

# 35.1 Condensation polymerisation

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 9 marks

**KEY WORDS** monomer 单体 • repeat unit 重复单元 • polyester 聚酯 • polyamide 聚酰胺  
• condensation polymerisation 缩合聚合

## Objective

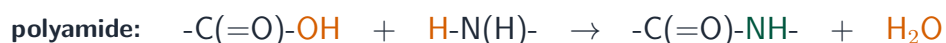
Build the skills to answer exam questions on **condensation polymerisation** 缩合聚合 — making **polyesters** 聚酯 and **polyamides** 聚酰胺, and finding the **monomers** 单体 or **repeat unit** 重复单元.

You must be able to:

- describe condensation polymerisation (two-group monomers, a small molecule lost)
- name the monomers for a polyester or polyamide
- deduce the monomers/repeat unit from a section of polymer

## 1 Worked examples

### ■ Links and monomers



every new ester or amide link loses a small molecule (condensation)

*A polyester forms ester links, a polyamide forms amide links; each new link releases a small molecule (e.g. water)*

- **condensation:** each monomer has **two** reactive groups; a small molecule (water or HCl) is lost at each link.
- **polyester** = diol + dicarboxylic acid (or diolyl chloride); **polyamide** = diamine + dicarboxylic acid.

polyester (ester links)



break each link; add back  $-\text{OH}$  and  $-\text{H}$



diol



dicarboxylic acid

*To find the monomers, break the chain at each link and add back  $-\text{OH}$  and  $-\text{H}$  to the cut ends*

## 2 Practice

**2.1** Name the small molecule lost when a diol and a dicarboxylic acid form a polyester. [1]

**2.2** Name the type of link in a polyamide. [1]

## 3 Exam-style questions

**3.1** A polyamide is made from: [1]

|   |   |
|---|---|
| A | B |
| C | D |

**A** an alkene only

**B** a diol and a dicarboxylic acid

**C** a diamine and a dicarboxylic acid

**D** a single alcohol

**3.2** When a section of polyester is hydrolysed, the monomers recovered are: [1]

|   |   |
|---|---|
| A | B |
| C | D |

**A** two alkenes

**B** a diol and a dicarboxylic acid

**C** two diamines

**D** an amino acid only

**3.3** A polyester has the repeat unit  $-\text{O}-\text{CH}_2\text{CH}_2-\text{O}-\text{CO}-\text{C}_6\text{H}_4-\text{CO}-$ .

(a) Draw the two monomers.

[2]

(b) Name the small molecule lost when they polymerise.

[1]

**3.4** Explain why each monomer in a condensation polymer must have **two** functional groups.

[2]