

Exercise walk-through

Alcohols ■ 32.1

eXercise

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

Method — 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

- **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).

Method — Ester from an acyl chloride



Method — Ester from an acyl chloride



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

Esters from acyl chlorides and alcohols

Practice 2.1 ■ 1 mark

Name the ester formed from ethanol and ethanoyl chloride.

Solution 2.1

Method: Ester from an acyl chloride

Worked steps

ethyl ethanoate **B1**.

Practice 2.2 ■ 1 mark

Name the other product (the fumes) given off.

Solution 2.2

Worked steps

hydrogen chloride, HCl **B1**.

Exam-style 3.1 ■ 1 mark

Compared with using ethanoic acid, making an ester from ethanoyl chloride is:

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

Solution 3.1

Method: Ester from an acyl chloride

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



Worked steps

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

Exam-style 3.2 ■ 1 mark

Which product is given off as fumes when an alcohol reacts with an acyl chloride?

A H_2

B CO_2

C HCl

D H_2O

Solution 3.2

Method: Ester from an acyl chloride

A H_2

B CO_2

C HCl



D H_2O

Worked steps

C. HCl fumes are released.

Exam-style 3.3 ■ 2 marks

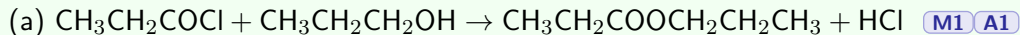
Propan-1-ol reacts with propanoyl chloride.

- (a) Write the equation for the reaction.
- (b) Name the ester produced.

Solution 3.3

Method: Ester from an acyl chloride

Worked steps



organic product, balanced + HCl.

(b) propyl propanoate B1.

Exam-style 3.4 ■ 2 marks

Explain why an acyl chloride is preferred over a carboxylic acid for making an ester in the lab.

Solution 3.4

Method: Ester from an acyl chloride

Worked steps

the acyl chloride reaction is fast and goes to completion **M1**; whereas esterification with a carboxylic acid is slow, reversible and needs an acid catalyst and heat **A1**.