

## 20.1 Addition polymerisation

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

Total: 10 marks

**KEY WORDS** repeat unit 重复单元 • monomer 单体 • addition polymerisation 加成聚合  
 • polymer 聚合物 • poly(ethene) 聚乙烯

### Objective

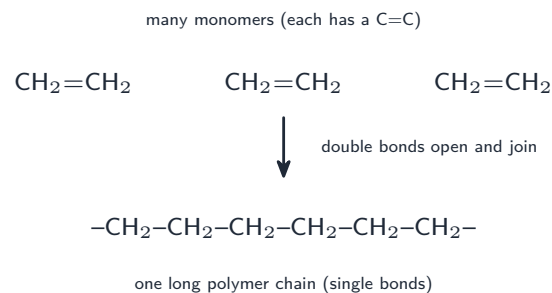
Build the skills to answer exam questions on **addition polymerisation** 加成聚合 — drawing **repeat units** 重复单元, finding **monomers** 单体, and the problems of disposal.

You must be able to:

- describe addition polymerisation (poly(ethene), PVC)
- deduce the repeat unit from a monomer, and the monomer from a polymer
- explain the difficulty of disposing of poly(alkene)s

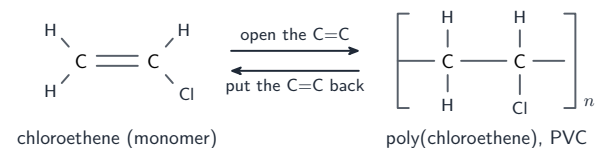
### 1 Worked examples

#### ■ Addition polymerisation

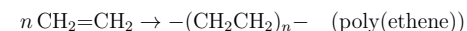


*Many unsaturated monomers join into one long chain, with no other product*

#### ■ Repeat unit and monomer

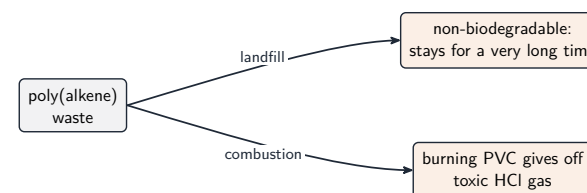


*Repeat unit: change the monomer's C=C to a single bond and draw bonds out at each end*



To find the **monomer** from a polymer: take one repeat unit and put the C=C back.

#### ■ Disposal



*Poly(alkene)s are **non-biodegradable** and their combustion can release harmful gases (e.g. PVC gives toxic HCl)*

### 2 Practice

**2.1** State what is meant by the **repeat unit** of a polymer. [1]

\_\_\_\_\_

**2.2** State **two** problems of disposing of poly(alkene)s. [2]

\_\_\_\_\_

\_\_\_\_\_

### 3 Exam-style questions

**3.1** Which feature must a monomer have to undergo addition polymerisation? [1]

- **A** an –OH group
- **B** a C=C double bond
- **C** a benzene ring
- **D** an ionic bond

**3.2** Burning PVC is a particular problem because it releases: [1]

- **A** carbon dioxide only
- **B** toxic hydrogen chloride
- **C** water vapour
- **D** nitrogen

**3.3** Propene is  $\text{CH}_3\text{CH}=\text{CH}_2$ .

(a) Draw the repeat unit of poly(propene). [2]

(b) A section of a polymer is  $-(\text{CH}_2\text{CHCl})_n-$ . Draw the monomer it was made from. [1]

**3.4** Explain why addition polymers are described as non-biodegradable. [2]

### Solutions

**2.1** the small part that is repeated again and again along the polymer chain.

**2.2** non-biodegradable (microbes cannot break them down); combustion releases harmful/toxic gases.

**3.1 B.** The monomer needs a C=C double bond.

**3.2 B.** Burning PVC releases toxic hydrogen chloride.

**3.3** (a)  $-(\text{CH}_2\text{CH}(\text{CH}_3))_n-$  drawn with bonds out at each end.  
(b) chloroethene,  $\text{CH}_2=\text{CHCl}$ .

**3.4** the C–C backbone is strong and unreactive, so microbes/enzymes cannot break it down, and it persists in the environment.