Carbohydrates: AQA A Level Biology Exam Questions by Topic

18 questions · 42 marks · about 55 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · A level Paper 1 · June 2024 · Q04.1 · 1 mark

0 4 . 1 Molasses is a solution obtained from sugar beet plants. The sugars present in molasses are sucrose, glucose and fructose.

Give the number of different types of monosaccharides present in molasses.

[1 mark]

Question 2 · A level Paper 1 · November 2020 · Q07.1 · 2 marks

0 7 . 1 Alpha-gal is a disaccharide found in red meat.

Alpha-gal is made of two galactose molecules. Galactose has the chemical formula $C_6H_{12}O_6$

Give the chemical formula for the disaccharide, alpha-gal, and describe how it is formed from two galactose molecules.

[2 marks]

Formula _____

Description _____

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Question 3 · AS Paper 1 · November 2020 · Q01.2 · 1 mark

0 1 . 2 Raffinose is a trisaccharide of three monosaccharides: galactose, glucose and fructose. The chemical formulae of these monosaccharides are:

- galactose = $C_6H_{12}O_6$
- glucose = $C_6H_{12}O_6$
- fructose = $C_6H_{12}O_6$

Give the number of carbon atoms, hydrogen atoms and oxygen atoms in a molecule of raffinose.

[1 mark]

Number of carbon atoms _____

Number of hydrogen atoms _____

Number of oxygen atoms _____

Question 4 · A level Paper 1 · June 2022 · Q02.2 · 1 mark

0 2 . 2 Scientists suggested that factors, other than antibiotic use, led to the increase in antibiotic-resistant *C. difficile* infections. One suggested factor is people eating more trehalose in their diet.

Trehalose is a disaccharide formed from two glucose molecules.

Name another disaccharide formed from two glucose molecules.

[1 mark]

_____

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Question 5 · A level Paper 1 · June 2025 · Q03.1 · 3 marks

0 3 . 1 Complete **Table 1** by adding a tick (✓) if the feature is present in the biological molecules.

Table 1

	Biological molecule		
Feature	**Glycogen**	**Sucrose**	**DNA**
Contains glucose			
Contains galactose			
Contains fructose			
Contains phosphate			
Formed by condensation reaction(s)			
Is a polymer			

[3 marks]

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Question 6 · A level Paper 1 · June 2018 · Q10.3 · 4 marks

1 0 . 3 Mucus also contains glycoproteins. One of these glycoproteins is a polypeptide with the sugar, lactose, attached.

Describe how lactose is formed and where in the cell it would be attached to a polypeptide to form a glycoprotein.

[4 marks]

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Question 7 · AS Paper 2 · June 2022 · Q02.1 · 1 mark

0 2 . 1 What term is used to describe the different structures of α-glucose and β-glucose?

[1 mark]

Question 8 · AS Paper 2 · June 2023 · Q03.1 · 2 marks

0 3 Galacto-oligosaccharides (GOS) are polymers of galactose.

0 3 . 1 Explain why GOS are described as polysaccharides.

[2 marks]

Question 9 · AS Paper 2 · June 2023 · Q03.2 · 2 marks

0 3 . 2 Give **two** differences between the structures of GOS and lactose.

[2 marks]

1

2

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Question 10 · A level Paper 1 · June 2017 · Q02.1 · 2 marks

0 2 In mammals, in the early stages of pregnancy, a developing embryo exchanges substances with its mother via cells in the lining of the uterus. At this stage, there is a high concentration of glycogen in cells lining the uterus.

0 2 . 1 Describe the structure of glycogen.

[2 marks]

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Question 11 · A level Paper 1 · June 2022 · Q09.2 · 6 marks

0 9 . 2 Compare and contrast the structure of starch and the structure of cellulose.

[6 marks]

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Question 12 · AS Paper 1 · June 2025 · Q07.2 · 3 marks

0 7 . 2 In the storage tissues of plants, carbohydrates transported through the phloem can be converted into starch.

Explain **three** features of starch that make it a good storage molecule.

[3 marks]

1 _____

_____

_____

2 _____

_____

_____

3 _____

_____

_____

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Question 13 · AS Paper 1 · June 2018 · Q02.2 · 2 marks

0 2 . 2 Lactulose is a disaccharide formed from one molecule of galactose and one molecule of fructose.

Other than both being disaccharides, give **one** similarity and **one** difference between the structures of lactulose and lactose.

[2 marks]

Similarity _____

_____

_____

_____

_____

Difference _____

_____

_____

_____

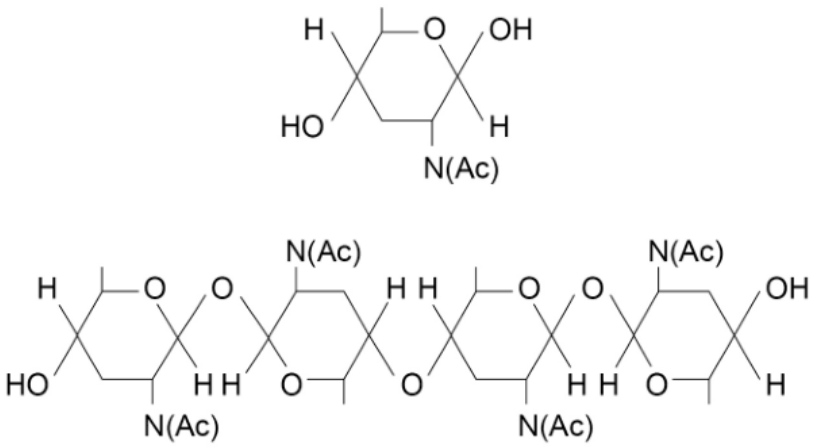
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0 2 . 1 Chitin is a polysaccharide. The chitin monomer is a β-glucose molecule with one OH group replaced by an $NHCOCH_3$ group. $NHCOCH_3$ can be represented by N(Ac).

Figure 1 shows the monomer that forms chitin and the chitin polymer.

Figure 1



Chitin has a similar structure to cellulose.

Use **Figure 1** to describe **three** ways the structure of chitin is similar to the structure of cellulose.

[3 marks]

1 _____

2 _____

3 _____

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Question 15 · A level Paper 1 · June 2024 · Q04.2 · 3 marks

0 4 . 2 A student used the biochemical test for reducing sugars on a clear sample of molasses.

Describe the biochemical test for a reducing sugar.

Explain the result expected from the test on the sample of molasses.

[3 marks]

Description of biochemical test _____

Explanation of expected result _____

Question 16 · AS Paper 1 · November 2020 · Q01.3 · 3 marks

0 1 . 3 A biochemical test for reducing sugar produces a negative result with raffinose solution.

Describe a biochemical test to show that raffinose solution contains a non-reducing sugar.

[3 marks]

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Question 17 · AS Paper 2 · June 2022 · Q02.2 · 1 mark

0 2 . 2 A student investigated the difference in the reducing sugar content of two fruit juices. He performed a biochemical test on each fruit juice using Benedict's solution. He then used a colorimeter with each test result.

Describe how the results from the colorimeter can identify the fruit juice containing the higher sugar content.

[1 mark]

Question 18 · AS Paper 2 · June 2022 · Q02.3 · 2 marks

0 2 . 3 The student controlled variables in the test using Benedict's solution.

Give **two** variables the student controlled.

[2 marks]

1 _____

2 _____

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Mark schemes

Question 1 · A level Paper 1 · June 2024 · Q04.1 · 1 mark

04.1	2;	1 (1 x AO1)	Accept glucose **and** fructose

Question 2 · A level Paper 1 · November 2020 · Q07.1 · 2 marks

07.1	1. $C_{12}H_{22}O_{11}$; 2 2. Condensation reaction OR With a glycosidic bond;	2. Reject if any other named reaction or named bond given. 2. Reject if reaction includes addition of water. Do not credit answers relating to other carbohydrates.

Question 3 · AS Paper 1 · November 2020 · Q01.2 · 1 mark

01.2	C = 18, H = 32, O = 16; 1	Accept only these answers

Question 4 · A level Paper 1 · June 2022 · Q02.2 · 1 mark

02.2	Maltose; 1 (AO1)	Reject maltase Accept phonetic spelling eg moltose/maltosse/maltoze/moltoes/maltoez

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Question 5 · A level Paper 1 · June 2025 · Q03.1 · 3 marks

03.1

1 mark for each correct column;;;

Feature	Biological molecule: Glycogen	Sucrose	DNA
Contains glucose	✓	✓	
Contains galactose			
Contains fructose		✓	
Contains phosphate			✓
Formed by condensation reaction(s)	✓	✓	✓
Is a polymer	✓		✓

3 (3 x AO1)

Question 6 · A level Paper 1 · June 2018 · Q10.3 · 4 marks

10.3

1. Glucose **and** galactose;
2. Joined by condensation (reaction);
3. Joined by glycosidic bond;
4. Added to polypeptide in Golgi (apparatus);

4

1. Ignore α or β for glucose

Question 7 · AS Paper 2 · June 2022 · Q02.1 · 1 mark

02.1

Isomer(ism); 1 (AO1)

Accept phonetic spelling

Ignore structural

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Question 8 · AS Paper 2 · June 2023 · Q03.1 · 2 marks

03.1	Any **two** from: 1. Galactose is a monosaccharide/monomer; 2. (Polysaccharide is a) carbohydrate polymer; 3. (Several) monosaccharides/monomers/galactose joined by condensation reactions **OR** (Several) monosaccharides/monomers/galactose joined by glycosidic bonds;	2 max (2 x AO2)

Question 9 · AS Paper 2 · June 2023 · Q03.2 · 2 marks

03.2	1. Lactose contains (alpha) glucose **and** GOS does not **OR** Lactose contains (alpha)glucose + galactose **and** GOS contains only galactose; 2. Lactose is a disaccharide **and** GOS is a polysaccharide; 3. Lactose has one glycosidic bond **and** GOS has many glycosidic bonds;

2 max (2 x AO2)	3. Accept 'more than one' for many

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2.1	1. Polysaccharide of α-glucose; **OR** polymer of α-glucose; 2. (Joined by) glycosidic bonds **OR** Branched structure;	2

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Question 11 · A level Paper 1 · June 2022 · Q09.2 · 6 marks

09.2	1. Both polysaccharides **OR** Both are glucose <u>polymers</u> **OR** Both are made of glucose <u>monomers</u>; 2. Both contain glycosidic bonds (between monomers); 3. Both contain carbon, hydrogen and oxygen/C, H and O; 4. Starch has α-glucose **and** cellulose has β-glucose; 5. Starch (molecule) is helical/coiled **and** cellulose (molecule) is straight; 6. Starch (molecule) is branched **and** cellulose is not/unbranched; 7. Cellulose has (micro/macro) fibr<u>ils</u> **and** starch does not;	6 max (6 x AO1)

Must include 1, 2 OR 3 to achieve 6 marks

All statements must be clearly comparative or linked by the candidate, not inferred from separate statements

Additional mark point

8. Starch has 1–6 glycosidic bonds **and** cellulose does not

OR

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Question 12 · AS Paper 1 · June 2025 · Q07.2 · 3 marks

07.2	1. Insoluble (in water), **so** doesn't affect water potential/osmosis; 2. Coiled/spiral/(*α*-)helix, **so** compact **OR** Coiled/spiral/(*α*-)helix **so** can fit many (molecules) in small area; 3. Many (*α*-)glucose **for** respiration; 4. Branched/more ends **so** fast breakdown/hydrolysis; 5. Large (molecule), **so** can't leave the cell;	3 max (3 x AO1)

1. Accept Ψ for water potential

4. Ignore surface area
4. Accept branched **so** glucose readily released

Question 13 · AS Paper 1 · June 2018 · Q02.2 · 2 marks

02.2	**Similarity** 1. Both contain galactose / a glycosidic bond; **Difference** 2. Lactulose contains fructose, whereas lactose contains glucose;	2	1. Ignore references to hydrolysis and / or condensation 2. Ignore alpha / beta prefix for glucose 2. Difference must be stated, not implied

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Question 14 · A level Paper 1 · June 2023 · Q02.1 · 3 marks

02.1	1. (Alternate) monomers/glucoses are flipped/upside down/rotated (by 180°); 2. (Joined by) glycosidic bonds; 3. (Forms) straight/linear/unbranched (chains/ molecules);	3 max (3 x AO2)	Ignore they are both polysaccharides 4. Accept as an additional mark point, 'contains 1-4 linkages/bonds' 4. Reject if reference made to 1-6 5. Accept as an additional mark point, 'have β glucose' Ignore both contain C, H and O

Question 15 · A level Paper 1 · June 2024 · Q04.2 · 3 marks

04.2	1. **Heat** with Benedict's (solution/reagent); 2. Red (colour/precipitate); 3. (Because) glucose/fructose is/are reducing sugars **OR** (Because) glucose/fructose is/are detected;	3 (3 x AO1)	1. Ignore water bath unqualified 1. Ignore warm 1. Accept Fehling's for Benedict's 1. Reject if heat with acid 2. Accept green **OR** orange **OR** brown **OR** yellow 2. Ignore emulsion 3. Reject if sucrose is detected

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Question 16 · AS Paper 1 · November 2020 · Q01.3 · 3 marks

01.3	1. Heat with acid **and** neutralise; 2. Heat with Benedict's (solution); 3. Red precipitate/colour;	3	Accept boil/water bath for heat Accept named alkali for neutralise 1. Accept named examples, eg HCl, $NaHCO_3$ 3. Accept other colours eg orange/ brown/green
TOTAL		**8**	

Question 17 · AS Paper 2 · June 2022 · Q02.2 · 1 mark

02.2	High(er) absorbance (has more sugar) **OR** Low(er) transmission (has more sugar);	1 (AO2)	Accept a description of absorbance or transmission

Question 18 · AS Paper 2 · June 2022 · Q02.3 · 2 marks

02.3	1. Benedict's (solution) <u>volume</u>; 2. Benedict's (solution) <u>concentration</u>; 3. (Fruit) juice <u>volume</u>; 4. (Water bath/water/solution) temperature; 5. Duration of heating (in water bath);	2 max (2 x AO2)	Accept examples of volumes and concentrations and temperatures

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