

34.3 Amides

Name: _____ Class: _____ Date: _____

Total: 11 marks

Objective

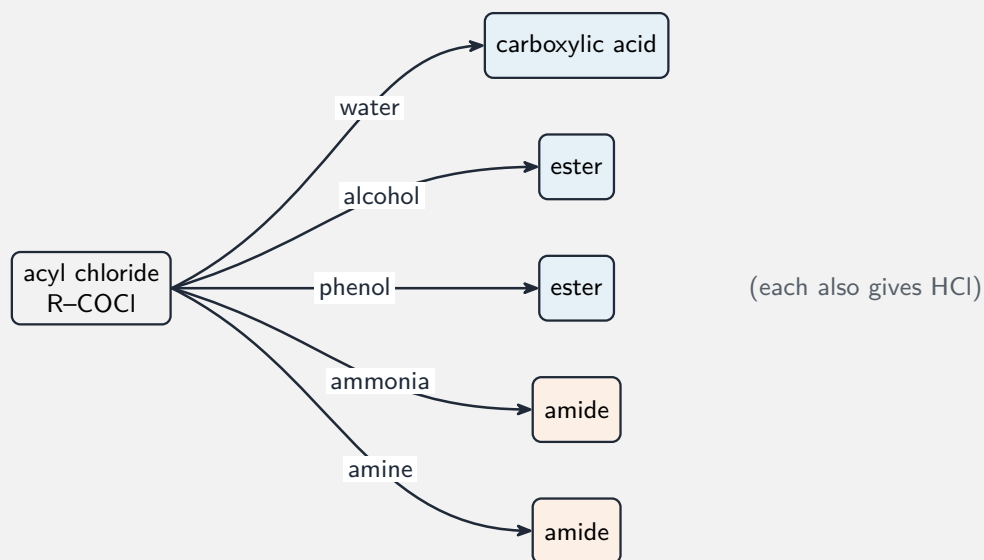
Build the skills to answer exam questions on **amides** 酰胺—making them, their **hydrolysis** 水解 and reduction, and why an amide is a very weak base.

You must be able to:

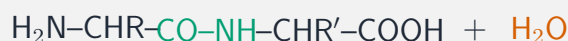
- make an amide from an acyl chloride and ammonia/an amine
- give the products of acid and alkaline hydrolysis of an amide
- explain why an amide is a much weaker base than an amine

1 Worked examples

■ Reactions of amides



An amide is made from an acyl chloride with ammonia or an amine (+ HCl)



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

- **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^+ .

2 Practice

2.1 Give the two reagents used to make ethanamide. [2]

2.2 Name the organic product of reducing ethanamide with LiAlH_4 . [1]

3 Exam-style questions

3.1 Acid hydrolysis of ethanamide gives ethanoic acid and: [1]

- **A** ethylamine
 - **B** an ammonium salt
 - **C** ethanol
 - **D** ethene
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3.2 An amide is a much weaker base than an amine because the nitrogen lone pair is: [1]

- **A** removed completely
 - **B** delocalised onto the adjacent $\text{C}=\text{O}$ group
 - **C** used in a $\text{C}-\text{H}$ bond
 - **D** more available
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3.3 Ethanamide is hydrolysed by hot aqueous NaOH .

(a) Name the two products. [2]

(b) Write the equation.

[2]

3.4 Explain why ethanamide is a far weaker base than ethylamine.

[2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **34.3 Amides** past-paper sheet in the Library, or try these in **Practice mode**:

- 9701/41 N25 —Q9 (amides)
- 9701/41 N25 —Q7 (amides)

Solutions

2.1 ethanoyl chloride; ammonia, NH_3 .

2.2 ethylamine.

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

3.2 B. The N lone pair is delocalised onto the neighbouring $\text{C}=\text{O}$ group.

3.3 (a) sodium ethanoate and ammonia.

(b) $\text{CH}_3\text{CONH}_2 + \text{NaOH} \rightarrow \text{CH}_3\text{COONa} + \text{NH}_3$.

3.4 in ethanamide the nitrogen lone pair is delocalised onto the $\text{C}=\text{O}$ group; so it is not available to accept an H^+ , whereas in ethylamine the lone pair is fully available.