Carbohydrates: OCR A Level Biology Exam Questions by Topic

17 questions · 43 marks · about 52 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · A level Paper 1 · June 2024 · Q16(a) · 3 marks

16

(a) The table lists some biological molecules.

Complete the table by putting a tick (✓) in the appropriate box or boxes on each line to show whether the corresponding feature is present.

The first line has been completed for you.

Biological molecule	Is a monomer	Is a polymer	Contains glycosidic bond(s)
Amino acid	✓		
Amylopectin			
Glucose			
Sucrose			

[3]

Question 2 · A level Paper 1 · June 2024 · Q16(b) · 2 marks

(b) Describe the bond between the two glucose monomers in maltose.

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..... **[2]**

Turn over

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3 (a) Congenital lactose intolerance is where a person is born without the enzyme lactase needed to digest lactose in milk. The use of enzyme technology has allowed lactose free milk to be widely available in shops and supermarkets.

Fig. 3.1 shows a technique used to produce lactose free milk.

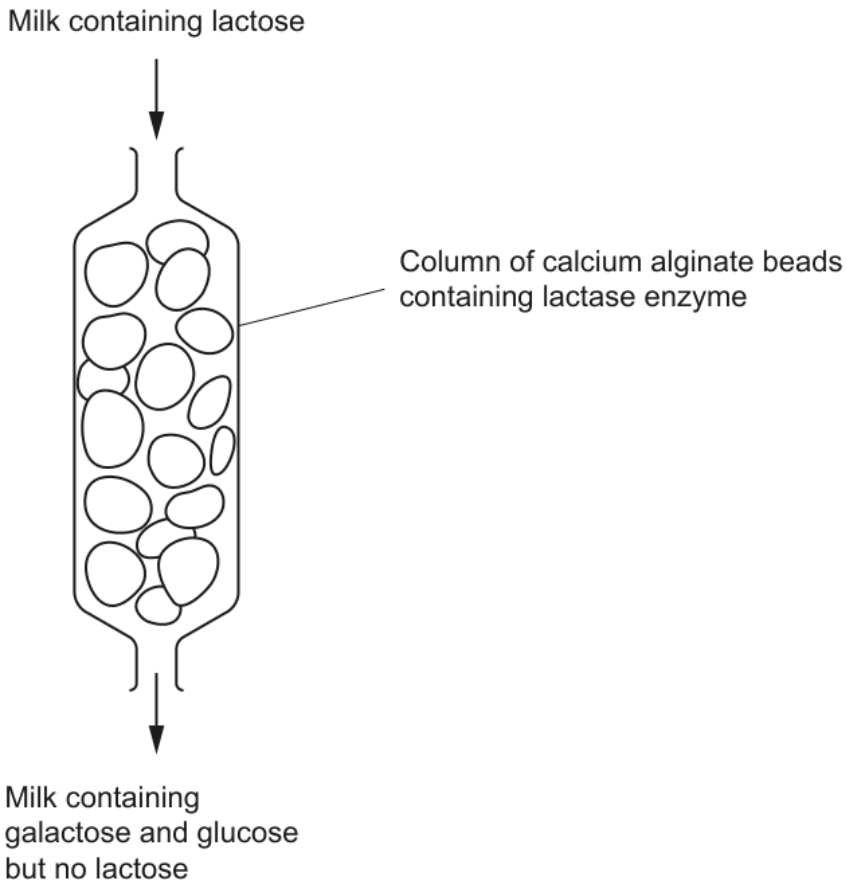


Fig. 3.1

(i) Name the type of bond broken by the enzyme lactase **and** describe what happens when this bond is broken.

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..... **[2]**

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Question 4 · AS Paper 2 · June 2025 · Q1(a) · 3 marks

1

(a) The table describes features of molecules.

Complete the table. Use ticks (✓) to identify if the feature describes starch or cellulose.

Description	Starch	Cellulose
Is made of amylose and amylopectin		
Is a long unbranched chain		
Is made from β glucose molecules		

[3]

Question 5 · AS Paper 2 · November 2021 · Q1(a)(i) · 1 mark

1 The information below is about carbohydrates.

- Glucose is a monomer of polysaccharides such as glycogen and starch.
- Glucose is an important source of energy in animals and is transported in the circulatory system.
- Glycogen is an energy storage molecule found in many animals.
- Starch is an energy storage molecule found in many plants.
- Amylopectin is one of the two polysaccharides that constitute the molecular structure of starch.

(a) (i) State **one** property of glucose that allows it to be easily transported in animals.

..... **[1]**

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Question 6 · AS Paper 2 · November 2021 · Q1(a)(ii) · 3 marks

(ii) Explain how the structure of glycogen differs from that of amylopectin to make it better suited as an energy store in animals.

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..... **[3]**

Question 7 · A level Paper 1 · June 2018 · Q18(b) · 3 marks

(b) Plant cell walls are made of cellulose. Cellulose is a polymer of β-glucose.

Give **three** properties of cellulose that make it suitable as the basis of plant cell walls.

1 .....

2 .....

3 .....

[3]

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Question 8 · AS Paper 1 · June 2023 · Q28(b) · 4 marks

(b) Starch and glycogen are polysaccharides. Starch is present in plant cells, and glycogen is present in animal cells. Glucose is a monosaccharide present in both types of cell.

Outline how the different properties of glucose, starch and glycogen relate to their functions in cells.

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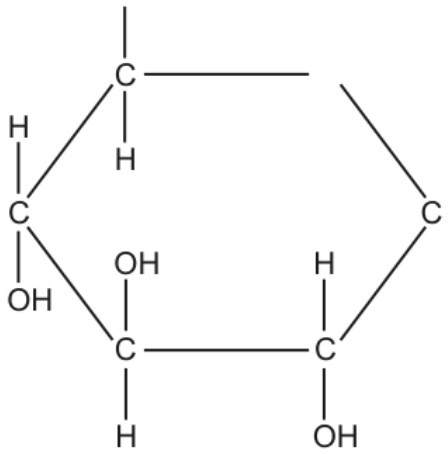
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..... **[4]**

Question 9 · A level Paper 2 · June 2023 · Q21(c)(i) · 3 marks

(c) *Rhizobium* forms nodules on the roots of certain plants. The *Rhizobium* receives a supply of glucose from the plant which the bacterium is able to use.

The diagram below shows an incomplete diagram of the structure of alpha glucose.



(i) Write **on the diagram** to show the complete structure of alpha glucose. **[3]**

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Question 10 · A level Paper 2 · June 2023 · Q21(c)(ii) · 2 marks

(ii) Explain how the structure of glucose allows it to move from the plant to the bacterium.

.....

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..... **[2]**

Question 11 · AS Paper 2 · June 2016 · Q3(a)(i) · 1 mark

3 (a) Polymers are important molecules that have structural and functional roles in organisms.

Chitin is a polymer that is found in insects, where it forms a major part of the structure of the exoskeleton.

- Chitin is a macromolecule that is similar to a polysaccharide.
- Chitin is composed of molecules of N-acetylglucosamine, the structure of which is shown in Fig. 3.1 below.
- The monomers of N-acetylglucosamine join by 1–4 glycosidic bonds to form the chitin molecule.

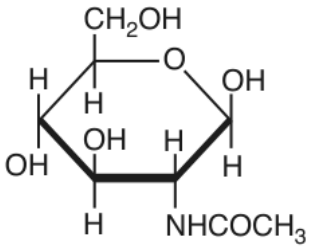


Fig. 3.1

(i) How does the composition of N-acetylglucosamine differ from the composition of a monosaccharide sugar?

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..... **[1]**

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Question 12 · A level Paper 1 · June 2018 · Q19(b) · 4 marks

(b) Chitin is a polysaccharide found in insects. It is used to form the hard outer casing of their bodies.

Fig. 19.2 shows the chemical structure of chitin.

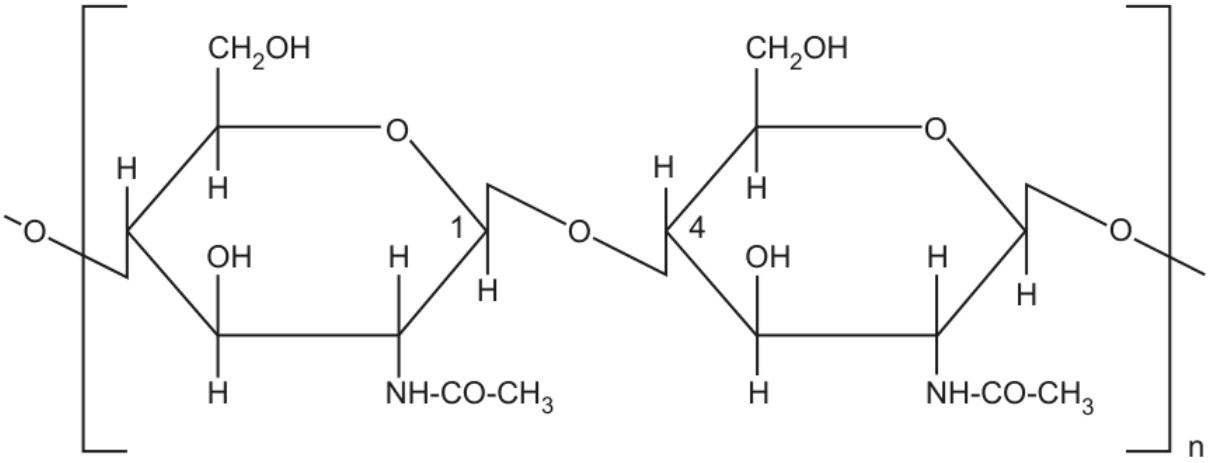


Fig. 19.2

Using information from Fig. 19.2, state **two** similarities and **two** differences between the structures of chitin and glycogen.

Similarity 1 .....

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Similarity 2 .....

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Difference 1 .....

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Difference 2 .....

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[4]

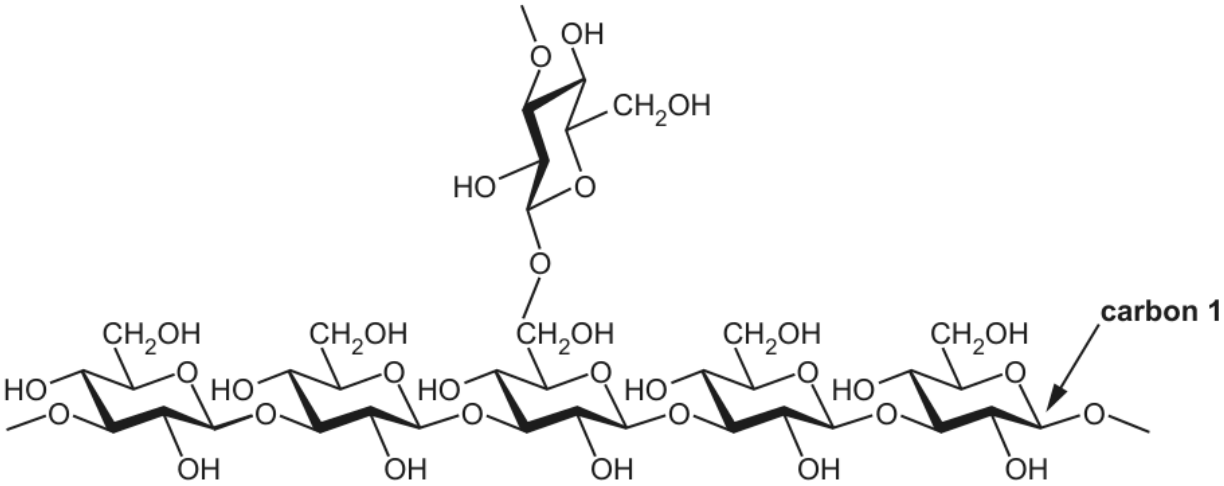
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Question 13 · A level Paper 3 · November 2021 · Q3(a) · 2 marks

3 Callose is a polysaccharide produced by plants.

(a) Callose is formed from β-glucose monomers.

The figure below shows a section of callose.



Describe the differences between the structures of callose and cellulose.

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.....

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..... **[2]**

Questions, mark schemes and examiners' report extracts © OCR.

Question 14 · A level Paper 3 · June 2018 · Q2(b) · 3 marks

(b) Glucose and other carbohydrates are present in respiring cells. The concentrations of carbohydrate molecules vary between tissues.

A student conducted tests on three tissues, **A**, **B** and **C**. Table 2 shows the results of these tests.

Tissue	Colour after Benedict's test	Colour after treatment with HC*l* and Benedict's test	Colour after iodine test
A	red	red	yellow
B	yellow	red	black
C	orange	orange	black

Table 2

Two of the tissues were known to be phloem tissue and liver tissue.

Use the evidence in Table 2 to identify which tissue, **A**, **B** or **C**, is phloem and which tissue is liver. Explain your answer.

Tissue ..... must be phloem because .....

.....

.....

Tissue ..... must be liver because .....

.....

.....

[3]

Question 15 · A level Paper 3 · November 2021 · Q4(a) · 2 marks

4 **(a)** Some organisms use a disaccharide called trehalose as a respiratory substrate. Trehalose has a similar structure and very similar chemical properties to sucrose.

Suggest how you could test for the presence of trehalose.

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.....

.....

..... **[2]**

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Question 16 · AS Paper 2 · June 2023 · Q3(c)(i) · 3 marks

(c) (i) The students were then asked to carry out an experiment to determine the glucose concentration of another test solution using a colorimeter.

Describe how the students would use a colorimeter in their experiment.

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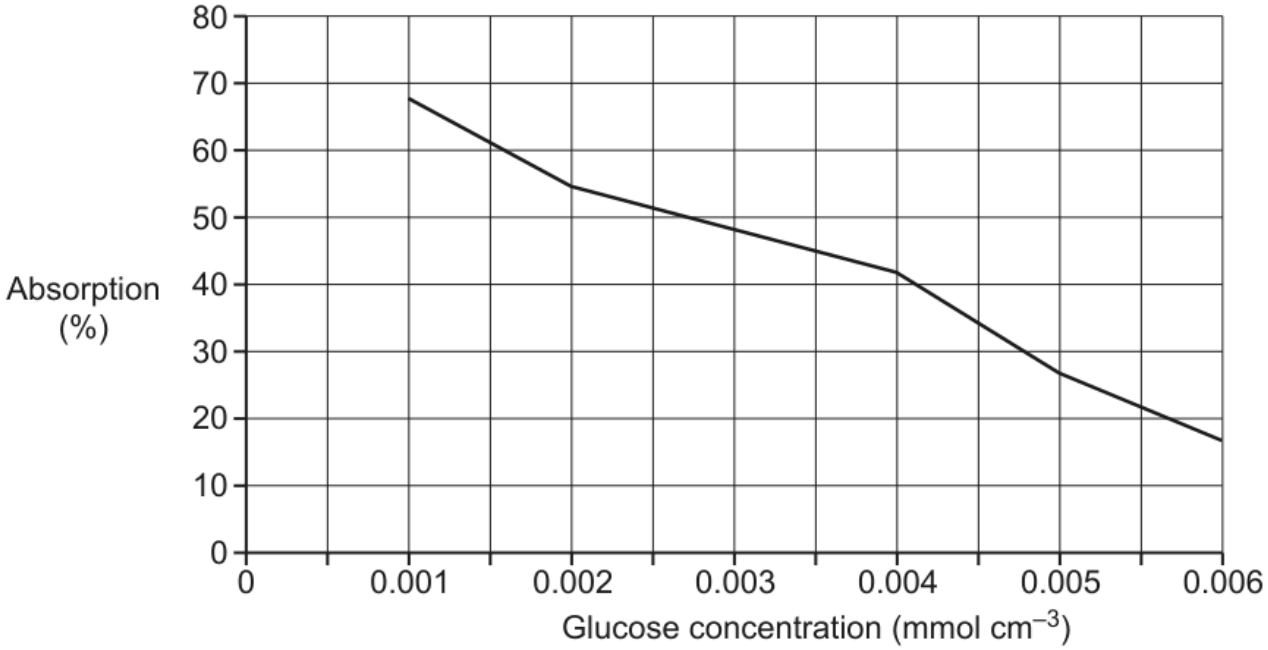
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..... **[3]**

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(ii) The students plotted their results, shown in the graph.



The students found that the test solution had an absorption value of 45%.

Use the graph to estimate the glucose concentration in the test solution.

Give your answer in mmol dm^{-3}.

Concentration = ...mmol dm^{-3} **[2]**

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Mark schemes

Question 1 · A level Paper 1 · June 2024 · Q16(a) · 3 marks

16 (a)

Biological molecule	Is a monomer	Is a polymer	Contains glycosidic bonds
Amino acid	✓		
Amylopectin		✓	✓
Glucose	✓		
Sucrose			✓

1 mark per correct row ✓ ✓ ✓

3

IGNORE crosses and hybrid ticks

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Question 2 · A level Paper 1 · June 2024 · Q16(b) · 2 marks

16	(b)	(α-) glycosidic ✓ carbon 1 to carbon 4 (bond) ✓	2

ALLOW marks clearly shown on annotated diagram
IGNORE ref to any named carbohydrate

ALLOW (α-)1,4 glycosidic bond for **2 marks**
DO NOT ALLOW beta / β

ALLOW 1,4 (bond)
DO NOT ALLOW 1,6 (bond)
ECF e.g β-1,4 glycosidic bond gets **MP2**
beta / β 1, 6 (bond) = 0 marks

Question 3 · AS Paper 2 · June 2022 · Q3(a)(i) · 2 marks

3	(a)	(i)	glycosidic (bond) ✓ hydrolysis **OR** water, added / needed ✓	2	AO 1.1

IGNORE numbers
DO NOT ALLOW condensation / water produced
ALLOW description
OH joins, one sugar / galactose, and H joins, the other / glucose (plus O from glycosidic bond)

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Question 4 · AS Paper 2 · June 2025 · Q1(a) · 3 marks

1	(a)	*One mark per row*	3	1.1

Description	Starch	Cellulose	
Is made of amylose and amylopectin	✓		✓
Is a long unbranched chain		✓	✓
Is made up of beta glucose molecules		✓	✓

DO NOT ALLOW hybrid tick and hybrid crosses
ALLOW crosses in place of ticks where only 1 response is used per row

Question 5 · AS Paper 2 · November 2021 · Q1(a)(i) · 1 mark

1	(a)	(i)	soluble / polar ✓	1	AO1.1

Question 6 · AS Paper 2 · November 2021 · Q1(a)(ii) · 3 marks

1	(a)	(ii)	*any three from:* *glycogen (compared to amylopectin)* more branched ✓ more coiled ✓ (so is) more compact / less space needed (for storage) ✓ (branching gives) many / more, free ends ✓ where glucose can be added or removed ✓ (so) speeds up glucose, release / hydrolysis ✓	**3 max**	AO2.1

ORA for amylopectin throughout

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Question 7 · A level Paper 1 · June 2018 · Q18(b) · 3 marks

(b)	insoluble ✓ unreactive / inert ✓ high tensile strength ✓ flexible ✓ can form hydrogen bonds with neighbouring chains ✓	**3 max**

List Rule

If all **three** prompt lines used and more than one property is on prompt line mark the **first** one on each line.

If only **one** or **two** lines used but there is more than one property listed mark the first three properties given.

IGNORE detail about structure or cell walls

IGNORE permeable

IGNORE rigid

IGNORE strong

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Question 8 · AS Paper 1 · June 2023 · Q28(b) · 4 marks

	(b)		*glucose* soluble / polar ✓ has chemical energy in its bonds **OR** is a, respiratory substrate / source of energy ✓ *starch / glycogen* insoluble **and** compact **OR** large(r), SA ✓ used for (energy / glucose) storage / allows quick release (of stored energy / glucose) ✓ *idea that* glycogen is broken down faster than starch due to, higher SA / many branch ends ✓	**4**
			Total	**8**

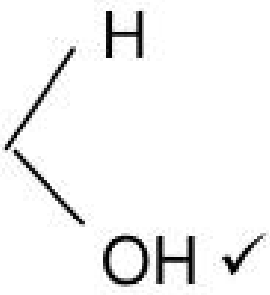
IGNORE descriptions of structure (e.g. 'glycogen is branched')
IGNORE misspelling of 'glycogen' throughout

ALLOW release, energy / ATP

IGNORE starch / glycogen, can be stored

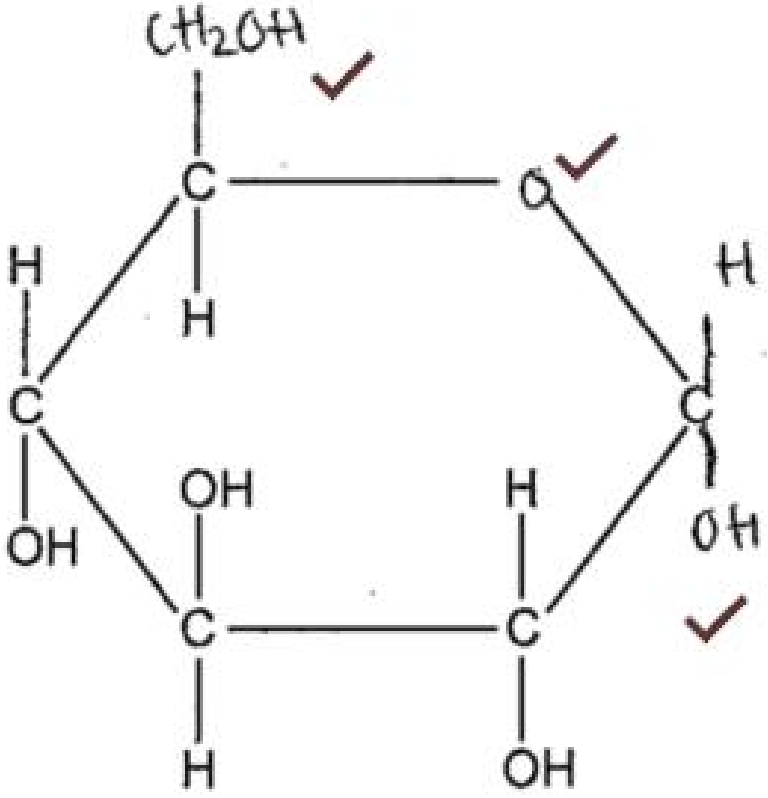
IGNORE broken down more easily

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(c)	**(i)**	*correct positions for* CH_2OH ✓ O ✓  OH ✓	**3**	1.1

ALLOW bond line to any part of the group
ALLOW correct displayed formula

IGNORE bond angles



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Question 10 · A level Paper 2 · June 2023 · Q21(c)(ii) · 2 marks

(c)	(ii)	small so it can cross membranes ✓ OH / H (groups) , allow , H bond formation / solubility / bonding with water molecules ✓	**2**	2.1

ALLOW small enough to fit through protein channels

Question 11 · AS Paper 2 · June 2016 · Q3(a)(i) · 1 mark

3	(a)	(i)	it contains **,** N / nitrogen **or** monosaccharide does not contain nitrogen ✓	**1**

CREDIT any correct ref to the nitrogen-containing group in Fig. 3.1 $NHCOCH_3$

ACCEPT 'OH is replaced with $NHCOCH_3$'
or
'$NHCOCH_3$ is replaced with OH'

ACCEPT ref to H not being twice C /
15 H instead of 12 / 8 C instead of 6

ACCEPT has no OH on carbon 2

ACCEPT 'monosaccharide **only** contains C, H & O'

DO NOT CREDIT 'it has a nitrogen molecule'

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Question 12 · A level Paper 1 · June 2018 · Q19(b) · 4 marks

19	(b)	*Similarities* ***Any two from:*** polymers / polysaccharides ✓ have , 6 carbon / C6 , sugars ✓ have 1-4 glycosidic bonds ✓ have CH_2OH side group (in monomers) ✓ *Differences* ***Any two from:*** chitin has β-glycosidic bonds ✓ chitin contains , nitrogen / N / amide / NH-CO-CH_3 ✓ no 1-6 glycosidic bonds in chitin ✓ no branching in chitin ✓	**4 max**

ALLOW have hexose(s)

ALLOW glycogen has α-glycosidic bonds
ALLOW ORA for glycogen
ALLOW ORA for glycogen
ALLOW ORA for glycogen

Question 13 · A level Paper 3 · November 2021 · Q3(a) · 2 marks

3	a		*callose…* (has) 1-3 and 1-6 glycosidicbonds ✓ (is) branched ✓ (is) helical ✓ *idea of* alternate glucose molecules are not rotated 180° ✓

2 max	2.1	**ALLOW** cellulose (has only) 1-4 glycosidic bonds **ALLOW** cellulose is, not branched / straight chains **ALLOW** cellulose is not helical **IGNORE** callose is more compact **ALLOW** *idea of* alternate glucose molecules rotated 180° in cellulose

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Question 14 · A level Paper 3 · June 2018 · Q2(b) · 3 marks

b	Phloem = B **AND** contains sucrose / non-reducing sugar ✓ non-reducing sugar / sucrose, hydrolysed / broken down, to monosaccharides ✓ Liver = A **AND** does not contain starch / gives negative result for iodine test ✓	**3**

ALLOW non-reducing sugars broken down to, reducing sugars / named monosaccharide

ALLOW 'colour after iodine added was yellow'

Question 15 · A level Paper 3 · November 2021 · Q4(a) · 2 marks

4	**a**	(carry out) Benedict's test / described ✓ (if test for reducing sugar negative) boil with (dilute) HCl and (re)test (with Benedict's) ✓	**2**	2.7

ALLOW 'add Benedict's (solution)'

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Question 16 · AS Paper 2 · June 2023 · Q3(c)(i) · 3 marks

(c)	(i)	*Any three from:*	3
		1 zero/calibrate, colorimeter with distilled water ✓	
		2 add, 600nm/red, filter (to colorimeter) ✓	
		3 place, samples/water, in a cuvette ✓	
		4 use a range of known (glucose) concentrations ✓	
		5 measure, percentage transmission / (light) absorption of, glucose solution(s)/sample(s)✓	

2.7 x1	**ALLOW** test solution for glucose solution
2.8 x1	**1 DO NOT ALLOW** calorimeter for 'colorimeter' **1 ALLOW** reset for 'zero/calibrate'
3.3 x1	**1 IGNORE** restart for 'reset'
	2 ALLOW set colorimeter to, red/600nm

Question 17 · AS Paper 2 · June 2023 · Q3(c)(ii) · 2 marks

	(ii)	**FIRST CHECK ON ANSWER LINE** **If answer = 3.5 award 2 marks**	
		45% absorption on graph = 0.0035 (mmol cm^{-3}) ✓	
		x 1000 = 3.5 (mmol dm^{-3}) ✓	
			Total

2	**2.8**	**ALLOW** range 3.4 to 3.6 (mmol dm^{-3}) for 2 marks. **ALLOW** evidence from graph for '45% absorption' **ALLOW** range of 0.0034-0.0036
14		

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