

# Biological Molecules

## Question Paper 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Biological Molecules
Sub Topic	
Booklet	Multiple Choice
Paper Type	Question Paper 2

Time Allowed : 60 minutes

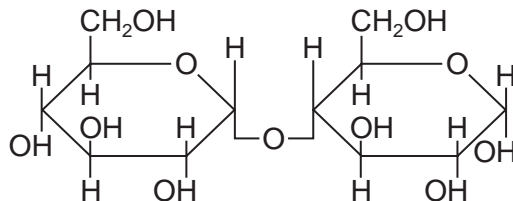
Score : / 50

Percentage : /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

- 1 The diagram shows an  $\alpha$  1:4 glycosidic bond.



Which molecules contain this bond?

- A amylose and cellulose
  - B amylose but not cellulose
  - C cellulose but not amylose
  - D neither amylose nor cellulose
- 2 Which combination describes a triglyceride?

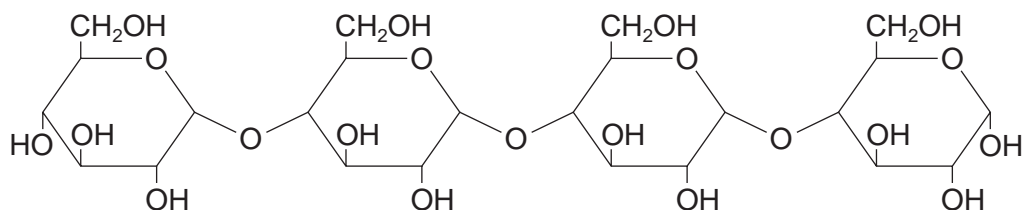
	hydrophilic	soluble in alcohol
<b>A</b>	✓	✓
<b>B</b>	x	x
<b>C</b>	✓	x
<b>D</b>	x	✓

- 3 When hydrolysed, which molecules have products containing a carboxyl group?

- 1 phospholipids
- 2 polysaccharides
- 3 proteins

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

- 4 This molecule is a polymer of reducing sugars.



Which of the following procedures could be carried out in order to test for the presence of the reducing sugars in this molecule?

- 1 add hydrolytic enzyme and then heat with Benedict's reagent
- 2 dissolve in water, neutralise and then heat with Benedict's reagent
- 3 boil with ethanol and then heat with Benedict's reagent
- 4 boil with hydrochloric acid, neutralise and then heat with Benedict's reagent

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

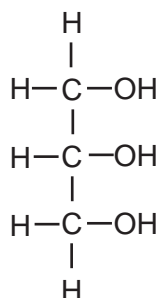
- 5 Which correctly matches the functional and structural features of cellulose, collagen, glycogen and triglyceride?

		function	structure		
			fibrous	molecule held together by hydrogen bonds	branched chains
<b>A</b>	cellulose	support strengthening	✓	✗	✓
	collagen		✓	✓	✗
<b>B</b>	cellulose	support energy source	✓	✓	✗
	triglyceride		✗	✗	✗
<b>C</b>	collagen	strengthening storage	✓	✓	✓
	glycogen		✗	✗	✓
<b>D</b>	glycogen	storage energy source	✗	✓	✓
	triglyceride		✗	✓	✗

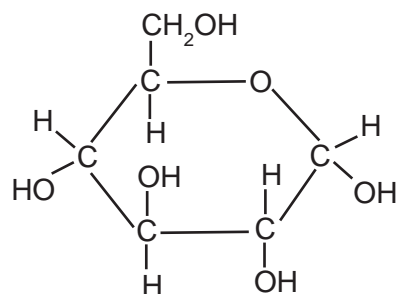
- 6 Which describes the structure of amylopectin?
- A** a branched chain with 1,2 and 1,4 glycosidic bonds
  - B** a branched chain with 1,4 and 1,6 glycosidic bonds
  - C** an unbranched chain with only 1,4 glycosidic bonds
  - D** an unbranched chain with 1,4 and 1,6 glycosidic bonds

- 7 Which molecule is found in glycogen?

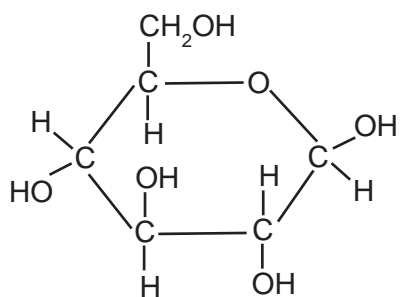
**A**



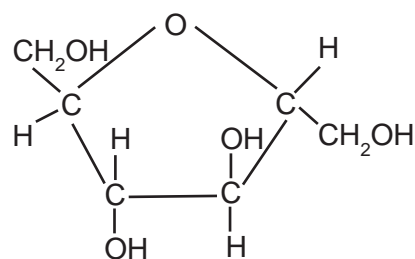
**B**



**C**



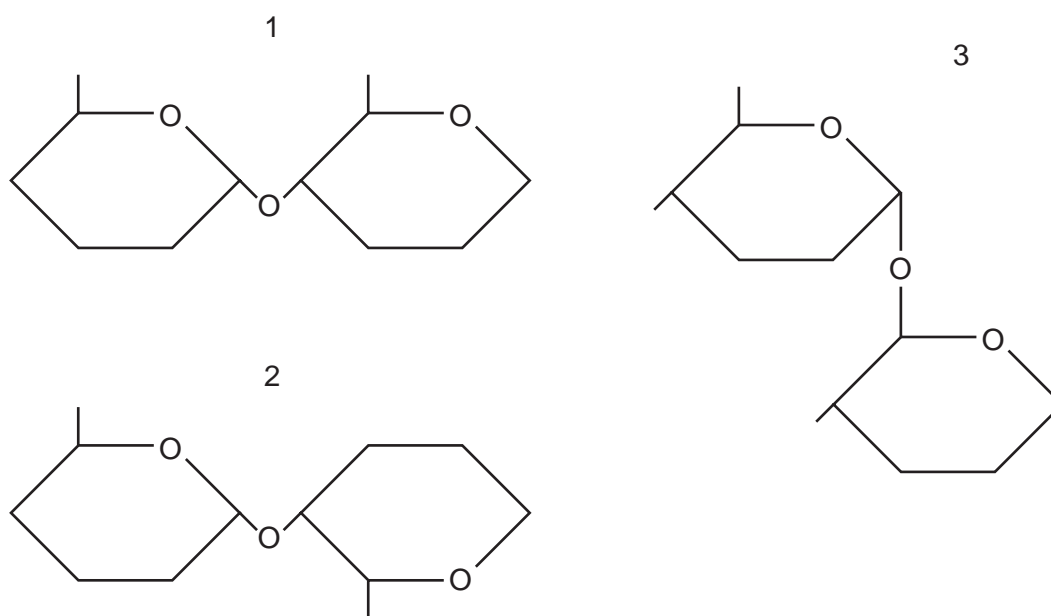
**D**



8 Which type of reaction takes place when starch molecules are converted into reducing sugars?

- A condensation
- B hydrolysis
- C polymerisation
- D synthesis

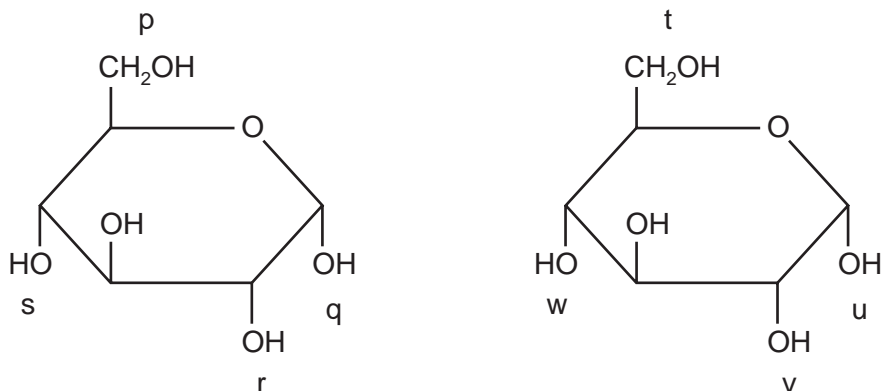
9 The diagrams show different types of bond found in polysaccharides.



Which type or types of bond are found in amylose?

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

- 10 The diagram shows two molecules of glucose. Four possible bonding positions are labelled p, q, r, and s, and t, u, v, w.



When these two molecules condense to form glycogen, where could bonds form?

- A p - u or p - v
- B p - u or q - w
- C p - v or q - w
- D p - w or v - w

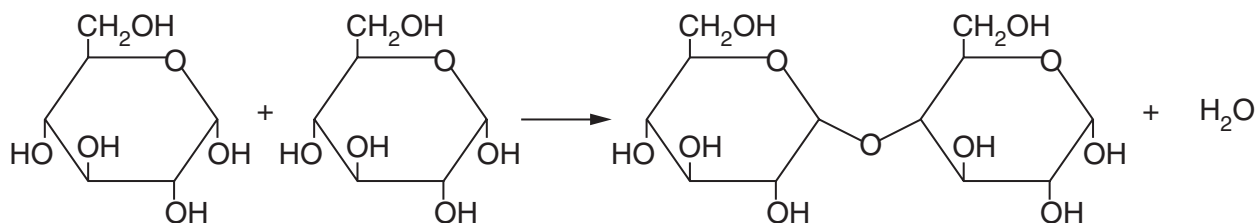
- 11 What are the features of triglycerides?

	polar	less dense than water	higher energy value than carbohydrates	lower proportion of hydrogen than in carbohydrates
<b>A</b>	✓	✓	✗	✗
<b>B</b>	✓	✗	✓	✓
<b>C</b>	✗	✓	✓	✗
<b>D</b>	✗	✗	✗	✓

12 Which polysaccharides are branched and which are unbranched?

	branched	unbranched
<b>A</b>	amylose	glycogen
<b>B</b>	amylopectin	cellulose
<b>C</b>	cellulose	amylose
<b>D</b>	glycogen	amylopectin

13 The diagram shows a reaction resulting in the formation of a bond between two molecules.



Which bond is formed and what is the type of reaction?

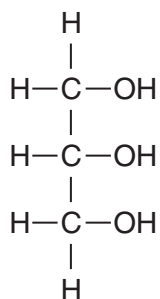
	bond formed	type of reaction
<b>A</b>	glycosidic	condensation
<b>B</b>	glycosidic	hydrolysis
<b>C</b>	peptide	condensation
<b>D</b>	peptide	hydrolysis

14 What is the general formula for a monosaccharide?

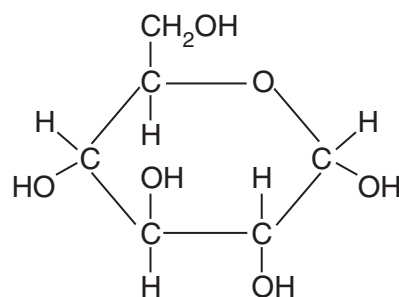
- A  $C(H_2O)_n$
- B  $(CH_2O)_n$
- C  $C_2(H_2O)_n$
- D  $C_n(H_2O)$

15 Which molecule is found in glycogen?

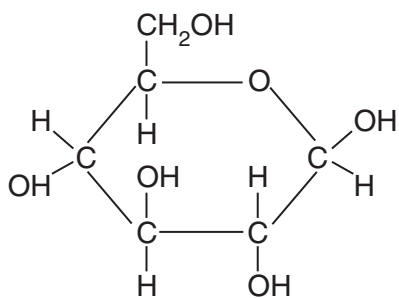
A



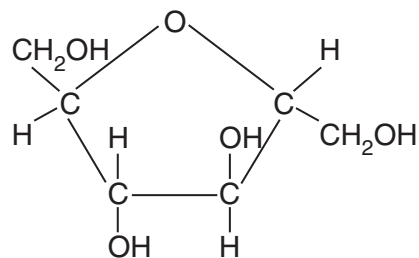
B



C



D





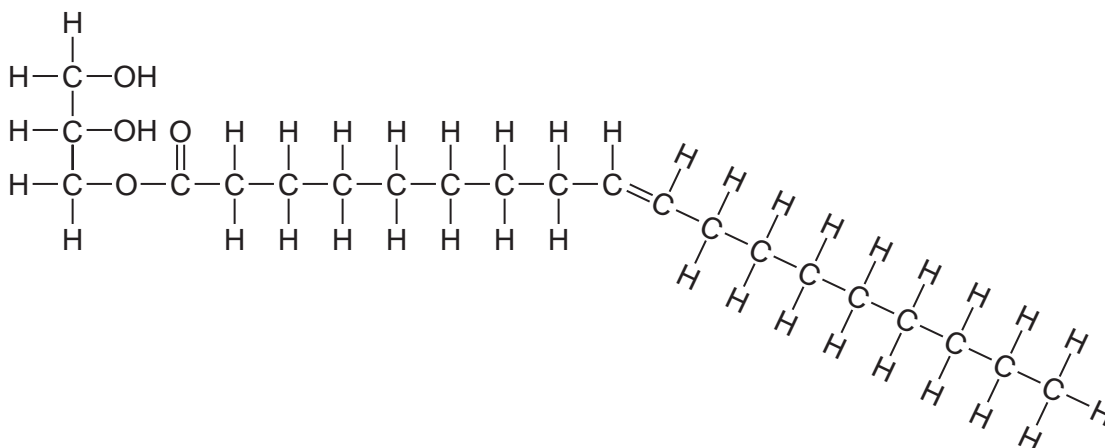
16 How many fatty acid residues are normally present in a phospholipid molecule?

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

17 What is a role of essential fatty acids in the body?

- A as part of glycoproteins in cell membranes
- B as part of phospholipids in cell membranes
- C to use for enzyme formation
- D to use for RNA formation

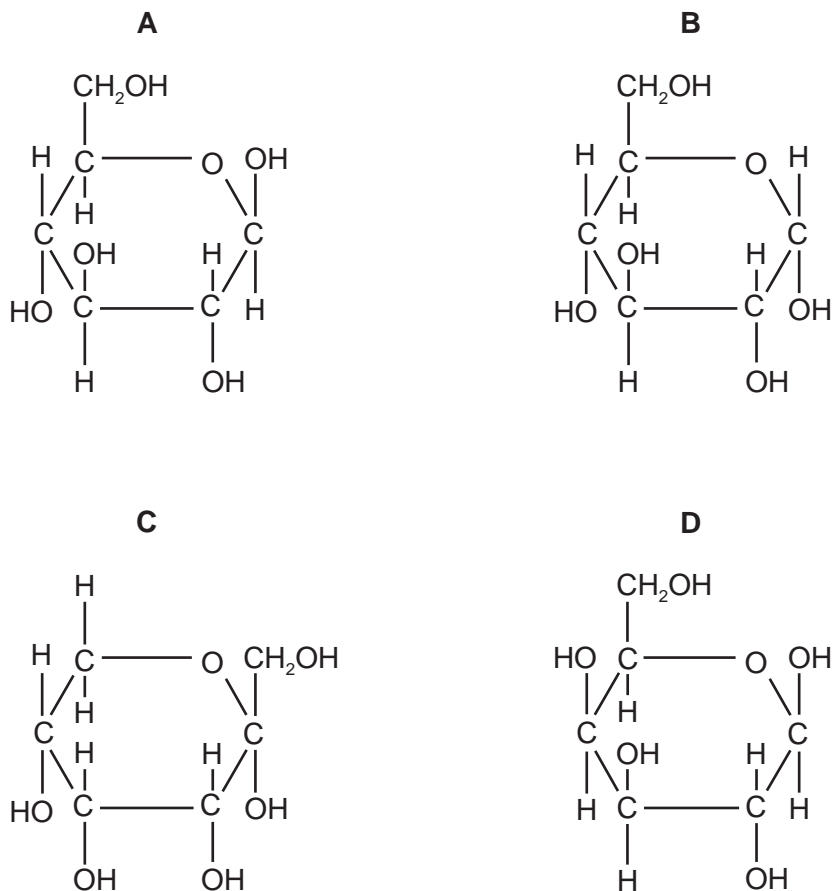
18 The diagram shows a triglyceride molecule that has been partially hydrolysed.



What will be the products of the total hydrolysis of the molecule shown?

- A a molecule of glycerol and a saturated fatty acid molecule only
- B a molecule of glycerol and an unsaturated fatty acid molecule only
- C a molecule of water, a molecule of glycerol and a saturated fatty acid molecule
- D a molecule of water, a molecule of glycerol and an unsaturated fatty acid molecule

19 Which shows  $\alpha$ -glucose?



20 Which correctly matches the functional and structural features of cellulose, collagen, glycogen or triglyceride?

		function	structure		
			fibrous	molecule held together by hydrogen bonds	branched chains
<b>A</b>	cellulose triglyceride	support energy source	✓ ✗	✓ ✗	✗ ✗
<b>B</b>	collagen cellulose	strengthening support	✓ ✓	✓ ✗	✗ ✓
<b>C</b>	collagen glycogen	strengthening storage	✓ ✗	✓ ✗	✓ ✓
<b>D</b>	glycogen triglyceride	storage energy source	✗ ✗	✓ ✓	✓ ✗

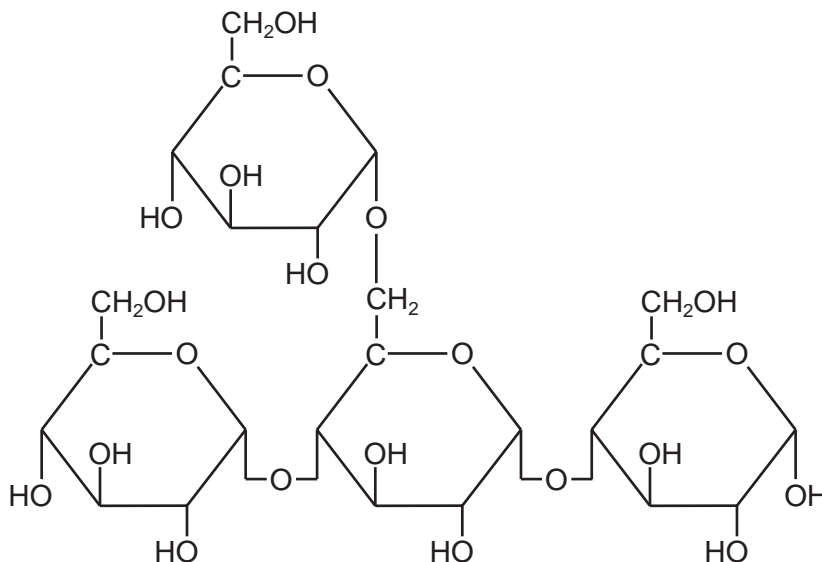
key ✓ = true ✗ = false

- 21 Two disaccharides are maltose and sucrose. Maltose is formed from two molecules of glucose, whilst sucrose is formed from fructose and glucose.

Which row shows the molecular formulae of the two disaccharides?

	maltose	sucrose
<b>A</b>	$C_{12}H_{22}O_{11}$	$C_{12}H_{22}O_{11}$
<b>B</b>	$C_{12}H_{22}O_{11}$	$C_{12}H_{24}O_{12}$
<b>C</b>	$C_{12}H_{24}O_{12}$	$C_{12}H_{22}O_{11}$
<b>D</b>	$C_{12}H_{24}O_{12}$	$C_{12}H_{24}O_{12}$

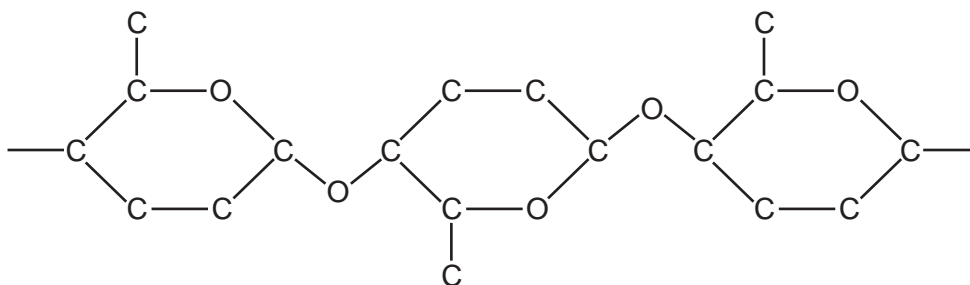
- 22 The diagram shows a carbohydrate molecule.



Of which polymers could this be a part?

- A** amylopectin and cellulose
- B** amylose and starch
- C** glycogen and amylose
- D** starch and glycogen

23 The diagram shows a section of a polysaccharide.

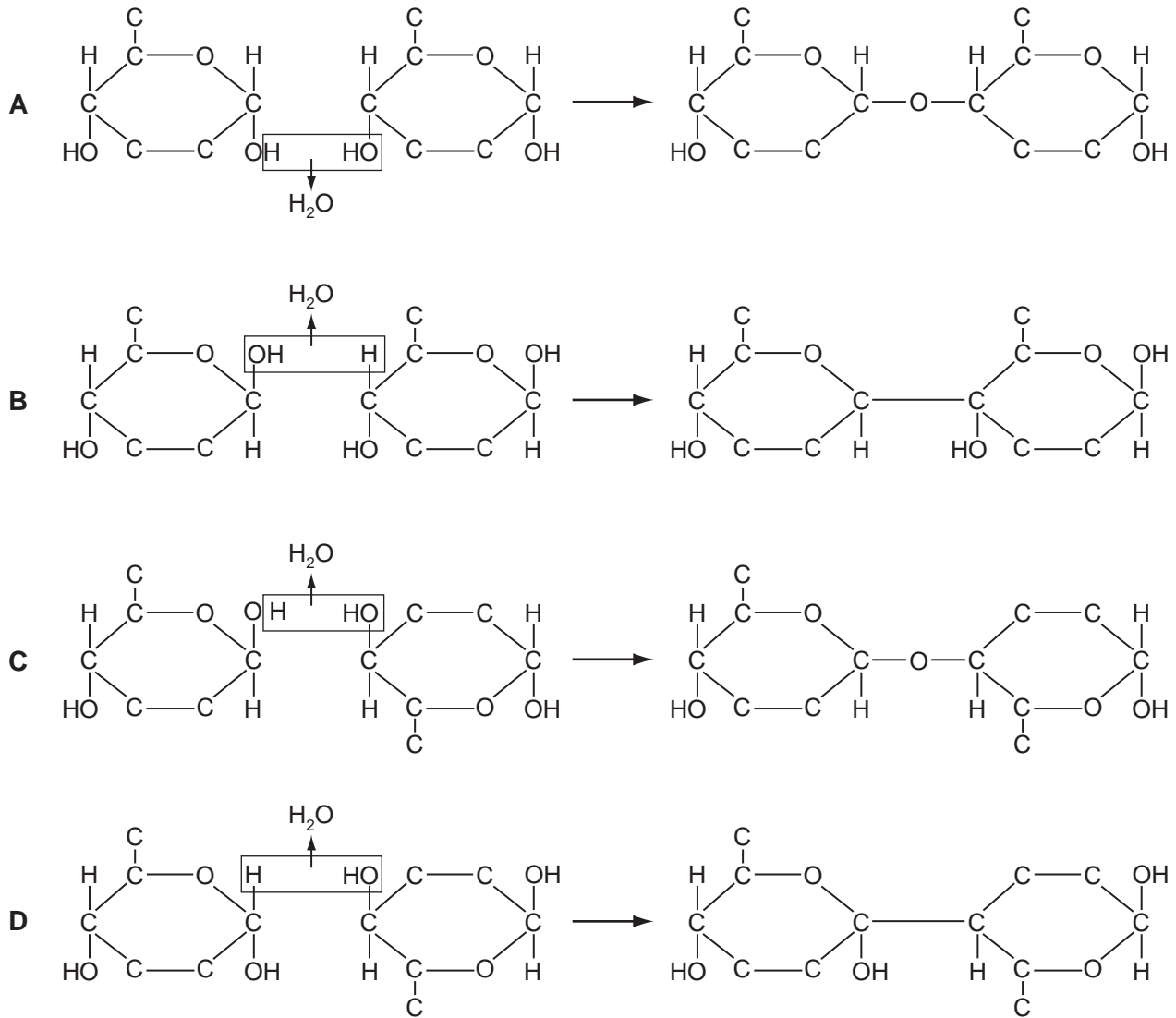


In which polysaccharide(s) could this section be found?

- 1 amylose
- 2 cellulose
- 3 glycogen

**A** 1 only      **B** 2 only      **C** 1 and 3      **D** 2 and 3

24 Which diagram shows the reaction that occurs to link two monomers that form cellulose?



25 Which bonds will be broken when a molecule of glycogen is hydrolysed?

- 1  $\alpha$ -1, 4
- 2  $\beta$ -1, 4
- 3  $\alpha$ -1, 6
- 4  $\beta$ -1, 6

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

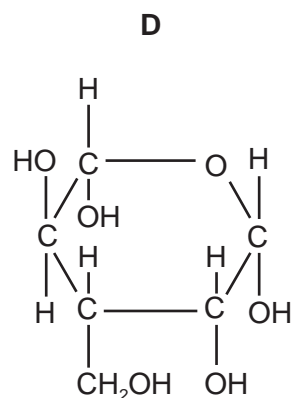
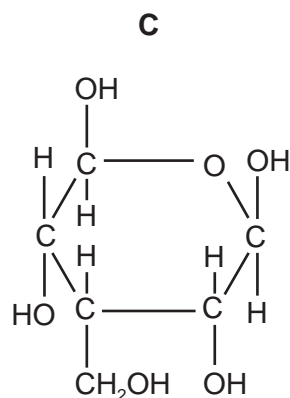
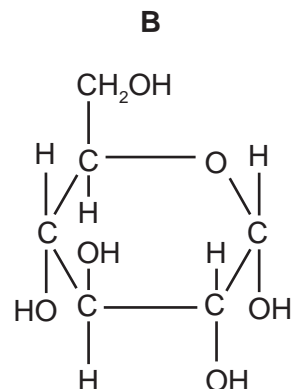
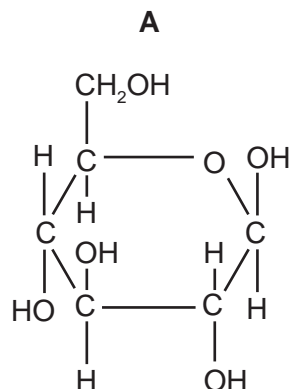
26 Each list, 1, 2 and 3, shows some substances found in animal tissues.

- 1 glucose, cholesterol, triglycerides, water.
- 2 glycogen, antibodies, adenine, phospholipids.
- 3 haemoglobin, carbon dioxide, mRNA, monosaccharides.

Which shows one or more substances that contain nitrogen atoms?

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

27 Which shows  $\beta$ -glucose?



28 Which row is correct when one molecule of sucrose is hydrolysed?

	molecules of reducing sugar	molecules of water
<b>A</b>	1	1
<b>B</b>	1	2
<b>C</b>	2	1
<b>D</b>	2	2

29 The formation of glycosidic and peptide bonds is responsible for polymerisation in some biological molecules.

Which bonds are found in which molecules?

	glycosidic	peptide
<b>A</b>	glycerol	glycoprotein
<b>B</b>	glycogen	glycerol
<b>C</b>	glycogen	glycoprotein
<b>D</b>	glycoprotein	glycolipid

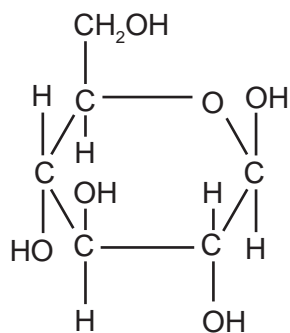
30 When mitochondria are extracted from cells for biochemical study, they are usually kept in a  $0.25 \text{ mol dm}^{-3}$  sucrose solution.

Why is the sucrose solution used?

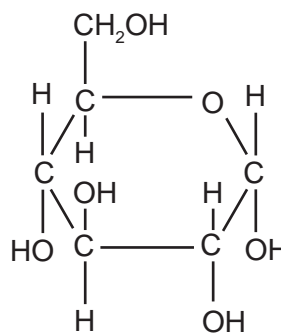
- A** to act as a solvent
- B** to enable the rate of reaction of the mitochondria to be determined
- C** to prevent the mitochondria from changing in structure
- D** to provide a source of energy

31 Which shows the basic unit of cellulose?

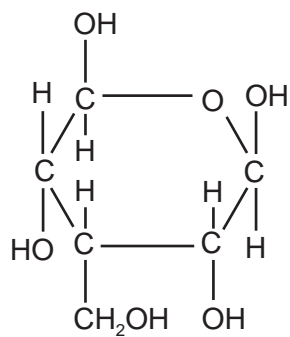
**A**



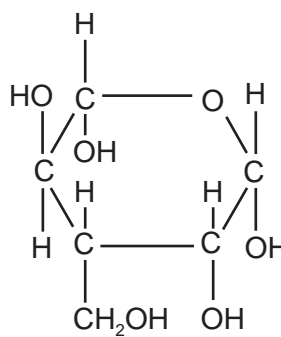
**B**



**C**

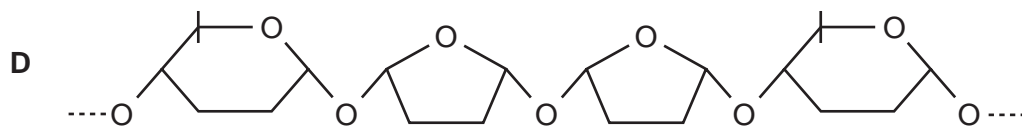
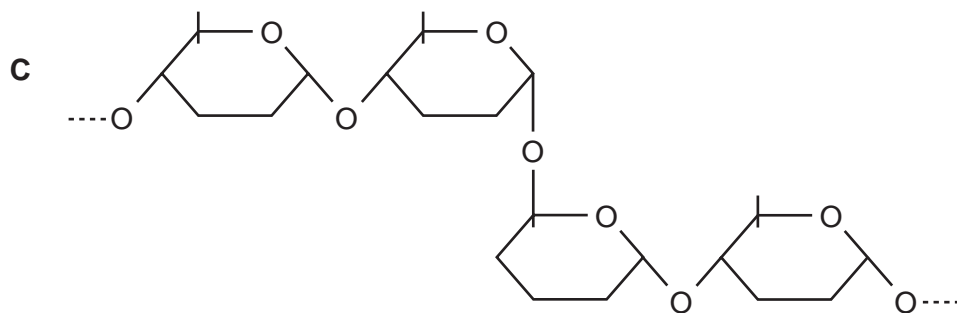
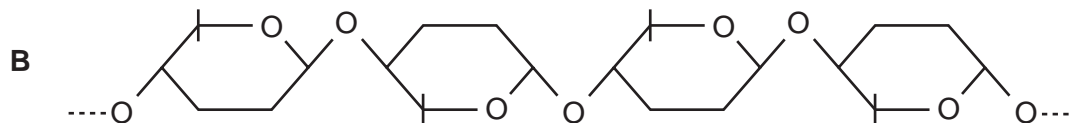
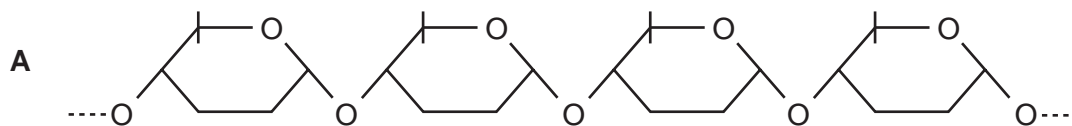


**D**





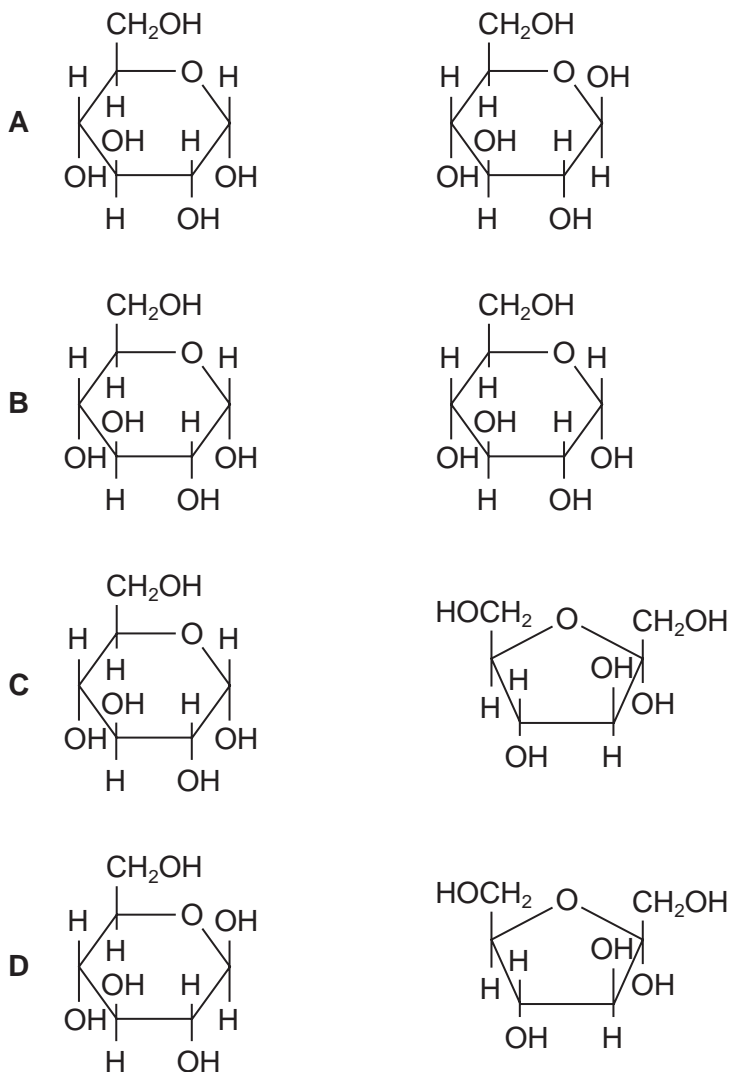
32 Which diagram shows part of a structural polysaccharide?



33 Which row is correct for each of the molecules?

	$\beta$ -glucose	collagen	haemoglobin	sucrose
<b>A</b>	hexose sugar with a molecular formula $C_6H_{12}O_6$	structural function, found in tendons and blood vessel walls	contains the elements carbon, hydrogen, iron, nitrogen and sulfur	formed by releasing a molecule of water in a hydrolysis reaction
<b>B</b>	repeating monomer of the polysaccharide, cellulose	a molecule consists of three polypeptide chains, each containing a prosthetic group	each non-protein haem group contains a central iron ion	composed of two monosaccharides linked by a glycosidic bond
<b>C</b>	monomer of the 1,6 glycosidic branches of the polysaccharide, glycogen	molecules lie parallel to each other, with cross-links and staggered ends	has two identical $\alpha$ chains and two identical $\beta$ chains	formed by condensation of two identical monosaccharides
<b>D</b>	in its ring structure, the hydroxyl group of carbon atom 1 is above the plane of the ring	polypeptide chains interact to produce a fibrous protein	has all four levels of protein structure and at least four types of bond	digestion yields glucose and fructose in equal proportions

34 Which pair of monosaccharides form sucrose?



35 Which statement about triglycerides is correct?

- A** They are made up of three fatty acids combined with glycogen.
- B** They are more saturated with hydrogen compared with phospholipids.
- C** They form a bilayer in the membranes of cells.
- D** They have a lower ratio of oxygen to carbon compared with carbohydrates.

36 Which molecules contain C=O bonds?

- 1 amino acids
- 2 fatty acids
- 3 glycerol

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

37 Which of the statements about polysaccharides can be used to describe both amylose and glycogen?

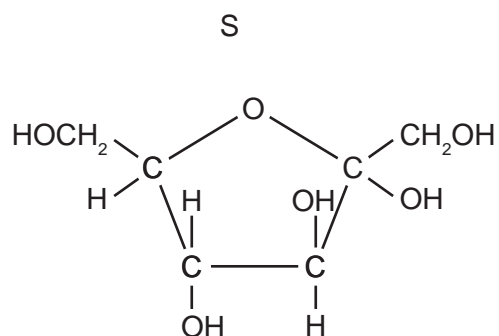
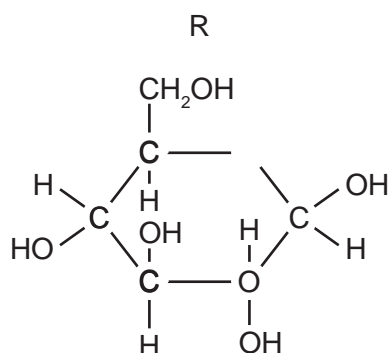
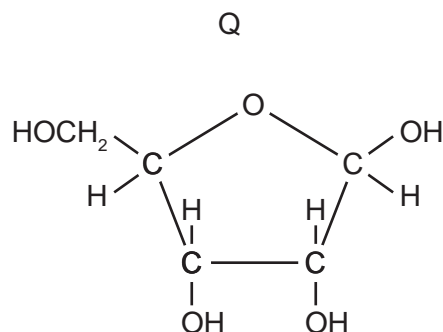
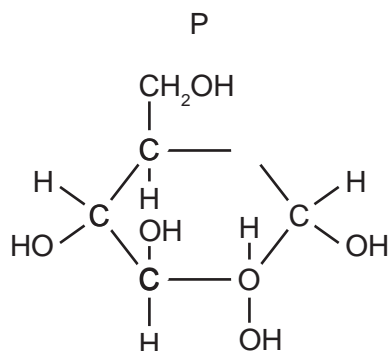
- 1 contains 1,4 glycosidic bonds
- 2 contains 1,6 glycosidic bonds
- 3 polymer of  $\alpha$ -glucose

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

38 Heating with which solution breaks glycosidic bonds?

- A** Benedict's solution
- B** dilute hydrochloric acid
- C** dilute sodium hydroxide
- D** ethanol

39 The diagram shows four molecules.



Which two molecules condense to form sucrose?

- A** P and Q      **B** P and S      **C** R and Q      **D** R and S

40 Which molecules have a structural formula that contains C=O bonds?

- 1 glucose
- 2 glycerol
- 3 protein

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

41 Which of the statements about polysaccharides can be used to describe both glycogen and amylopectin?

- 1 contains 1,4 glycosidic bonds
- 2 contains 1,6 glycosidic bonds
- 3 polymer of  $\alpha$ -glucose

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

42 Which molecules have a structural formula that contains C=O bonds?

- 1 amino acids
- 2 glucose
- 3 glycerol
- 4 protein

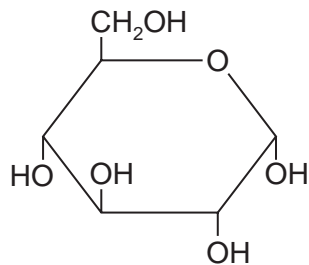
- A** 1, 2 and 3
- B** 1, 2 and 4
- C** 1, 3 and 4
- D** 2, 3 and 4

43 Which of the statements about polysaccharides can be used to describe **both** starch and cellulose?

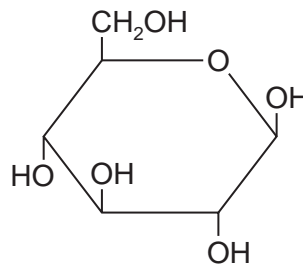
- 1 adjacent glucose molecules are rotated by  $180^\circ$
- 2 contains glycosidic bonds
- 3 polymer of  $\alpha$ -glucose

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

- 44 Polymers of molecule X or polymers of molecule Y can be formed using glycosidic bonds.



molecule X



molecule Y

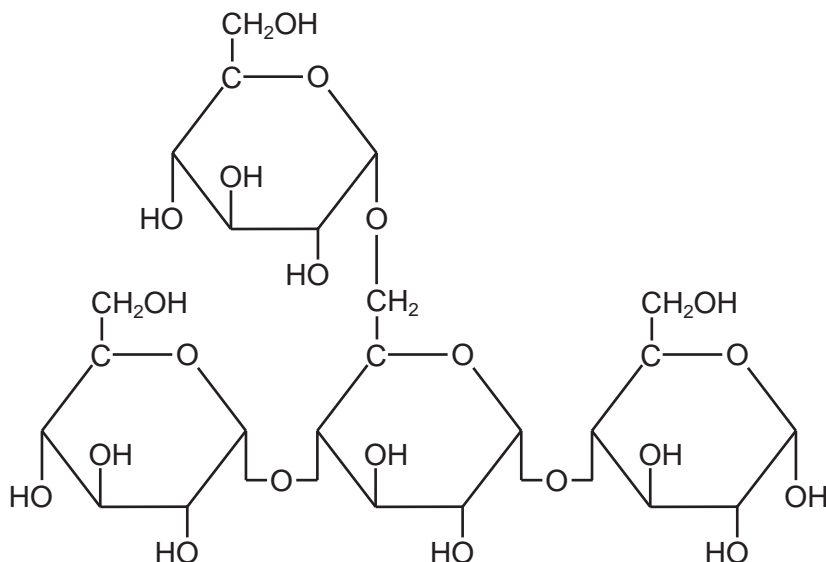
Which statement is correct?

- A** Many of molecule X join to form amylose.
  - B** Many of molecule X join to form cellulose.
  - C** Many of molecule Y join to form amylopectin.
  - D** Many of molecule Y join to form glycogen.
- 45 Two disaccharides are maltose and sucrose. Maltose is formed from two molecules of glucose, whilst sucrose is formed from fructose and glucose.

Which row shows the molecular formulae of the two disaccharides?

	maltose	sucrose
<b>A</b>	$C_{12}H_{22}O_{11}$	$C_{12}H_{22}O_{11}$
<b>B</b>	$C_{12}H_{22}O_{11}$	$C_{12}H_{24}O_{12}$
<b>C</b>	$C_{12}H_{24}O_{12}$	$C_{12}H_{22}O_{11}$
<b>D</b>	$C_{12}H_{24}O_{12}$	$C_{12}H_{24}O_{12}$

46 The diagram shows a carbohydrate molecule.



Of which polymers could this be a part?

- A amylopectin and cellulose
  - B amylose and starch
  - C glycogen and amylose
  - D starch and glycogen
- 47 Solutions of biological molecules are tested for sugars. The table shows the colours of the solutions after testing.

Which may contain reducing sugars?

solution	heated with Benedict's solution	boiled with hydrochloric acid, neutralised, then heated with Benedict's solution
1	blue	yellow
2	green	orange
3	orange	red

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



48 What are the features of triglycerides?

	polar	less dense than water	higher energy value than carbohydrates	lower proportion of hydrogen than in carbohydrates
<b>A</b>	✓	✓	x	x
<b>B</b>	✓	x	✓	✓
<b>C</b>	x	✓	✓	x
<b>D</b>	x	x	x	✓

key

✓ = yes

x = no

49 Which linkages are found between the glucose units in cellulose?

**A**  $\alpha$  1–4 only

**B**  $\alpha$  1–4 and  $\alpha$  1–6

**C**  $\beta$  1–4 and  $\alpha$  1–6

**D**  $\beta$  1–4 only

50 Which diagram shows the bond linking the individual units of both cellulose and amylose?

