

34.3 Amides

Name: _____ Class: _____ Date: _____

Total: 23 marks**KEY WORDS** amides 酰胺 • hydrolysis 水解 • amine 胺 • reduction 还原 • ammonia 氨

Objective

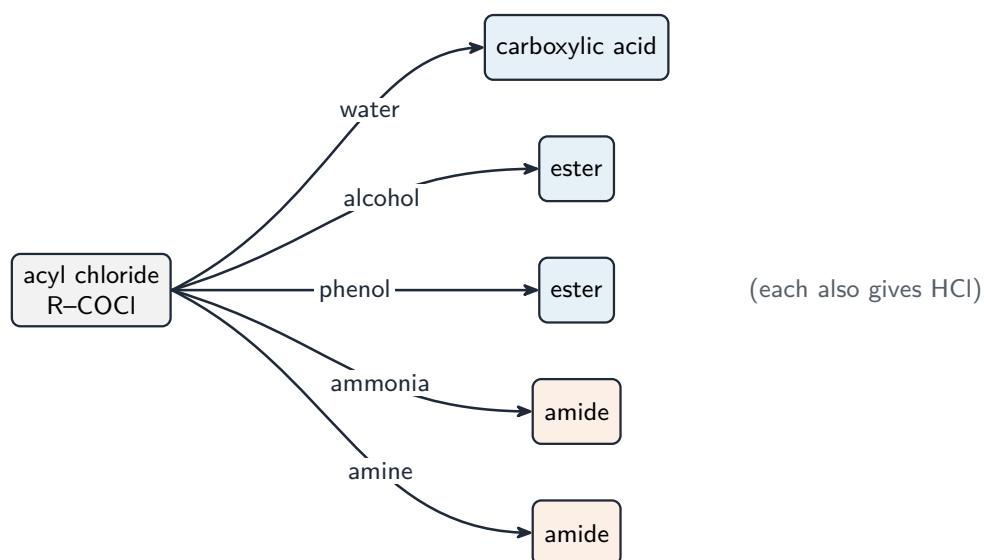
Build the skills to answer exam questions on **amides** 酰胺 — making them, their **hydrolysis** 水解 and reduction, and why an amide is a very weak base.

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)

Amides include the peptide bond

- **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	B
C	D

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

3.2 An amide is a much weaker base than an amine because the nitrogen lone pair is: [1]

A	B
C	D

- 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

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]

3.5 *N*-methylethanamide, $\text{CH}_3\text{CONHCH}_3$, is a secondary amide.

(a) Name the two compounds that react together to make it, and state why an acyl chloride is preferred to the carboxylic acid. [3]

(b) The amide is refluxed with (i) dilute hydrochloric acid and (ii) aqueous sodium hydroxide. Give the organic products in each case. [4]

(c) The amide is reduced with LiAlH_4 in dry ether. Name the product and give the equation using $[\text{H}]$. [2]

(d) Explain why an amide is a far weaker base than an amine. [3]
