

Exercise walk-through

4.3

Synthetic polymers

Pearson Edexcel · International GCSE · Chemistry

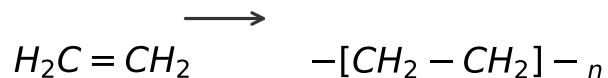
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The method

Method — Monomer to repeat unit

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.

monomer: ethene repeat unit of poly(ethene)



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

Method — Why polymers are a disposal problem

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

Exercises 2.1·2.3

2.1 Define monomer and addition polymer. [2]

2.2 Draw or describe the repeat unit of poly(propene), given propene $\text{CH}_3\text{--CH=CH}_2$. [2]

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

Exercises 2.1·2.3

2.1 Define monomer and addition polymer. [2]

2.1 Monomer – a small molecule that joins to many others; addition polymer – a long chain of monomers joined by addition, opening C=C.

2.2 Draw or describe the repeat unit of poly(propene), given propene $\text{CH}_3\text{--CH=CH}_2$. [2]

2.2 $-\text{[CH(CH}_3\text{)--CH}_2\text{]}_n-$: brackets around the two carbons with the CH_3 side group, single bonds out, subscript n.

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

2.3 Chloroethene.

Exercises 2.4·3.1

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]

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

Exercises 2.4·3.1

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

2.4 Inert – do not biodegrade, so they persist; burning releases toxic gases.

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

2.5 (C) A dicarboxylic acid and a diol; water.

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]

3.1 Monomer: $\text{H}_2\text{C}=\text{CHCl}$ displayed with the double bond. Repeat unit: $-\text{[CH}_2\text{-CHCl]}-\text{}$ _n – brackets, single bonds out, n. Relation: the double bond opens into the two outward single bonds of the repeat unit.

Exercises 3.2·3.3

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]

Exercises 3.2·3.3

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

3.2 Their C–C bonded chains are inert – no enzymes break them, so microbes cannot rot them; burning can release toxic gases such as hydrogen chloride from PVC.

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]

3.3 (C) A polyester – ester links ($-\text{COO}-$) join the two monomers alternately into a long chain; each link releases one molecule of water: the acid's $-\text{OH}$ + the alcohol's $-\text{H}$.