



**Exampro A-level Biology  
(7401/7402)**

Name:

Class:

Carbohydrates questions

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Author:

Date:

Time: **61**

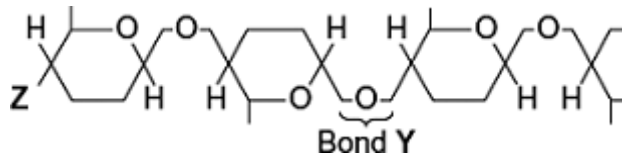
Marks: **47**

Comments:

**These questions mix the different styles of questions. Short answers, practical techniques, experimental data analysis, extended answer and comprehension Work through these, the more you do the better you will become with your exam technique.**

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**Q1.** The diagram shows one end of a cellulose molecule.



(a) (i) Name the monomers that form a cellulose molecule.

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(1)

(ii) Name bond Y.

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(1)

(iii) What chemical group is at position Z?

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(1)

(b) (i) Complete the table to show **two** ways in which the structure of cellulose is different from the structure of starch.

Starch	Cellulose

(2)

(ii) Explain **one** way in which the structure of cellulose is linked to its function.

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(2)  
(Total 7 marks)

**Q2.** (a) Starch and protein are biologically important polymers.

(i) Explain what is meant by a polymer.

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(1)

(ii) Give **one** example of a biologically important polymer other than starch or protein.

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(1)

(b) In an investigation, the enzyme amylase was mixed in a test tube with a buffer solution and a suspension of starch. The amylase broke down the starch to maltose. When all the starch had been broken down, a sample was removed from the test tube and tested with biuret reagent.

(i) Explain why a buffer solution was added to the amylase-starch mixture.

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(2)

(ii) What colour would you expect the sample to go when tested with biuret reagent?

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(1)

(iii) Give an explanation for your answer to part (ii)

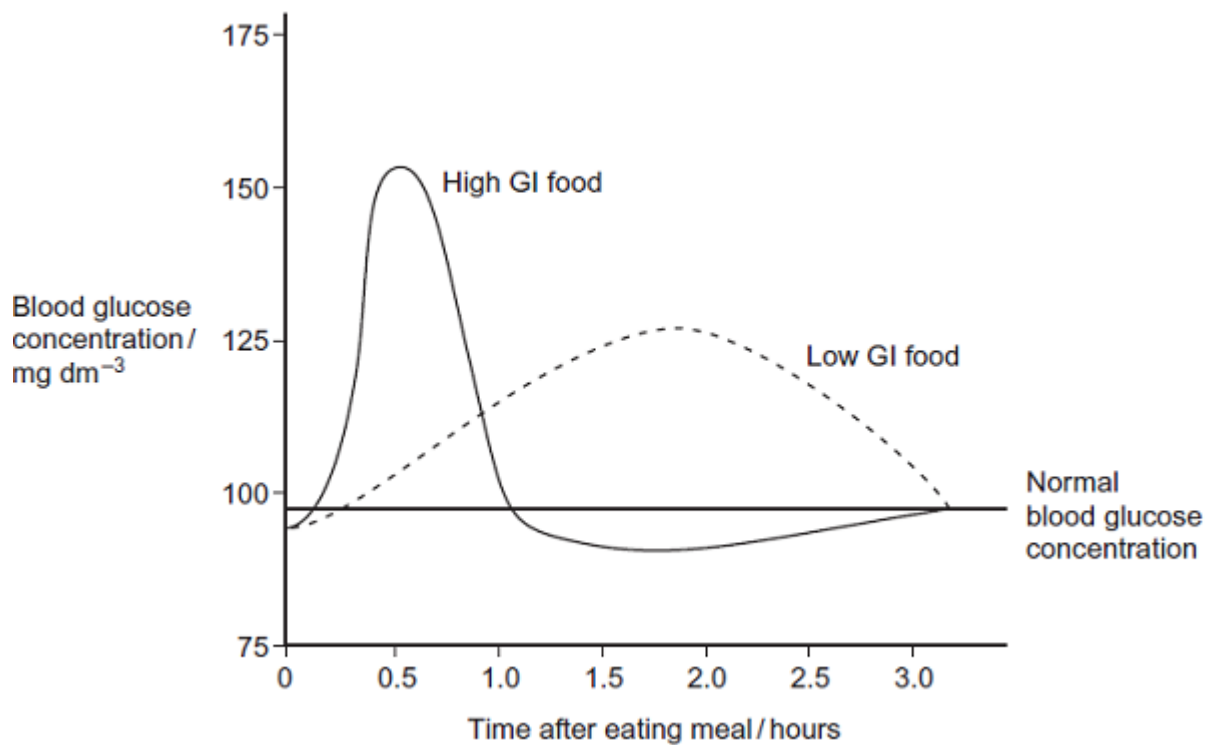
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(2)  
(Total 7 marks)

**Q3.** The glycaemic index (GI) is a measure of the increase in blood glucose concentration after eating a given mass of a food compared with eating the same mass of pure glucose. The GI of pure glucose has a value of 100.

The GI of a food depends on several factors such as how much starch and sugars it contains. High GI foods include those containing lots of simple sugars or white flour. The carbohydrates in these foods are rapidly digested and absorbed. Low GI foods include wholegrain bread and breakfast cereals that contain a lot of fibre. The carbohydrates in these foods are digested and absorbed more slowly.

The following figure shows changes in blood glucose concentration after eating meals of high GI food and meals of low GI food.



- (a) Complete the table below to give **four** differences between the effects of high GI and low GI foods on blood glucose concentration.

High GI foods	Low GI foods

(4)

- (b) White bread and wholegrain bread contain similar proportions of starch. White bread has a higher GI than wholegrain bread.

Suggest **one** explanation for the difference in GI.

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(2)

(Total 6 marks)

**Q4.** Some people are lactose intolerant. The lactose in milk and milk products, such as cheese, causes digestive discomfort in these people.

Scientists gave 159 adult volunteers, who had diagnosed themselves as lactose intolerant, a questionnaire to complete. The volunteers were asked,

- do you eat the food?
- if you eat the food, do you feel discomfort after eating it?

The results are shown in the table.

Food	Typical lactose content / g per serving	Percentage of people who			
		A do not eat the food	B feel discomfort after eating the food	C (= A + B) do not eat the food or feel discomfort after	D feel no discomfort after eating the food

				eating the food	
Hard cheese	1.2	11.1	39.9	51.0	49.0
Pizza	3.0	10.4	57.8	68.2	31.8
Soft cheese	3.6	25.1	53.0	78.1	21.9
Ice cream	6.0	14.6	68.2	82.8	17.2
Milk	9.9	27.0	67.1	94.1	5.9

(a) The scientists investigated the relationship between the lactose content of the food and the amount of digestive discomfort.

(i) The figures in columns **A** and **B** were used to produce those in column **C**. The scientists used column **C** rather than column **B** in their analysis. Suggest why.

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(1)

(ii) Describe the relationship between the lactose content of the food and the data in column **C**.

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(1)

(iii) The scientists could **not** conclude that the discomfort was caused by the increase in lactose content of the food. Explain why.

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(2)

(b) Suggest **two** reasons why the data in this table may be unreliable.

1 .....

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2 .....

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(2)  
(Total 6 marks)

**Q5.** Read the following passage.

Straw consists of three main organic substances – cellulose, hemicellulose and lignin. Cellulose molecules form chains which pack together into fibres. Hemicellulose is a small molecule formed mainly from five-carbon (pentose) sugar monomers. It acts as a cement holding cellulose fibres together. Like hemicellulose, lignin is a polymer, but it is not a carbohydrate. It covers the cellulose in the cell wall and supplies additional strength. In addition to these three substances, there are small amounts of other biologically important polymers present.

The other main component of straw is water. Water content is variable but may be determined by heating a known mass of straw at between 80 and 90°C until it reaches a constant mass.

10 The loss in mass is the water content.

Since straw is plentiful, it is possible that it could be used for the production of a range of organic substances. The first step is the conversion of cellulose to glucose. It has been suggested that an enzyme could be used for this process. There is a difficulty here, however. The lignin which covers the cellulose protects the cellulose from enzyme attack.

Use information from the passage and your own knowledge to answer the following questions.

(a) (i) Give **one** way in which the structure of a hemicellulose molecule is similar to the structure of a cellulose molecule.

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(1)

- (ii) Complete the table to show **two** ways in which the structure of a hemicellulose molecule differs from the structure of a cellulose molecule.

Hemicellulose	Cellulose
<p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p>
<p>.....</p> <p>.....</p>	<p>.....</p> <p>.....</p>

(2)

- (b) Name **one** biologically important polymer, other than those mentioned in the passage, which would be found in straw.

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(1)

- (c) Explain why the following steps were necessary in finding the water content of straw:

- (i) heating the straw *until it reaches constant mass* (line 9);

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(1)

- (ii) not heating the straw above 90°C (line 9).

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(2)

- (d) A covering of lignin protects cellulose from enzyme attack (line 14). Use your knowledge of the way in which enzymes work to explain why cellulose-digesting enzymes do not digest lignin.

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(2)

- (e) Describe the structure of a cellulose molecule and explain how cellulose is adapted for its function in cells.

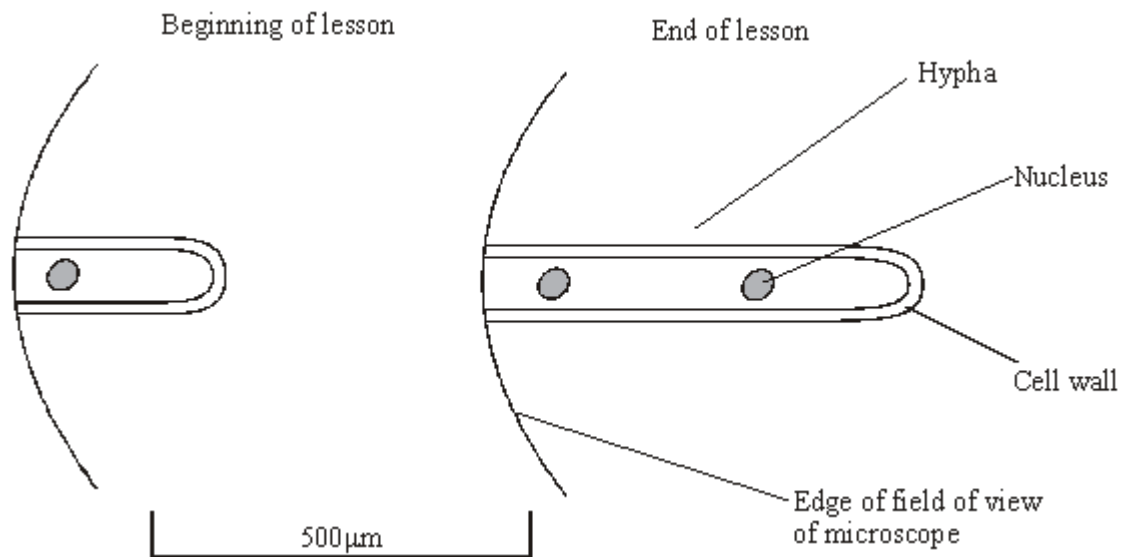
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(6)

(Total 15 marks)

**Q6.** Moulds belong to a group of organisms called fungi. When mould is examined with a microscope it is seen to consist of long, colourless threads called hyphae.

A student investigated the growth of fungal hyphae. The diagram shows part of a hypha seen under a microscope at the beginning of a lesson and again at the end of the lesson.



(a) Give **one** piece of evidence from the diagram that fungi are eukaryotic.

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(1)

(b) (i) By how much had the hypha grown during the lesson? Show your working.

Answer: ..... μm

(2)

(ii) Explain how you could use your answer to calculate the rate of growth of this hypha.

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(1)

- (c) Under the microscope, small granules were seen in the hypha. Describe how you could show that these granules consisted of starch.

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(2)  
(Total 6 marks)