AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.7.3.2

Condensation polymerisation (HT only)

Past-paper questions

Tier	**Higher**
Question groups	**7**
Available paper years	**2009–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.7.3.2 Condensation polymerisation (HT only)

Question 01

March 2009 | CHY1BP | Original Q4 | Legacy

QUESTION FOUR

Scientists have developed a process to convert plastics such as nylon back to their original monomers.

4A What is the monomer used to make the polymer called poly(chloroethene)?

1 ethene

2 ethane

3 chloroethene

4 chloroethane

4B Which of the following is **not** an advantage of returning a polymer back to its monomer?

1 reduces the amount of plastic going into landfill sites

2 oil reserves will last longer

3 uses up excess supplies of monomers

4 avoids recycling of plastics

4C Plastics that can be broken down by microorganisms are described as . . .

1 unsaturated.

2 thermosetting.

3 thermoplastic.

4 biodegradable.

4D At a supermarket, customers can get vouchers for school equipment when they use their own bags for shopping.

The advantage of this scheme is that . . .

1 the supermarket can order more bags.

2 less plastic has to be manufactured.

3 queues will be shorter.

4 the plastic will be easier to recycle.

4.7.3.2 Condensation polymerisation (HT only)

Question 02

0 6 This question is about polymers.

0 6 . 1 Polyesters are produced when monomers join together and lose a small molecule.

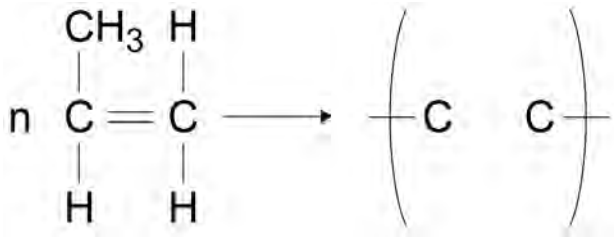
Name the small molecule lost.

[1 mark]

0 6 . 2 Poly(propene) is produced from propene.

Complete the structure of poly(propene) in the equation.

[3 marks]



0 6 . 3 Carpets are made from:

- poly(propene)
- wool
- a mixture of poly(propene) and wool.

Poly(propene) wears out more slowly than wool.

A mixture of poly(propene) and wool to make carpets is more sustainable than using just poly(propene) or just wool.

Suggest why.

[2 marks]

4.7.3.2 Condensation polymerisation (HT only)

Question 02 · continued

Polymer fibres are used to make firefighter uniforms.

Table 3 shows some properties of two polymer fibres.

Table 3

	Polymer fibres	
Property	**Poly(propene)**	**Polyester**
Density in g/cm^3	0.90	1.38
Melting point in °C	165	260
Flame resistance	Poor	Good
Water absorption	Low	High

0 6 . 4 Evaluate the suitability of poly(propene) and polyester for firefighter uniforms.

[4 marks]

10

4.7.3.2 Condensation polymerisation (HT only)

Question 03

June 2019 | 8462/2H | Original Q6

0 6 **Figure 5** shows a surfer on a surfboard.

Figure 5



Surfboards are made from polymers.

Surfboards have a poly(styrene) core and an outer skin.

0 6 . 1 **Figure 6** shows the displayed structural formula of poly(styrene).

Figure 6

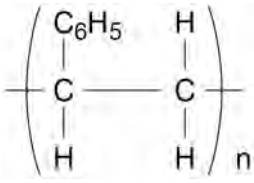
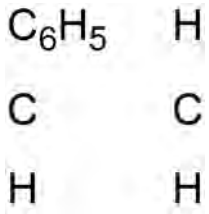


Figure 7 shows an incomplete displayed structural formula of the monomer styrene.

Complete **Figure 7**.

[2 marks]

Figure 7



4.7.3.2 Condensation polymerisation (HT only)

Question 03 · continued

The outer skin of surfboards contains a polyester.

Two monomers, **A** and **B**, are needed to make the polyester.

Figure 8 shows how these two monomers are represented.

Figure 8



Monomer **A** Monomer **B**

0 6 . 2 Name the functional group in monomer **B**.

[1 mark]

0 6 . 3 Monomers **A** and **B** join together to produce a polyester and a small molecule.

Name the small molecule.

[1 mark]

0 6 . 4 Why does this type of polyester melt when it is heated?

[2 marks]

4.7.3.2 Condensation polymerisation (HT only)

Question 03 · continued

The outer skin of surfboards is a composite material.

The composite material contains glass fibres surrounded by a polyester.

0 6 . 5 Draw **one** line from each material to the description of that material.

[2 marks]

Material	Description of the material
	Hydrocarbon
Glass fibres	Matrix
	Monomer
Polyester	Polypeptide
	Reinforcement

0 6 . 6 The outer skin makes the surfboard more expensive.

Suggest **two** reasons why an outer skin is added to the poly(styrene) core.

[2 marks]

1 _____

_____

2 _____

_____

10

4.7.3.2 Condensation polymerisation (HT only)

Question 04

November 2020 | 8462/2H | Original Q7

0 7 This question is about carboxylic acids.

Carboxylic acids belong to a homologous series.

Table 3 shows information about the first three carboxylic acids in this homologous series.

Table 3

Name	Formula	pH of a 0.01 mol/dm^3 solution
Methanoic acid		2.91
Ethanoic acid	CH_3COOH	3.39
	CH_3CH_2COOH	3.44

0 7 . 1 Complete **Table 3**.

[2 marks]

0 7 . 2 Ethanoic acid ionises in water.

The equation for the reaction is:

$$CH_3COOH(aq) \rightleftharpoons CH_3COO^-(aq) + H^+(aq)$$

Explain how the equation shows that ethanoic acid is a weak acid.

[2 marks]

4.7.3.2 Condensation polymerisation (HT only)

Question 04 · continued

0 7 . 3 A student adds a solution of ethanoic acid to zinc carbonate in an open flask on a balance.

Explain what happens to the mass of the flask and its contents during the reaction.

[3 marks]

0 7 . 4 The student compares the rates of the reaction of zinc carbonate with:

- 0.01 mol/dm^3 methanoic acid
- 0.01 mol/dm^3 ethanoic acid.

The rate of the reaction with methanoic acid is greater than the rate of the reaction with ethanoic acid.

Explain why.

You should refer to ions in your answer.

Use **Table 3**.

[3 marks]

4.7.3.2 Condensation polymerisation (HT only)

Question 04 · continued

Ethanoic acid reacts with ethanol to produce an ester.

0 7 . 5 Give the name of the ester produced when ethanoic acid reacts with ethanol.

[1 mark]

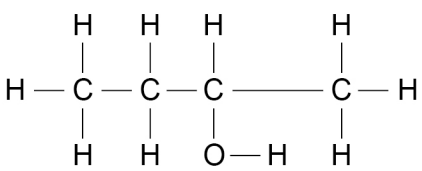
0 7 . 6 Hexanedioic acid and ethanediol join together to produce a polyester.

Ethanoic acid and ethanol join together in the same way to produce an ester.

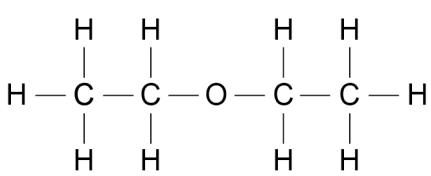
Which is the displayed structural formula of the ester produced when ethanoic acid reacts with ethanol?

[1 mark]

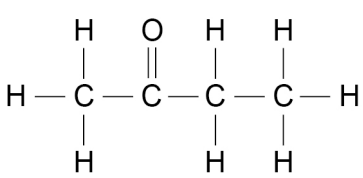
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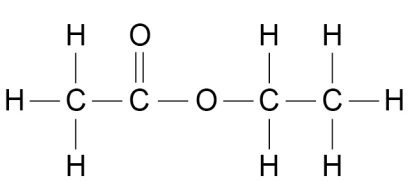
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☐

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4.7.3.2 Condensation polymerisation (HT only)

Question 05

November 2020 | 8462/2H | Original Q9

0 9 This question is about algae.

A student:

- placed algae in water containing dissolved carbon dioxide
- shone bright light on the algae.

Gas bubbles were collected as the algae photosynthesised.

0 9 . 1 Describe a test that would identify the gas collected.

Give the result of the test.

[2 marks]

Test _____

Result _____

_____

0 9 . 2 Glucose is produced when algae photosynthesise.

Name **two** naturally occurring polymers produced from glucose.

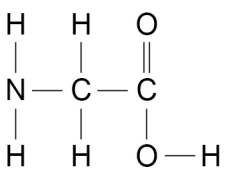
[2 marks]

_____ and _____

Question 9 continues on the next page

Figure 6 shows the displayed structural formula of an amino acid called glycine.

Figure 6



0 9 . 3 How many functional groups are there in the molecule in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

1 ☐ 2 ☐ 3 ☐ 4 ☐

0 9 . 4 Glycine reacts by condensation polymerisation to produce a polypeptide and one other substance.

Name the other substance produced.

[1 mark]

_____

0 9 . 5 Scientists think that algae may have used gases in Earth's early atmosphere.

Algae need an element to produce the molecule in **Figure 6** which is **not** present in water or carbon dioxide.

Which **two** gases from Earth's early atmosphere could have provided this element?

[2 marks]

_____ and _____

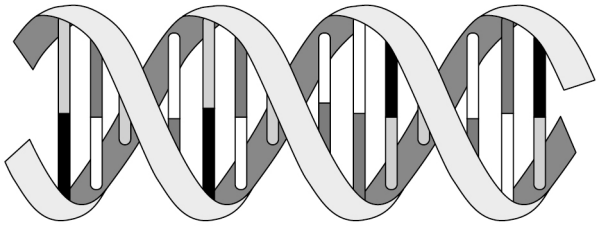
4.7.3.2 Condensation polymerisation (HT only)

Question 05 · continued

0 9 . 6 The development and function of algae are controlled by a naturally occurring polymer.

Figure 7 represents the shape and structure of this polymer.

Figure 7



Describe the shape and structure of this polymer.

[3 marks]

11

4.7.3.2 Condensation polymerisation (HT only)

Question 06

November 2021 | 8462/2H | Original Q4

0 4 This question is about poly(ethene) and polyesters.

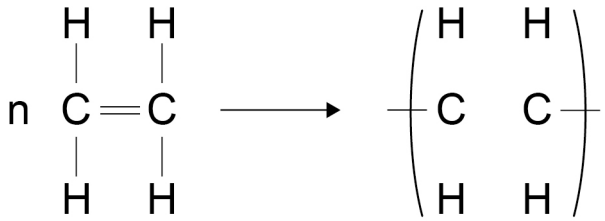
0 4 . 1 Poly(ethene) is produced from ethene.

Figure 3 shows part of the displayed structural formula equation for the reaction.

Complete **Figure 3**.

[2 marks]

Figure 3



0 4 . 2 Poly(ethene) is a thermosoftening polymer.

Suggest why poly(ethene) is easier to recycle than thermosetting polymers.

[2 marks]

0 4 . 3 Ethene produces different forms of poly(ethene).

How can different forms of poly(ethene) be produced from ethene?

[1 mark]

4.7.3.2 Condensation polymerisation (HT only)

Question 06 · continued

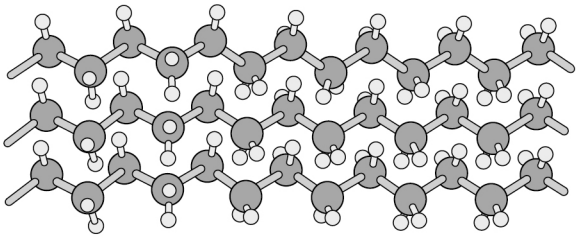
0 4 . 4 Two different forms of poly(ethene) are:

- high density poly(ethene) (HDPE)
- low density poly(ethene) (LDPE).

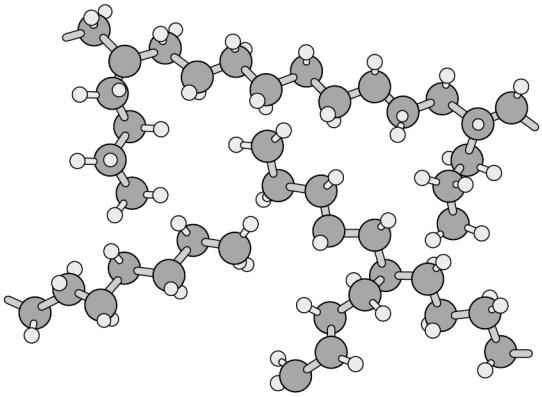
Figure 4 represents part of the structures of HDPE and LDPE.

Figure 4

HDPE



LDPE



Explain why HDPE has a higher density than LDPE.

[2 marks]

Question 4 continues on the next page.

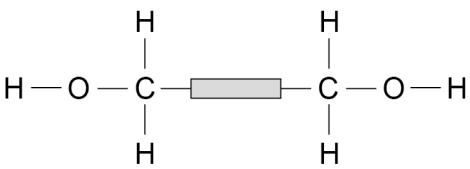
4.7.3.2 Condensation polymerisation (HT only)

Question 06 · continued

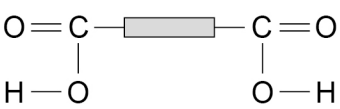
Figure 5 shows three monomers, **A**, **B** and **C**.

Monomer **A** can react with monomer **B** and with monomer **C** to produce polyesters.

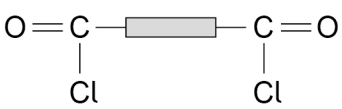
Figure 5



Monomer **A**



Monomer **B**



Monomer **C**

0 4 . 5 Draw a circle on **Figure 5** around an alcohol functional group.

[1 mark]

0 4 . 6 Complete **Table 2** to show the formula of the small molecule produced when:

- monomer **A** reacts with monomer **B**
- monomer **A** reacts with monomer **C**.

[1 mark]

Table 2

Reacting monomers	Formula of small molecule produced
A and **B**	
A and **C**	

9

4.7.3.2 Condensation polymerisation (HT only)

Question 07

June 2025 | 8462/2H | Original Q7

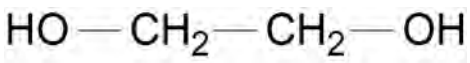
0 7 This question is about polymers.

A condensation polymer is produced from two different compounds, **A** and **B**.

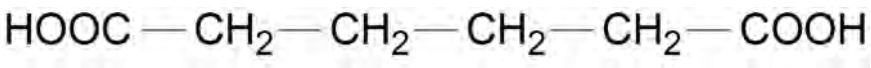
Figure 4 represents a molecule of **A** and a molecule of **B**.

Figure 4

A



B



0 7 . 1 Name compound **A** and compound **B**.

[2 marks]

A _____

B _____

0 7 . 2 Compound **A** and compound **B** react to produce a condensation polymer.

Name the type of condensation polymer produced from compound **A** and compound **B**.

[1 mark]

_____

0 7 . 3 Name the small molecule lost when molecules of compound **A** and of compound **B** react.

[1 mark]

_____

4.7.3.2 Condensation polymerisation (HT only)

Question 07 · continued

Glycine is an amino acid.

Glycine can produce condensation polymers.

0 7 . 4 Name the type of condensation polymer produced when glycine polymerises.

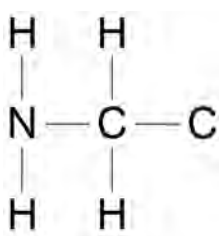
[1 mark]

_____

0 7 . 5 Complete **Figure 5** to show the displayed structural formula of glycine.

[1 mark]

Figure 5



0 7 . 6 Which polymer is produced when different amino acids are combined in the same chain?

[1 mark]

Tick (✓) **one** box.

- Cellulose ☐
- DNA ☐
- Protein ☐
- Starch ☐

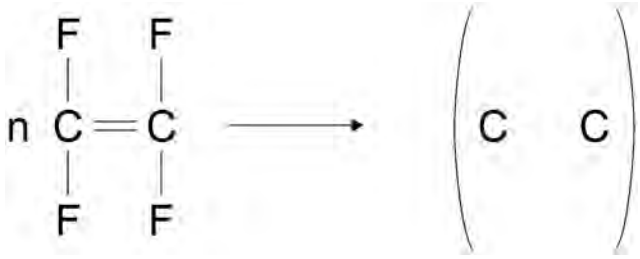
4.7.3.2 Condensation polymerisation (HT only)

Question 07 · continued

The polymer poly(tetrafluoroethene) is produced from the monomer tetrafluoroethene (C_2F_4).

0 7 . 7 Complete the equation for the production of poly(tetrafluoroethene) from tetrafluoroethene.

[3 marks]



0 7 . 8 Poly(tetrafluoroethene) is a thermosoftening polymer.

Some other polymers are thermosetting polymers.

Describe the structure of a thermosetting polymer.

[2 marks]

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