Exercise walk-through

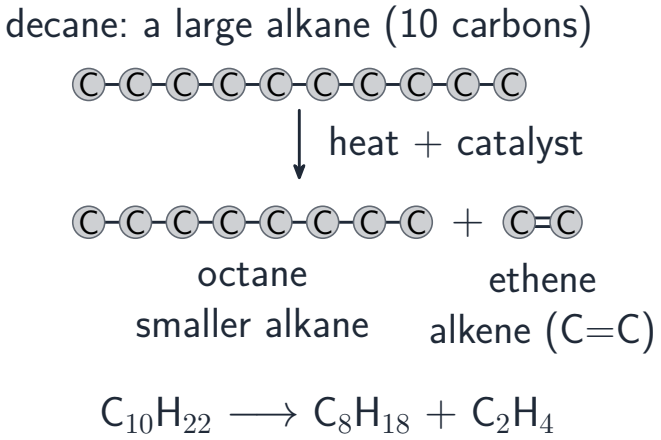
7.3 Synthetic and naturally occurring polymers (4.7.3.1–4.7.3.2)

AQA · GCSE · Chemistry

Cracking and alkenes

- **Crude oil** contains more large hydrocarbons than we need, and fewer small ones such as petrol. **Cracking** breaks long **hydrocarbon** molecules into shorter, more useful ones.
- In catalytic **cracking**, the vapour is passed over a hot catalyst; in steam cracking, it is mixed with steam at a very high temperature.
- Cracking makes smaller alkanes, which are useful fuels, and alkenes, which are used to make polymers and other chemicals.
- **Worked example 4.** Balance $\mathrm{C_{10}H_{22}} \rightarrow \mathrm{C_8H_{18}} + \mathrm{X}$.

Figure: Cracking and alkenes



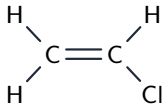
- Heat and a catalyst break the chain.
- One product is always an **alkene**.

Condensation polymers and natural polymers (chemistry only)

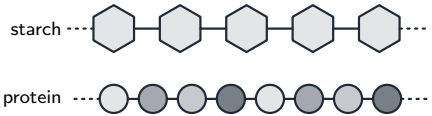
- DNA is two polymer chains wound into a **double helix** ; each chain is made from four different monomers, each a **nucleotide** . DNA carries the genetic instructions for living things.
- Proteins are polymers of amino acids.
- Starch and cellulose are both polymers of glucose, but the glucose units are joined differently, so starch stores energy in plants while cellulose makes their cell walls.

Exercises 2.1·2.2

2.1 This is the monomer chloroethene. Name the polymer made from it, and the type of polymerisation. [2]

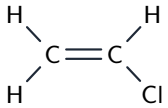


2.2 The diagram shows parts of a starch molecule and a protein molecule. Name the monomer of starch and the monomers of proteins. [2]



Exercises 2.1·2.2

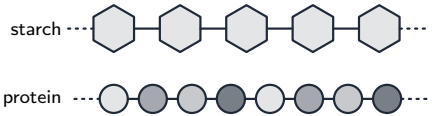
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2.1

- **poly(chloroethene)** (accept PVC); addition polymerisation

2.2 The diagram shows parts of a starch molecule and a protein molecule. Name the monomer of starch and the monomers of proteins. [2]

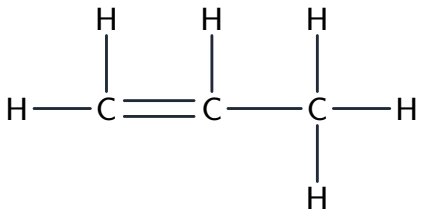


2.2

- starch: glucose, or sugar; proteins: amino acids

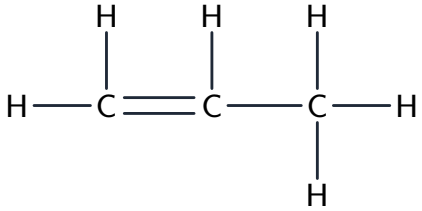
Exercise 3.1

3.1 Propene forms poly(propene). Draw the repeat unit of poly(propene). [3]



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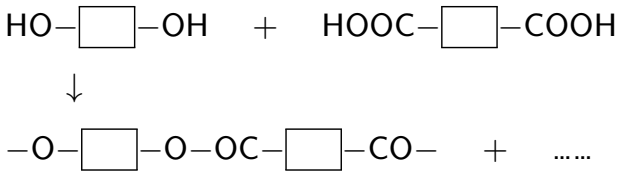
3.1

- two carbon atoms joined by a single bond, with three H and one CH_3
- bonds that go out through the brackets
- brackets with n after them

Exercise 3.2 (a)

3.2 (HT) A polyester is made from two monomers. The diagram shows the monomers, with each box standing for a group of atoms.

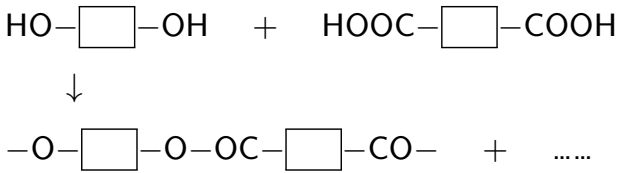
(a) Name the type of polymerisation, and the small molecule that is made. [2]



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3.2 (HT) A polyester is made from two monomers. The diagram shows the monomers, with each box standing for a group of atoms.

(a) Name the type of polymerisation, and the small molecule that is made. [2]



(a) condensation; water

Exercise 3.2 (b)

3.2 (HT) A polyester is made from two monomers. The diagram shows the monomers, with each box standing for a group of atoms.

(b) Explain how this polymerisation is different from the polymerisation of ethene. [3]

Exercise 3.2 (b)

3.2 (HT) A polyester is made from two monomers. The diagram shows the monomers, with each box standing for a group of atoms.

(b) Explain how this polymerisation is different from the polymerisation of ethene. [3]

(b) it uses two different monomers; each monomer has two functional groups; a small molecule (water) is lost at each link, but addition makes only the polymer

Exercise 3.2 (c)

3.2 (HT) A polyester is made from two monomers. The diagram shows the monomers, with each box standing for a group of atoms.

(c) Proteins are also condensation polymers. Name the **two** functional groups in an amino acid. [2]

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3.2 (HT) A polyester is made from two monomers. The diagram shows the monomers, with each box standing for a group of atoms.

(c) Proteins are also condensation polymers. Name the **two** functional groups in an amino acid. [2]

(c) amino group, $-NH_2$; carboxyl group, $-COOH$

Exercise 3.2 (d)

3.2 (HT) A polyester is made from two monomers. The diagram shows the monomers, with each box standing for a group of atoms.

(d) Describe the structures of DNA, proteins, starch and cellulose, and the monomers that form them. [6]

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(d) points to include:

- DNA is made of two polymer chains twisted into a double helix
- the monomers of DNA are nucleotides, which contain four different bases
- proteins are chains of amino acids (polypeptides), folded into shapes
- different orders of amino acids give different proteins
- starch and cellulose are both made of glucose (a sugar)
- they are condensation polymers: water is lost as the monomers join

Levels: **5–6** a full, logical answer with correct chemistry and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.