

35.2 Predicting the type of polymerisation

Name: _____ Class: _____ Date: _____

Total: 9 marks

Objective

Build the skills to answer exam questions on **predicting the type of polymerisation**
判断聚合类型—telling **addition** 加成聚合 from **condensation** 缩合聚合 from the monomer and the product.

You must be able to:

- use the monomer's structure to predict the polymerisation type
- recognise addition ($C=C$, nothing lost) vs condensation (two groups, small molecule lost)

1 Worked examples

■ Which type?

addition polymerisation

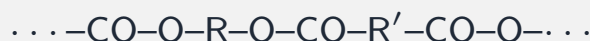
- monomer has a $C=C$
- the double bond opens and the monomers join
- **nothing else** is lost
e.g. ethene $\rightarrow$ poly(ethene)

condensation polymerisation

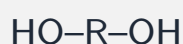
- each monomer has **two** functional groups
- a **small molecule** (H_2O or HCl) is lost
- ester or amide links form
e.g. a polyester or polyamide

Addition opens a $C=C$ and loses nothing; condensation joins two-group monomers and loses a small molecule

polyester (ester links)



break each link; add back $-OH$ and $-H$



Clue	Type
monomer has a C=C, nothing else lost	addition
each monomer has two functional groups; a small molecule is lost; chain has ester/amide links	condensation

2 Practice

2.1 State the type of polymerisation when ethene forms poly(ethene). [1]

2.2 State the type of polymerisation when a small molecule is lost at each link. [1]

3 Exam-style questions

3.1 A monomer with **one** C=C and no other functional group will undergo: [1]

- **A** addition polymerisation
 - **B** condensation polymerisation
 - **C** neither
 - **D** hydrolysis
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3.2 Which observation shows that a polymer formed by **condensation**? [1]

- **A** the monomer had a C=C
 - **B** no small molecule was lost
 - **C** water (or HCl) was released and the chain has ester/amide links
 - **D** the polymer is an alkene
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3.3 For each monomer, predict the type of polymerisation and justify it: [3]

(a) $\text{CH}_2=\text{CHCl}$ (chloroethene)

(b) $\text{HOCH}_2\text{CH}_2\text{OH} + \text{HOOC}(\text{CH}_2)_4\text{COOH}$

(c) a single amino acid $\text{H}_2\text{NCH}_2\text{COOH}$

3.4 Explain how you could tell, from the **product** alone, whether a polymer was made by addition or condensation. [2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **35.2 Predicting polymerisation type** material in the Library, or try this in **Practice mode**:

- 9701/42 N25 —Q8 (polymerisation type)

Solutions

2.1 addition polymerisation.

2.2 condensation polymerisation.

3.1 A. One $C=C$ and nothing lost $\rightarrow$ addition polymerisation.

3.2 C. Releasing a small molecule and having ester/amide links shows condensation.

3.3 (a) addition —it has a $C=C$ and nothing is lost.

(b) condensation —two two-group monomers join, losing water $\rightarrow$ polyester.

(c) condensation —the amino acid has two groups ($-NH_2$ and $-COOH$), losing water $\rightarrow$ polyamide.

3.4 an addition polymer has a saturated $C-C$ backbone with no links (the repeat unit is just the monomer); a condensation polymer has ester or amide links along the chain, which can be hydrolysed back to two monomers.