** H_2
- **B** CO_2
- **C** HCl
- **D** H_2O

3.3 Propan-1-ol reacts with propanoyl chloride.

(a) Write the equation for the reaction. [2]

(b) Name the ester produced. [1]

3.4 Explain why an acyl chloride is preferred over a carboxylic acid for making an ester

in the lab.

[2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **32.1 Alcohols** past-paper sheet in the Library, or try these in **Practice mode**:

- 9701/44 N25 —Q7 (alcohols)

Solutions

2.1 ethyl ethanoate.

2.2 hydrogen chloride, HCl.

3.1 B. The reaction is fast and goes essentially to completion (not reversible).

3.2 C. HCl fumes are released.

3.3 (a) $\text{CH}_3\text{CH}_2\text{COCl} + \text{CH}_3\text{CH}_2\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_2\text{CH}_3 + \text{HCl}$.

(b) propyl propanoate.

3.4 the acyl chloride reaction is fast and goes to completion; whereas esterification with a carboxylic acid is slow, reversible and needs an acid catalyst and heat.