

32.1 Alcohols (esters from acyl chlorides)

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS ester 酯 • acyl chloride 酰氯 • alcohol 醇

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 **-OH** (acid) and **-H** (alcohol) leave as **water**; the **C-O-C** ester link forms
(concentrated H₂SO₄ catalyst; reversible)

Esters from acyl chlorides and alcohols

- **alcohol + acyl chloride → ester + HCl**, at room temperature.
- e.g. ethanol + ethanoyl chloride → 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** H₂
- **B** CO₂
- **C** HCl
- **D** H₂O

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]

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.