

Macromolecules

Question Paper

Level	O Level
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	Organic Chemistry
Sub-Topic	Macromolecules
Booklet	Question Paper

Time Allowed: 48 minutes

Score: /40

Percentage: /100

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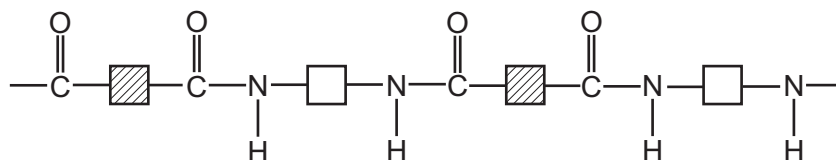
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- 1 Amino acids are essential building blocks in the human body. Macromolecules in food are hydrolysed to form amino acids.

Which macromolecules provide the body with amino acids?

- A carbohydrates
- B fats
- C proteins
- D sugars

- 2 Polymer Z has the structure shown.



These four terms can be used to describe polymers.

- 1 addition polymer
- 2 condensation polymer
- 3 polyamide
- 4 polyester

Which two terms can be applied to polymer Z?

- A 1 and 3 B 1 and 4 C 2 and 3 D 2 and 4

- 3 Which of these polymers is a protein?

- A $(\text{C}_2\text{H}_3\text{Cl})_n$ B $(\text{C}_5\text{H}_8\text{O}_2)_n$ C $(\text{C}_6\text{H}_{10}\text{O}_5)_n$ D $(\text{C}_2\text{H}_3\text{NO})_n$

- 4 In the addition polymer poly(propene), what is the simplest ratio of carbon atoms to hydrogen atoms?

	carbon atoms	hydrogen atoms
A	1	2
B	2	1
C	2	4
D	3	6

- 5 A carbohydrate such as starch can be represented as shown.



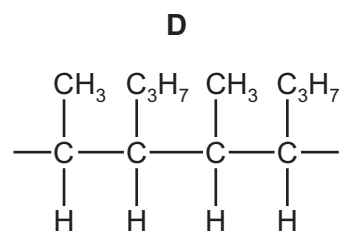
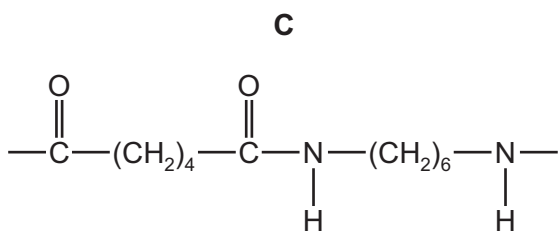
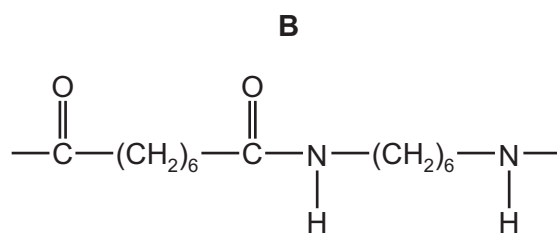
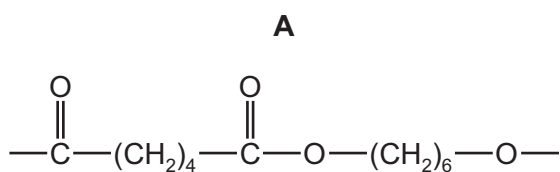
What is X?

- A** carbon
- B** hydrogen
- C** nitrogen
- D** oxygen

6 **P** is a polymer that

- has six carbon atoms in each of the monomers from which it was formed,
- is **not** a polyester,
- was formed using condensation polymerisation.

What is the partial structure of **P**?



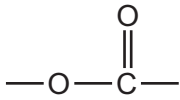
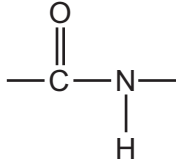
7 Which of the following is **not** a condensation polymer?

- A** nylon
- B** poly(ethene)
- C** protein
- D** *Terylene*

8 Fats, carbohydrates and proteins all contain which chemical elements?

- A** carbon, hydrogen and oxygen
- B** carbon, hydrogen and nitrogen
- C** carbon, hydrogen and sulfur
- D** carbon, nitrogen and oxygen

9 The table gives some statements about some macromolecules.

1	fats contain the linkage 	proteins contain the linkage 
2	poly(ethene) is made by addition polymerisation	<i>Terylene</i> is made by condensation polymerisation
3	starch can be hydrolysed to produce sugars	proteins can be hydrolysed to produce amino acids
4	<i>Terylene</i> is a naturally occurring polymer	nylon is a man-made polymer

Which pairs of statements are correct?

- A** 1 and 2 only **B** 2 and 3 only **C** 3 and 4 **D** 1, 2 and 3

10 Which of these compounds could react together to form a polymer?

- 1 $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$
- 2 $\text{CH}_3(\text{CH}_2)_4\text{COOH}$
- 3 $\text{HOOC}(\text{CH}_2)_4\text{COOH}$
- 4 $\text{H}_2\text{N}(\text{CH}_2)_6\text{CH}_3$

- A** 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

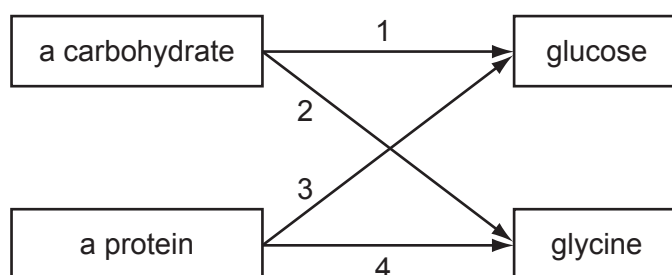
11 Nylon, poly(ethene) and *Terylene* are macromolecules.

In which of these macromolecules is the C=O group present in the linkage?

- A nylon and *Terylene* only
- B nylon only
- C poly(ethene) and *Terylene* only
- D *Terylene* only

12 Glucose is a simple sugar. Glycine is an amino acid.

In the diagram, which two arrows correctly show the hydrolysis products of a carbohydrate and of a protein?



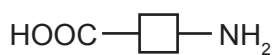
- A 1 and 3
- B 1 and 4
- C 2 and 3
- D 2 and 4

13 Poly(ethene) is the addition polymer formed from the monomer ethene.

Which statement is correct?

- A Poly(ethene) can be disposed of by burning – this produces carbon dioxide and water.
- B Poly(ethene) decolourises bromine water.
- C Poly(ethene) has the empirical formula C₂H₄.
- D Poly(ethene) is acted upon by bacteria so that it decomposes quickly when in a landfill site.

14 The diagrams show four monomers.



How many of these monomers would react with the molecule below to form a polymer?



A 1

B 2

C 3

D 4

15 Which of the following is a type of naturally occurring polymer?

- A paraffin
- B polyethene
- C protein
- D sugar

16 Which statement about macromolecules is correct?

- A Nylon and *Terylene* are both polyesters.
- B Proteins and nylon have the same monomer units.
- C Proteins have the same amide linkages as nylon.
- D *Terylene* and fats are esters but with different linkages.

17 Four conversions are listed.

- 1 amino acids to proteins
- 2 ethene to poly(ethene)
- 3 proteins to amino acids
- 4 starch to glucose

Which two conversions are **not** examples of hydrolysis?

A 1 and 2

B 1 and 4

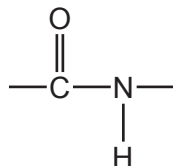
C 2 and 3

D 2 and 4

18 Which bond is present in both nylon and *Terylene*?

- A** C – O **B** C = O **C** N – C **D** N – H

19 Which pair of macromolecules both contain the linkage shown?



- A** fats and proteins
B nylon and proteins
C starch and sugars
D *Terylene* and sugars

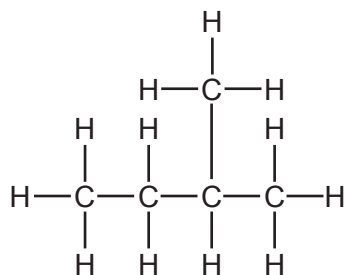
20 The macromolecules of proteins, fats and carbohydrates can all be broken down into their simple units by a similar process.

What is the process called?

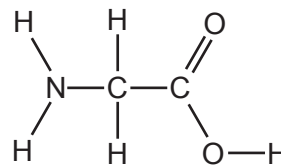
- A** esterification
B hydrolysis
C oxidation
D reduction

21 Which formula represents a compound likely to undergo addition polymerisation?

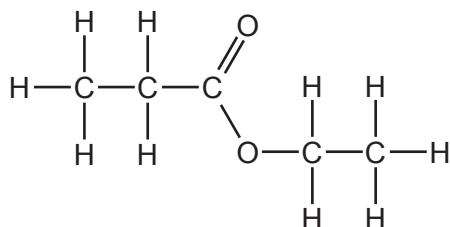
A



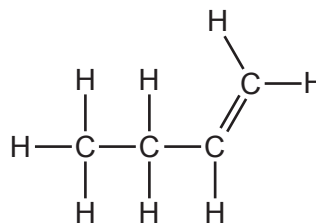
B



C



D



22 Carbohydrates, proteins, fats and *Terylene* are macromolecules.

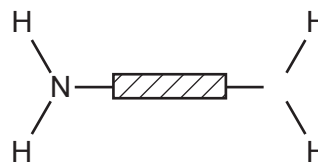
Which element is found **in only one** of these macromolecules?

- A carbon
- B hydrogen
- C nitrogen
- D oxygen

23 A polymer X is hydrolysed and the two products are



and

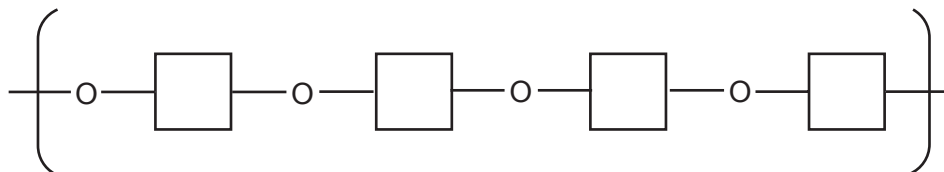


What can be deduced about X?

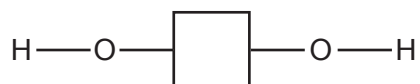
- A It is a condensation polymer.
 - B It is made by addition polymerisation.
 - C It is starch.
 - D It is *Terylene*.
- 24 Which statement about *Terylene* is correct?

- A It is an addition polymer.
- B It is an alkene.
- C It is a polyamide.
- D It is a polyester.

25 A section of a polymer is shown.



The structure of its monomer is



The monomer undergoes condensation polymerisation to form the polymer.

What is made each time a monomer adds to the polymer?

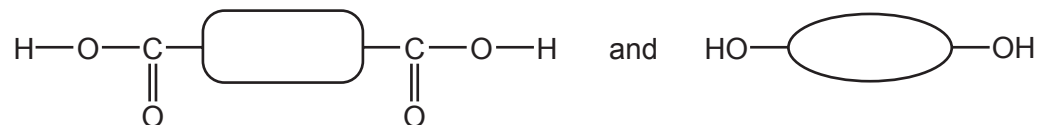
- A hydrogen molecules, H_2
- B hydroxide ions, OH^-
- C oxygen atoms, O
- D water molecules, H_2O

26 Information about the gases present in the atmospheres of four planets is given below.

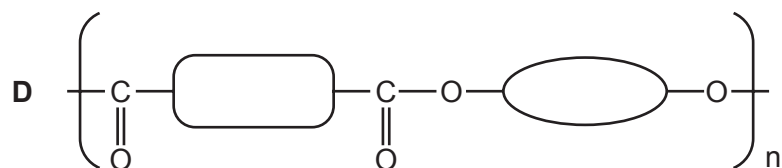
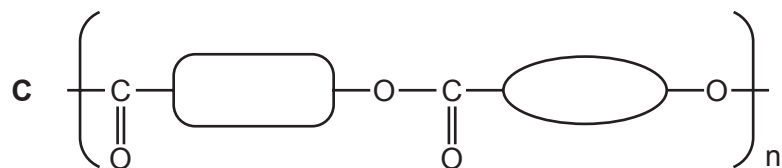
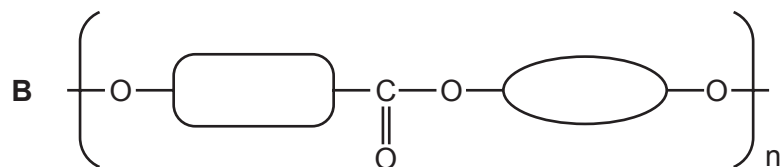
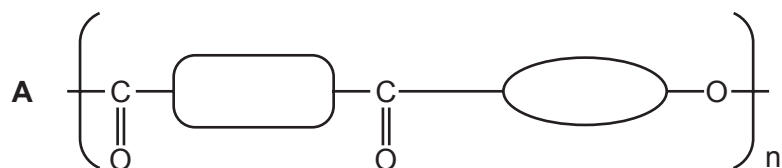
Which planet's atmosphere contains the four elements found in all proteins?

	composition of atmosphere		
A	CH_4	NH_3	HCl
B	CH_4	NH_3	H_2O
C	CH_4	SO_2	HCl
D	SO_2	NH_3	H_2O

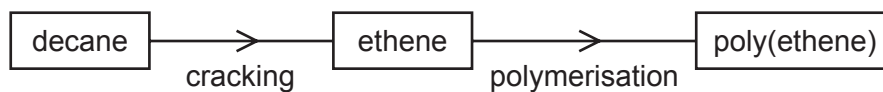
27 Terylene (a polyester) is made by condensation polymerisation of the two monomers shown.



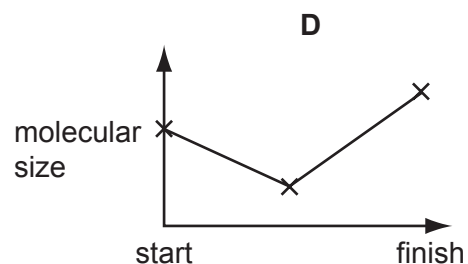
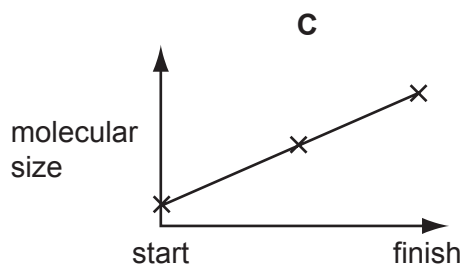
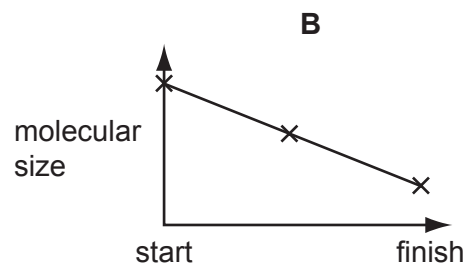
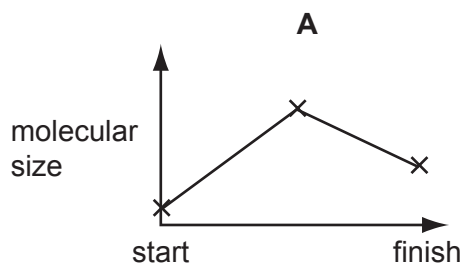
What is the repeat unit of the polymer?



28 Poly(ethene) can be manufactured by the process below.



Which diagram shows the change in molecular size during this process?



29 What is produced when proteins are hydrolysed?

- A** alcohols
- B** amides
- C** amino acids
- D** sugars

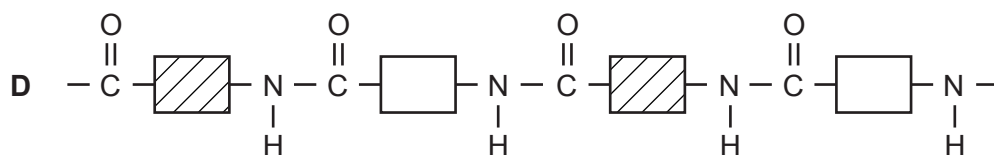
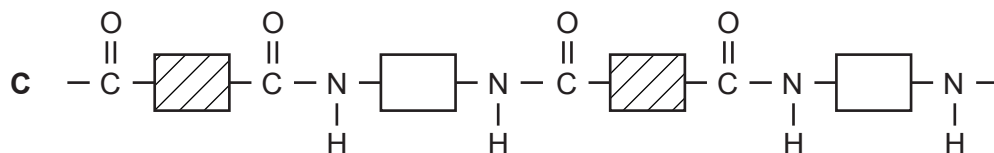
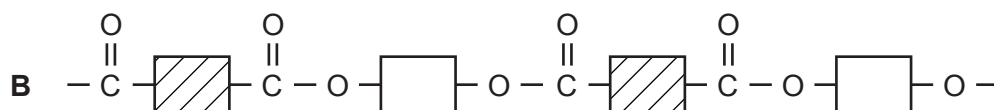
30 In the polymerisation of ethene to form poly(ethene), which of the following does **not** change?

- A boiling point
- B density
- C empirical formula
- D molecular mass

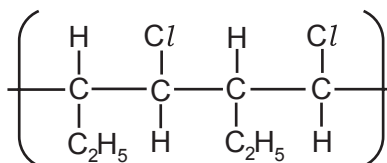
31 In which pair of macromolecules are the linkages the same?

- A fats and proteins
- B nylon and fats
- C nylon and proteins
- D proteins and *Terylene*

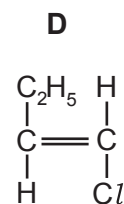
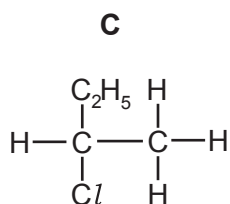
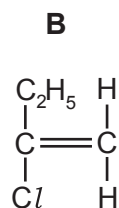
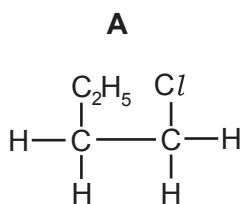
32 Which polymer would hydrolyse to amino acids?



33 The structural formula of a polymer is shown below.



Which one of the following will form this polymer?



34 Cholesterol is an organic molecule that occurs in the blood stream.

What type of compound is cholesterol?

- A an acid
- B an alcohol
- C an alkane
- D an alkene

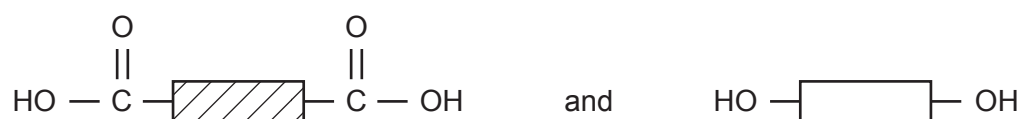
35 Which natural resource is being depleted by the manufacture of plastics?

- A air
- B fossil fuels
- C metal ores
- D water

36 Which element is **least** likely to be found in a macromolecule?

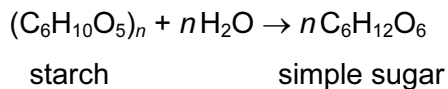
- A carbon
- B hydrogen
- C oxygen
- D sodium

37 A macromolecule is made from the two monomer molecules shown below.



What is the macromolecule?

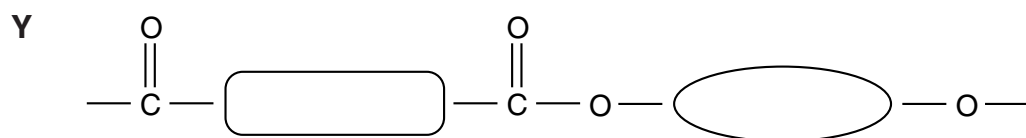
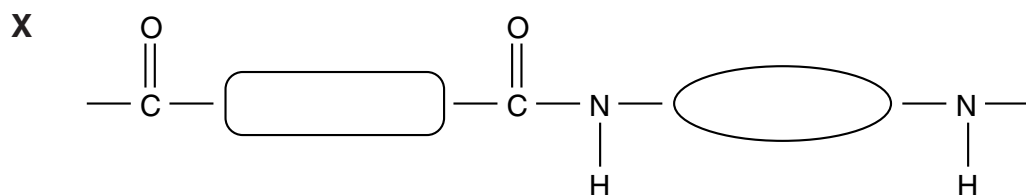
- A a carbohydrate
 - B a polyamide
 - C a polyester
 - D a protein
- 38 The equation represents the conversion of starch to a simple sugar.



This reaction is an example of

- A condensation.
 - B hydrogenation.
 - C hydrolysis.
 - D polymerisation.
- 39 Amino acids are produced when proteins are
- A hydrolysed.
 - B oxidised.
 - C polymerised.
 - D substituted.

40 The repeating units of two polymers, **X** and **Y**, are shown below.



What are **X** and **Y**?

	X	Y
A	nylon	<i>Terylene</i>
B	starch	<i>Terylene</i>
C	protein	starch
D	nylon	protein