

GCSE Chemistry

Worksheet: DNA and other naturally occurring polymers

TIME 25 min	TOTAL 24 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: DNA and other naturally occurring polymers

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0	1
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0	1	.	1
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 What are the monomers of starch?

Tick (✓) **one** box.

Sugars (glucose)

☐

Amino acids

☐

Nucleotides

☐

Alkenes

☐

[1 mark]

0	1	.	2
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 What are the monomers of proteins?

Tick (✓) **one** box.

Sugars

☐

Amino acids

☐

Nucleotides

☐

Esters

☐

[1 mark]

0 1 . 3

What are the monomers of DNA?

Tick (✓) **one** box.

Sugars

☐

Amino acids

☐

Nucleotides

☐

Alkanes

☐

[1 mark]

0 1 . 4

Give the name of the shape of a DNA molecule.

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.....

.....

[1 mark]

0 2

0 2 . 1

Which of these is a monomer, **not** a polymer?

Tick (✓) **one** box.

Starch

☐

Cellulose

☐

A protein

☐

Glucose

☐

[1 mark]

0 2 . 2

Name the monomers that join together to make proteins.

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[1 mark]

0 2 . 3

What name is given to the four different monomers that make up DNA?

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[1 mark]

0 3

Starch and cellulose, obtained from plants, are being investigated as renewable raw materials for making bioplastics, as an alternative to synthetic addition polymers made from crude oil.

0 3 . 1

Suggest **two** advantages of using starch or cellulose from plants, rather than crude oil, as a raw material for making plastics.

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[2 marks]

0 4

Table 1 compares the number of different types of monomer used to build four natural polymers.

Table 1

Polymer	Number of different types of monomer used
Starch	1 (glucose)
Cellulose	1 (glucose)
A protein	up to 20 (different amino acids)
DNA	4 (different nucleotides)

0 4 . 1

Use Table 1 to identify which polymer is likely to show the greatest variety of different molecules with different sequences of monomers, for a chain of a given length.

Explain your answer.

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[2 marks]

0 5

A scientist extracts three natural polymers, A, B and C, from a plant. Each polymer is broken down completely by reaction with water, and the products are identified:

- polymer A gives only glucose
- polymer B gives about 20 different amino acids
- polymer C gives four different nucleotides.

0 5 . 1

Identify polymers A, B and C.

Compare the structures of the three polymers, and explain which polymer carries genetic information.

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[6 marks]

0 6

Starch and cellulose are both natural polymers made only from glucose monomers, but they have very different properties: starch is used by plants to store energy, while cellulose forms strong, rigid plant cell walls.

0 6 . 1

Suggest why starch and cellulose can have such different properties, even though they are made from the same monomer.

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[2 marks]

0 7

DNA (deoxyribonucleic acid) is a large molecule that is essential for life.

0 7 . 1

Describe the structure of a DNA molecule.

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[3 marks]

0 7 . 2

What is the function of DNA?

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[1 mark]

0 7 . 3

Starch and cellulose are also naturally occurring polymers.
Name the monomer used to make both starch and cellulose.

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[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Chemistry · Worksheet: DNA and other naturally occurring polymers · 24 marks

Question 1 (4 marks)

01.1 [1 mark]

Correct: Sugars (glucose)

01.2 [1 mark]

Correct: Amino acids

01.3 [1 mark]

Correct: Nucleotides

01.4 [1 mark]

Answer: Double helix

- double helix (1)
-

Question 2 (3 marks)

02.1 [1 mark]

Correct: Glucose

02.2 [1 mark]

Answer: Amino acids

- amino acids (1)
-

02.3 [1 mark]

Answer: Nucleotides

- nucleotides (1)
-

Question 3 (2 marks)

03.1 [2 marks]

Answer: Plants are a renewable resource, unlike crude oil, which is finite; growing the plants also absorbs carbon dioxide from the atmosphere as they grow.

- plants are a renewable resource, so they will not run out, unlike crude oil which is a finite resource (1)
- growing the plants absorbs carbon dioxide from the atmosphere, which can help offset carbon dioxide released later (1)
- plastics made from starch or cellulose may be more biodegradable than conventional crude-oil-based plastics (1)

Any 2 of the points above.

Question 4 (2 marks)

04.1 [2 marks]

Answer: Protein: with up to 20 different possible monomers at each position along the chain, far more different sequences are possible than with only 1 type of monomer (starch, cellulose) or 4 types (DNA).

- a protein (1)
 - with up to 20 different amino acids possible at each position, many more different sequences are possible than with a polymer built from only 1 (starch, cellulose) or 4 (DNA) different types of monomer (1)
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Question 5 (6 marks)

05.1 [6 marks]

Answer: A is starch or cellulose (made from glucose only), B is a protein (made from many different amino acids) and C is DNA (made from four different nucleotides). All are natural polymers. A has the same repeating unit all along its chains; B and C have sequences of different monomers. DNA is two polymer chains in a double helix, and the sequence of its four nucleotides carries the genetic instructions for the growth, development, functioning and reproduction of the organism.

Levels of response

- **Level 3 (5–6)** A detailed, coherent answer. Relevant points are accurate, linked in a logical sequence and use correct scientific terms.
- **Level 2 (3–4)** Several relevant points with some linking, but the answer has gaps, errors or lacks detail.
- **Level 1 (1–2)** Simple statements making one or two relevant points, with little or no linking.
- **No marks (0)** Nothing relevant or worthy of credit.

Indicative content

- A is starch or cellulose; B is a protein (polypeptide); C is DNA
- all three are naturally occurring polymers: very large molecules made from many monomers joined together
- A is made from only one type of monomer (glucose), so its chains have the same repeating unit all the way along
- B is made from many different amino acids joined in chains, so there are very many possible sequences — which is why there are so many different proteins
- C (DNA) consists of two polymer chains, made from four different nucleotides, in the form of a double helix
- DNA carries genetic information: the order (sequence) of the four different nucleotides along the chains encodes the genetic instructions
- these instructions are used for the growth, development, functioning and reproduction of living organisms; a polymer made from only one type of monomer, such as starch, cannot carry information in its sequence

Notes: Allow 'deoxyribonucleic acid' for DNA. Base pairing is not required.

Level 3 (5–6 marks): identifies all three polymers, compares their monomers (one type, many types, four types) and structures (including the double helix of DNA), and explains that the varying sequence of nucleotides in DNA carries genetic information.

Level 2 (3–4 marks): identifies at least two polymers and makes some valid comparisons, with some reference to DNA carrying genetic information.

Level 1 (1–2 marks): identifies one or two polymers, or makes simple statements such as 'DNA is a double helix'.

Question 6 (2 marks)

06.1 [2 marks]

Answer: The glucose units join together in a different way (in different arrangements/shapes) in starch and cellulose, so the overall structure of the two polymer chains, and how they pack together, is different, giving them different properties.

- the glucose monomers are joined together in a different arrangement (structure) in starch compared with cellulose (1)
 - this gives the two polymer chains a different overall shape and different physical properties, even though the monomer is the same (1)
-

Question 7 (5 marks)

07.1 [3 marks]

Answer: Two polymer chains made from four different nucleotides, twisted into a double helix.

- two polymer chains (1)
 - made from four different monomers called nucleotides (1)
 - in the form of a double helix (1)
-

07.2 [1 mark]

Answer: It encodes the genetic instructions for the development and functioning of living organisms and viruses.

- it encodes genetic instructions (for the development and functioning of living organisms and viruses) (1)
-

07.3 [1 mark]

Answer: Glucose (a sugar)

- glucose / a sugar (1)
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