

Exercise walk-through

Amides ■ 34.3

eXercise

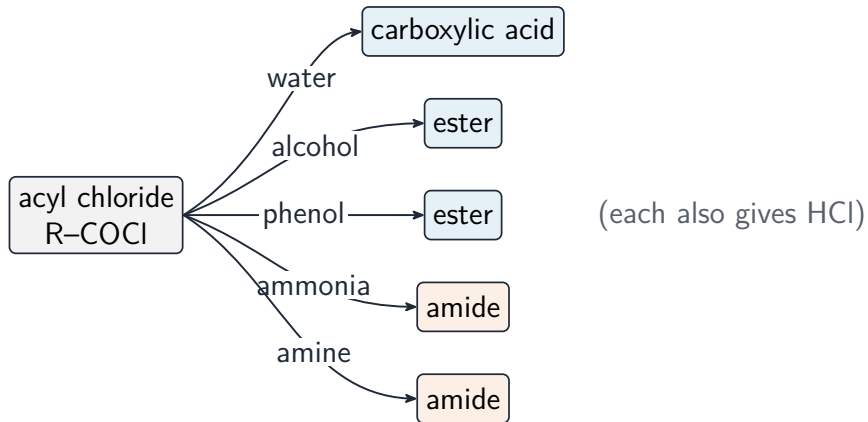
You must be able to

- make an amide from an acyl chloride and ammonia/an amine
- give the products of acid and alkaline hydrolysis of an amide
- explain why an amide is a much weaker base than an amine

Method — Reactions of amides

- **make it:** acyl chloride + NH_3 (or amine) $\rightarrow$ amide + HCl .
- **acid hydrolysis:** amide + H^+ /water $\rightarrow$ carboxylic acid + ammonium salt.
- **alkaline hydrolysis:** amide + OH^- $\rightarrow$ carboxylate salt + ammonia.
- **reduction:** LiAlH_4 reduces the $\text{C}=\text{O}$ to give an amine.
- an amide is a **very weak base** — its N lone pair is delocalised onto the $\text{C}=\text{O}$, so it cannot accept an H^+ .

Method — Reactions of amides



Acyl chloride at the centre reacting with ammonia or an amine to form an amide, plus HCl

Method — Reactions of amides



the **peptide bond** (an amide link)

Amides include the peptide bond

Practice 2.1 ■ 2 marks

Give the two reagents used to make ethanamide.

Solution 2.1

Worked steps

ethanoyl chloride **M1**; ammonia, NH_3 **A1**.

Practice 2.2 ■ 1 mark

Name the organic product of reducing ethanamide with LiAlH_4 .

Solution 2.2

Method: Reactions of amides

Worked steps

ethylamine **B1**.

Exam-style 3.1 ■ 1 mark

Acid hydrolysis of ethanamide gives ethanoic acid and:

- A** ethylamine
- B** an ammonium salt
- C** ethanol
- D** ethene

Solution 3.1

Method: Reactions of amides

A ethylamine

B an ammonium salt 

C ethanol

D ethene

Worked steps

B. Acid hydrolysis gives ethanoic acid and an ammonium salt.

Exam-style 3.2 ■ 1 mark

An amide is a much weaker base than an amine because the nitrogen lone pair is:

- A** removed completely
- B** delocalised onto the adjacent C=O group
- C** used in a C-H bond
- D** more available

Solution 3.2

Method: Reactions of amides

- A removed completely
- B delocalised onto the adjacent C=O group** 
- C used in a C-H bond
- D more available

Worked steps

B. The N lone pair is delocalised onto the neighbouring C=O group.

Exam-style 3.3 ■ 2 marks

Ethanamide is hydrolysed by hot aqueous NaOH.

- (a) Name the two products.
- (b) Write the equation.

Solution 3.3

Worked steps

(a) sodium ethanoate and ammonia **M1** **A1**.

(b) $\text{CH}_3\text{CONH}_2 + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{NH}_3$ **M1** **A1** *products, balanced.*

Exam-style 3.4 ■ 2 marks

Explain why ethanamide is a far weaker base than ethylamine.

Solution 3.4

Worked steps

in ethanamide the nitrogen lone pair is delocalised onto the C=O group **M1**; so it is not available to accept an H^+ , whereas in ethylamine the lone pair is fully available **A1**.