

4.3 Synthetic polymers

Name: _____ Class: _____ Date: _____

Total: 21 marks

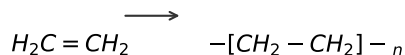
Objective

Cover synthetic polymers (4.44–4.50C): addition polymerisation from monomers, drawing repeat units and recovering monomers, disposal problems, (C) condensation polymerisation to polyesters. Original IGCSE-level practice.

1 Key knowledge and worked examples

■ Monomer to repeat unit

monomer: ethene repeat unit of poly(ethene)



open the C=C double bond, draw the two bonds out to the brackets

Open the C=C into two single bonds pointing out, wrap in brackets with n. Reverse it to recover the monomer: close the two outward bonds into a C=C. Required examples: poly(ethene), poly(propene), poly(chloroethene), PTFE.

■ Why polymers are a disposal problem

They are **inert and do not biodegrade** – they persist in landfill; burning can release **toxic gases**.

■ (C) Condensation to polyester

A **dicarboxylic acid** + **diol** link through ester bonds, releasing **water** at each link – a polyester chain. Some polyesters (biopolyesters) biodegrade.

2 Practice

2.1 Define monomer and addition polymer. [2]

2.2 Draw or describe the repeat unit of poly(propene), given propene $CH_3-CH=CH_2$. [2]

2.3 Name the monomer of poly(chloroethene). [1]

2.4 Give two problems in disposing of addition polymers. [2]

2.5 (C) What two monomers react in condensation polymerisation, and what small molecule forms? [3]

3 Exam-style questions

3.1 Chloroethene polymerises. Draw the monomer's displayed formula and the repeat unit of poly(chloroethene), and state how the two drawings relate. [4]

3.2 Explain why most addition polymers do not rot in landfill, and one problem with burning them. [3]

3.3 (C) Ethanedioic acid ($\text{HOOC}-\text{COOH}$) reacts with ethanediol ($\text{HO}-\text{CH}_2-\text{CH}_2-\text{OH}$). Describe the polymer formed and write what is released at each link. ^[4]
