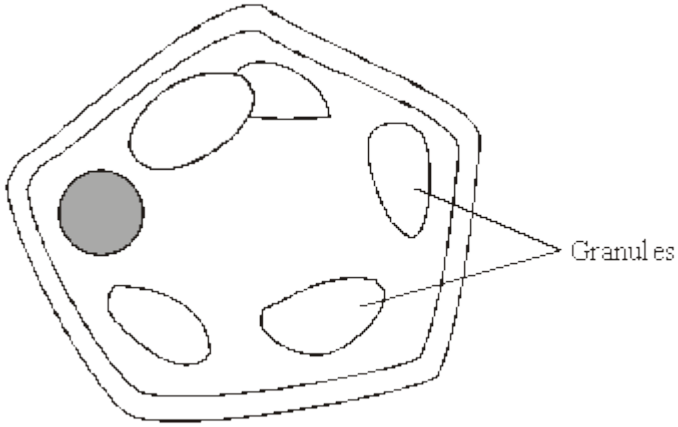
EXAM PAPERS PRACTICE

Carbohydrates 2

Level: AQA A Level 7402
Subject: Biology
Exam Board: Suitable for all boards
Topic: Carbohydrates 2
Type: Questionnaire

To be used by all students preparing for AQA A Level Biology 7402 foundation or higher tier but also suitable for students of other boards.

1 The diagram shows a cell from a potato.



(a) Give **two** features which may be found in a prokaryotic cell which would not be found in this cell.

1. _____

2. _____

(2)

(b) (i) Describe how you could confirm that the granules contained starch.

_____

_____

_____

(1)

(ii) Name **one** polysaccharide other than starch that would be found in this cell.

_____

(1)

(c) Explain **one** advantage of storing starch rather than glucose in potato cells.

_____

_____

_____

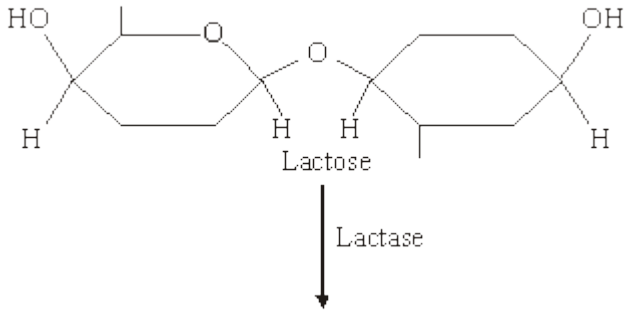
_____

(2)

(Total 6 marks)

2 Lactose is a disaccharide found in milk. In the human small intestine, the enzyme lactase catalyses the hydrolysis of lactose to the monosaccharides, galactose and glucose. These monosaccharides are then absorbed into the blood.

SComplete the diagram to show the hydrolysis of lactose to galactose and glucose.



(Total 2 marks)

3 Lactose is a disaccharide found in milk. In the small intestine, it is digested into glucose and galactose by the enzyme lactase. Molecules of lactase are located in the plasma membranes of cells lining the small intestine.

(a) What evidence in the paragraph suggests that galactose is a monosaccharide?

_____

_____

(1)

(b) (i) Name **one** other digestive enzyme that is located in the plasma membranes of cells lining the small intestine.

_____

(1)

(ii) Give an advantage of lactase and other digestive enzymes being located in the plasma membranes of cells lining the small intestine, rather than being secreted into the lumen of the small intestine.

_____

_____

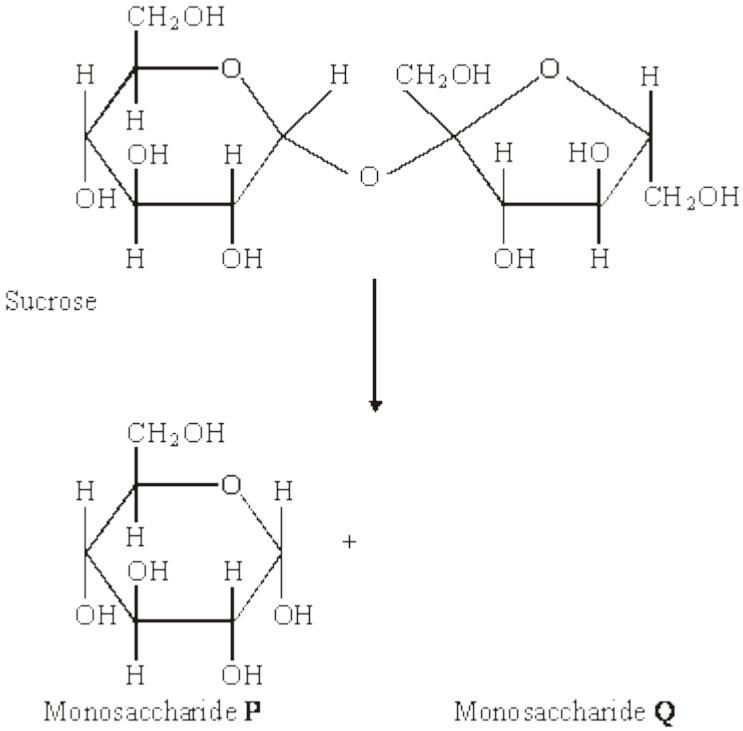
(1)

(c) The absorption of galactose from the small intestine is reduced if the absorbing cells are treated with a respiratory inhibitor, such as cyanide. Suggest an explanation for this.

(2)

(Total 5 marks)

4 Sucrose is a disaccharide. It is formed from two monosaccharides **P** and **Q**. The diagram shows the structure of molecules of sucrose and monosaccharide **P**.



(a) (i) Name monosaccharide **Q**.

(1)

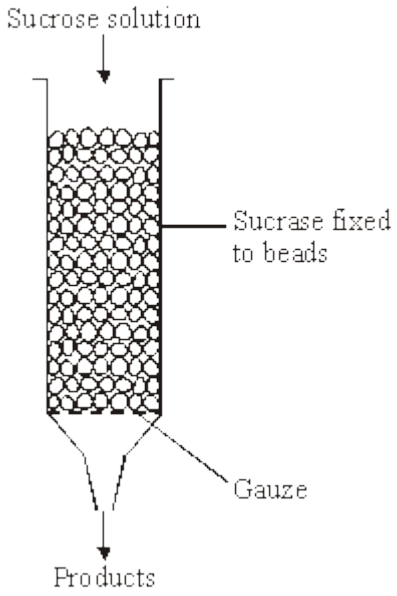
(ii) Draw the structure of a molecule of monosaccharide **Q** in the space above.

(1)

(b) The enzyme sucrase catalyses the breakdown of sucrose into monosaccharides. What type of reaction is this breakdown?

(1)

(c) The diagram shows apparatus used in breaking down sucrose. The enzyme sucrase is fixed to inert beads. Sucrose solution is then passed through the column.



Describe a biochemical test to find out if the solution collected from the apparatus contains

(i) the products;

_____

_____

_____

_____

(2)

(ii) the enzyme.

_____

_____

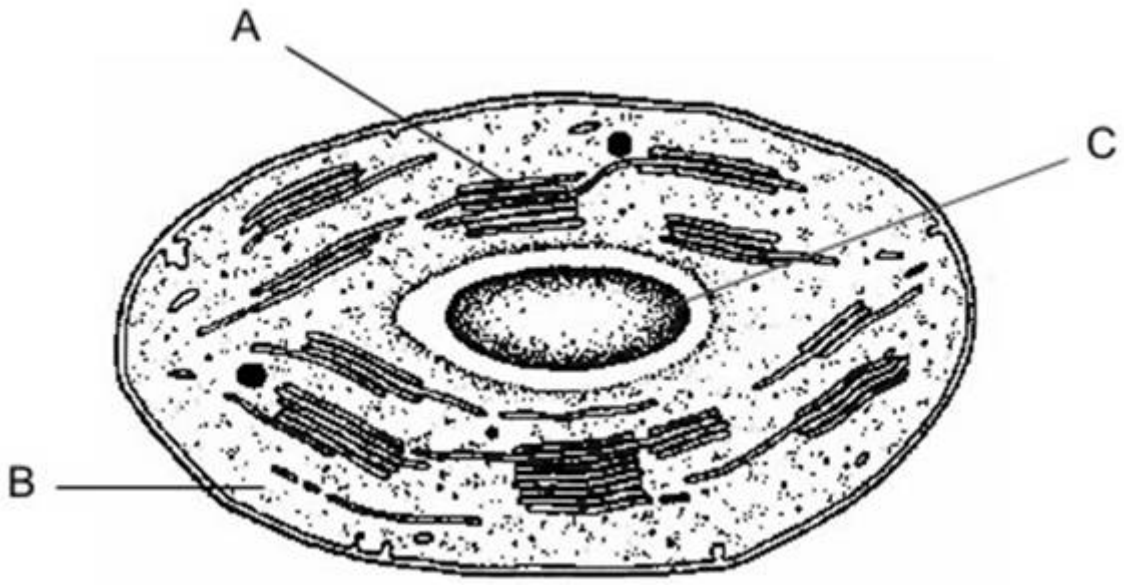
_____

_____

(2)

(Total 7 marks)

5 The electron micrograph shows part of a chloroplast.



(a) Name the parts labelled **A** and **B** and, for each, describe **one** role in the process of photosynthesis.

A Name _____

Role _____

(2)

B Name _____

Role _____

(2)

(b) (i) Name the main substance present in the part labelled **C**.

_____

(1)

(ii) How is this substance formed?

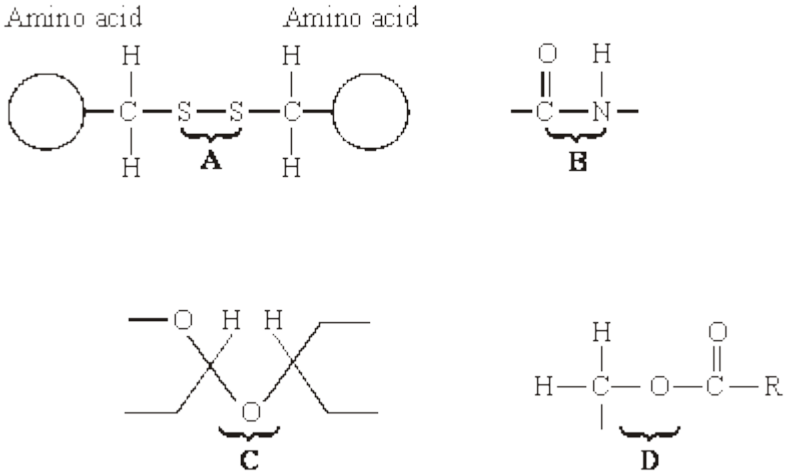
_____

_____

(1)

(Total 6 marks)

6 The diagrams show four types of linkage, **A** to **D**, which occur in biological molecules.



(a) Name the chemical process involved in the formation of linkage **B**.

_____

(1)

(b) Give the letter of the linkage which

(i) occurs in a triglyceride molecule;

_____

(1)

(ii) might be broken down by the enzyme amylase;

_____

(1)

(iii) may occur in the tertiary, but not the primary structure of protein.

_____

(1)

(c) Describe how a saturated fatty acid differs in molecular structure from an unsaturated fatty acid.

_____

_____

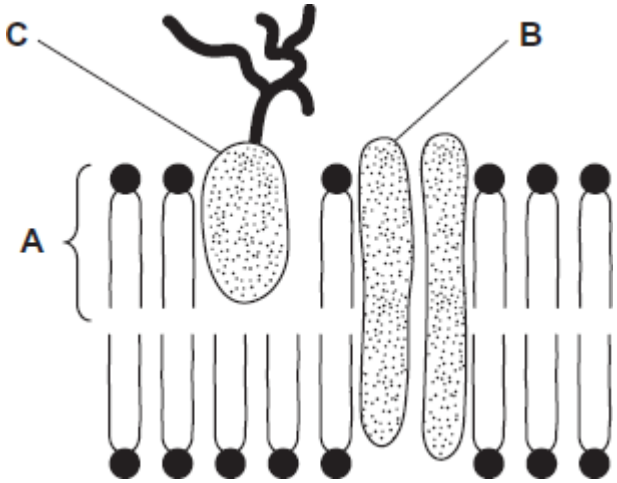
_____

_____

(2)

(Total 6 marks)

7 The diagram shows the structure of the cell-surface membrane of a cell.



(a) Name **A** and **B.**

A _____

B _____

(2)

(b) (i) **C** is a protein with a carbohydrate attached to it. This carbohydrate is formed by joining monosaccharides together. Name the type of reaction that joins monosaccharides together.

Name the type of reaction that joins monosaccharides together.

_____

(1)

(ii) Some cells lining the bronchi of the lungs secrete large amounts of mucus. Mucus contains protein.

Name **one** organelle that you would expect to find in large numbers in a mucus-secreting cell and describe its role in the production of mucus.

Organelle _____

Description of role _____

_____

_____

_____

(2)

(Total 5 marks)

8 (a) Name the monosaccharides of which the following disaccharides are composed.

(i) Sucrose

monosaccharides_____and_____

(1)

(ii) Lactose

monosaccharides_____and_____

(1)

(b) Amylase and maltase are involved in the digestion of starch in the small intestine.

Complete the table by identifying where these enzymes are produced and the product of the reaction they catalyse.

Name of enzyme	Where the enzyme is produced	Product of the reaction catalysed by the enzyme
Amylase		
Maltase		

(2)

(Total 4 marks)

9 (a) The table shows some statements about three carbohydrates. Complete the table with a tick in each box if the statement is true.

Statement	Starch	Cellulose	Glycogen
Found in plant cells			
Contains glycosidic bonds			
Contains β-glucose			

(3)

(b) Name the type of reaction that would break down these carbohydrates into their monomers.

_____

(1)

(c) Give **one** feature of starch and explain how this feature enables it to act as a storage substance.

Feature _____

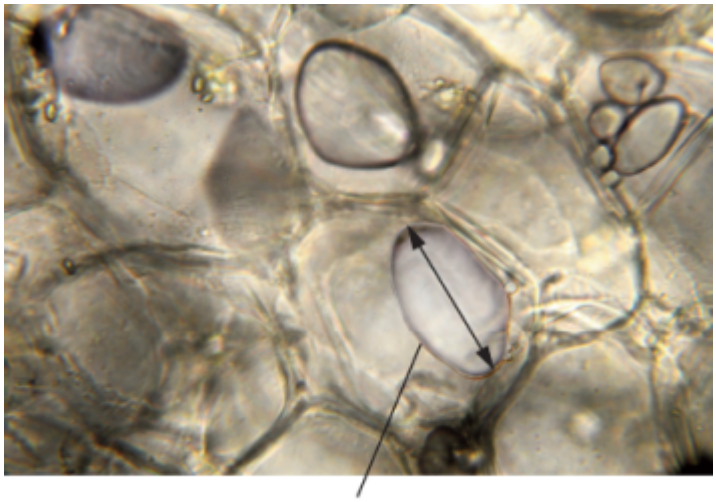
Explanation _____

_____

_____

(2)

(d) The picture shows starch grains as seen with an optical microscope. The actual length of starch grain **A** is 48 μm. Use this information and the arrow line to calculate the magnification of the picture. Show your working.

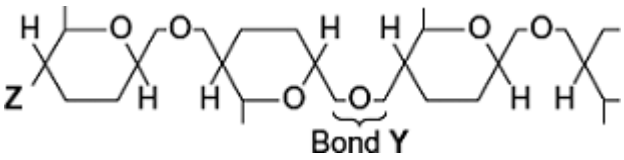


Magnification _____ times

(2)

(Total 8 marks)

10 The diagram shows one end of a cellulose molecule.



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

_____

(1)

(ii) Name bond **Y**.

_____

(1)

(iii) What chemical group is at position **Z**?

_____

(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.

_____

_____

_____

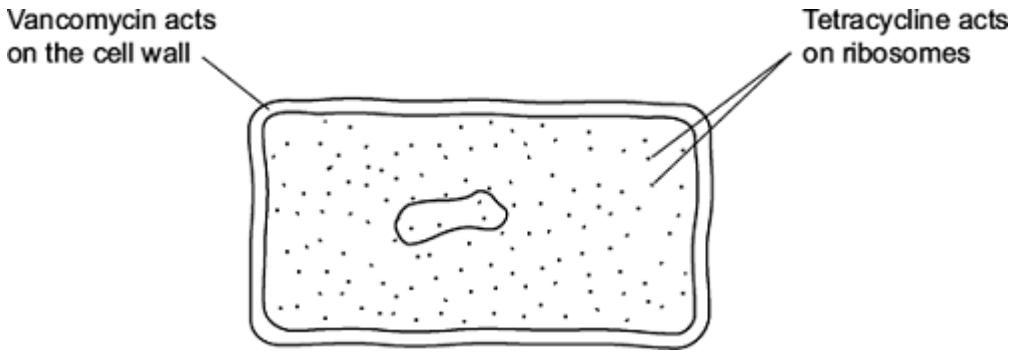
_____

_____

(2)

(Total 7 marks)

11 The diagram shows the structure of a bacterium and the sites of action of two antibiotics.



(a) (i) Use information in the diagram to explain why vancomycin does **not** affect human cells.

_____

_____

(1)

(ii) Use information in the diagram to explain how tetracycline prevents bacterial growth.

_____

_____

(1)

(b) Frequent treatment with vancomycin can result in resistant strains of bacteria. Explain how.

_____

_____

_____

_____

_____

_____

*(Extra space)*_____

_____

_____

(2)

(Total 4 marks)

12 The equation shows the breakdown of lactose by the enzyme lactase.

Lactose + water $\xrightarrow{\text{lactase}}$ galactose + monosaccharide **X**

(a) (i) Name the type of reaction catalysed by the enzyme lactase.

_____

(1)

(ii) Name monosaccharide **X**.

_____

(1)

(b) (i) Describe how you would use a biochemical test to show that a reducing sugar is present.

_____

_____

_____

_____

_____

(2)

(ii) Lactose, galactose and monosaccharide **X** are all reducing sugars.
After the lactose has been broken down there is a higher concentration of reducing sugar. Explain why.

_____

(1)

(c) A high concentration of galactose slows down the breakdown of lactose by lactase.
Use your knowledge of competitive inhibition to suggest why.

_____

_____

_____

_____

_____

(2)

(Total 7 marks)

13 (a) Give **one** feature of starch and explain how this feature enables it to act as a storage substance.

Feature _____

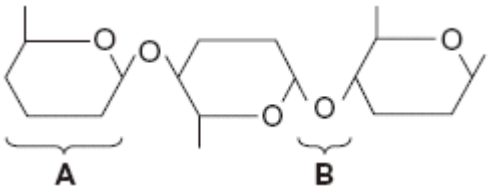
Explanation _____

_____

_____

(2)

(b) The diagram shows part of a cellulose molecule.



(i) Name part **A**.

_____

(1)

(ii) Name bond **B**.

_____

(1)

(c) The structure of cellulose is related to its role in plant cell walls. Explain how.

_____

_____

_____

_____

_____

_____

(3)

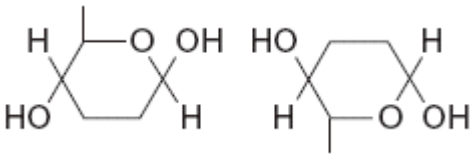
(Total 7 marks)

14 (a) The table shows some substances found in cells. Complete the table to show the properties of these substances. Put a tick in the box if the statement is correct.

Statement	**Substance**			
	Starch	Glycogen	Deoxyribose	DNA helicase
Substance contains only the elements carbon, hydrogen and oxygen				
Substance is made from amino acid monomers				
Substance is found in both animal cells and plant cells				

(4)

(b) The diagram shows two molecules of β-glucose.



On the diagram, draw a box around the atoms that are removed when the two β-glucose molecules are joined by condensation.

(2)

(c) (i) Hydrogen bonds are important in cellulose molecules. Explain why.

_____

_____

_____

_____

(2)

(ii) A starch molecule has a spiral shape. Explain why this shape is important to its function in cells.

_____

_____

_____

(1)

(Total 9 marks)

15 Doctors compared two tests for lactase deficiency.

Doctors investigated three groups of people. The people in all three groups were not allowed to eat or drink for 8 hours before the test. They each then drank a solution containing 50 g of lactose made with a radioactive form of carbon called ^{14}C.

- Group **A** were the control group
- Group **B** were lactase deficient
- Group **C** had irritable bowel syndrome (IBS)

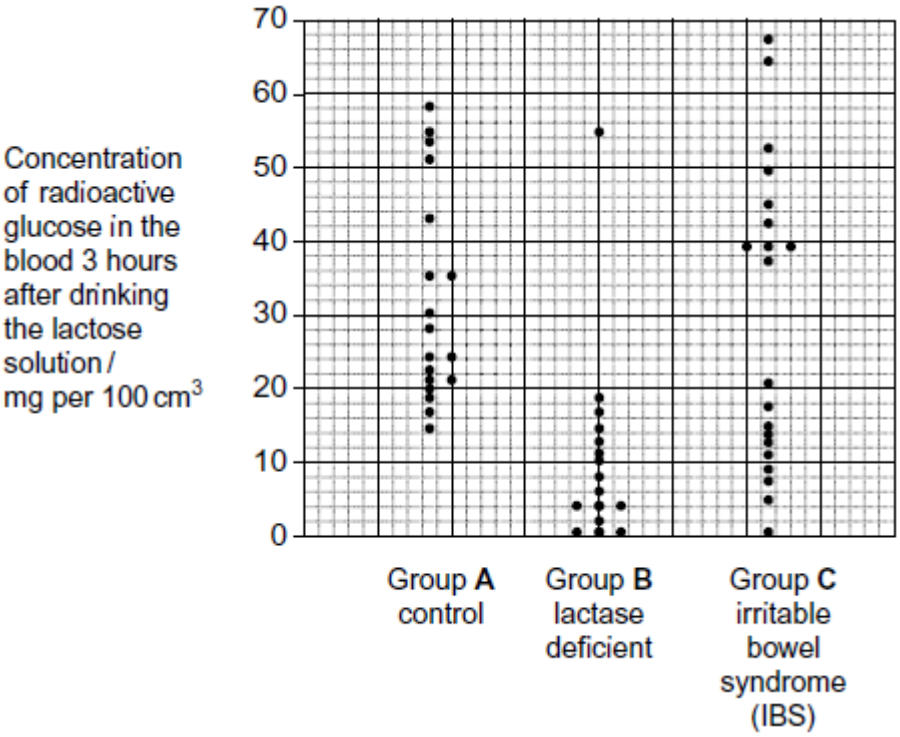
Both lactase deficiency and irritable bowel syndrome have similar symptoms.

The doctors carried out two measurements on the people in each group.

Test 1 – The lactose tolerance test

The doctors measured the concentration of radioactive glucose in the blood of each person. **Figure 1** shows the results. Each point shows the result for one person 3 hours after drinking the lactose solution.

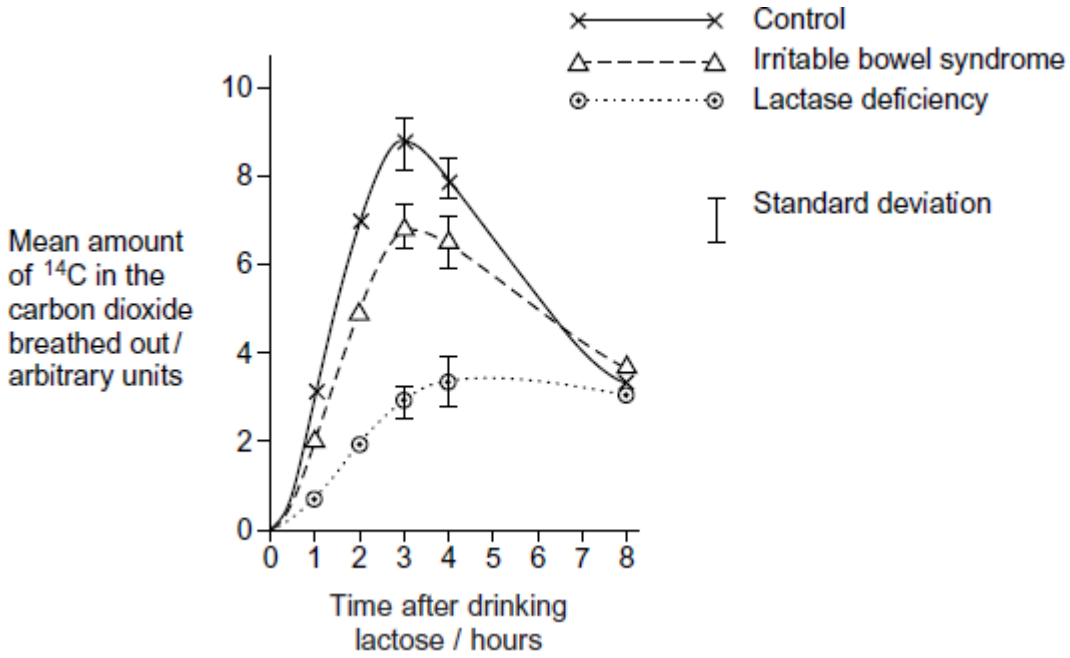
Figure 1



Test 2 – The carbon dioxide breath test

In this test the doctors measured the amount of ^{14}C in the carbon dioxide breathed out. The doctors took measurements at intervals for 8 hours after each volunteer had drunk the lactose solution. **Figure 2** shows the mean results for each group.

Figure 2



The people who took part in these tests were not allowed to eat or drink for 8 hours before the test. Explain why.

_____

_____

_____

_____

(Total 2 marks)

16 (a) (i) The equation shows the reaction catalysed by the enzyme lactase. Complete this equation.

Lactose + _____ ⟶ Glucose + _____

(2)

(ii) Name the type of chemical reaction shown in this equation.

_____

(1)

(b) Lactase is an enzyme. Lactose is a reducing sugar.

(i) Describe how you could use the biuret test to distinguish a solution of the enzyme, lactase from a solution of lactose.

_____

_____

(1)

(ii) Explain the result you would expect with the enzyme.

_____

_____

(1)

(Total 5 marks)

17 (a) What is a tissue?

_____

_____

(1)

(b) A student cut a thin section of tissue from a potato and examined it with an optical microscope.

(i) Starch was present in the cells of this tissue. Describe how the student could find out where in the cells the starch was present.

_____

_____

_____

_____

_____

(2)

(ii) The student cut a thin section of the tissue. Explain why it was important that the section was thin.

_____

_____

_____

_____

_____

(2)

(c) The cell walls of potato cells contain cellulose. Cellulose and starch are both carbohydrates. Describe **two** ways in which molecules of cellulose are similar to molecules of starch.

_____

_____

_____

_____

(2)

(Total 7 marks)

18 A glucose biosensor is an instrument used to measure glucose concentration. It contains an enzyme called glucose oxidase.

(a) A glucose biosensor detects only glucose. Use your knowledge of the way in which enzymes work to explain why.

_____

_____

_____

_____

_____

_____

(3)

(b) It is better to use a biosensor than the Benedict's test to measure the concentration of glucose in a sample of blood. Suggest **two** reasons why.

1. _____

_____

2. _____

_____

(2)

(c) (i) Diabetes mellitus is a disease that can lead to an increase in blood glucose concentration. Some diabetics need insulin injections. Insulin is a protein so it cannot be taken orally. Suggest why insulin cannot be taken orally.

_____

_____

_____

(1)

(ii) A drug company produced a new type of insulin. Scientists from the company carried out a trial in which they gave this new type of insulin to rats. They reported that the results of this trial on rats were positive. A newspaper stated that diabetics would benefit from this new drug. Suggest **two** reasons why this statement should be viewed with caution.

1. _____

_____

2. _____

_____

(2)

(Total 8 marks)

19 (a) Sucrose, maltose and lactose are disaccharides.

(i) Sucrase is an enzyme. It hydrolyses sucrose during digestion. Name the products of this reaction.

_____ and _____

(2)

(ii) Sucrase does **not** hydrolyse lactose. Use your knowledge of the way in which enzymes work to explain why.

_____

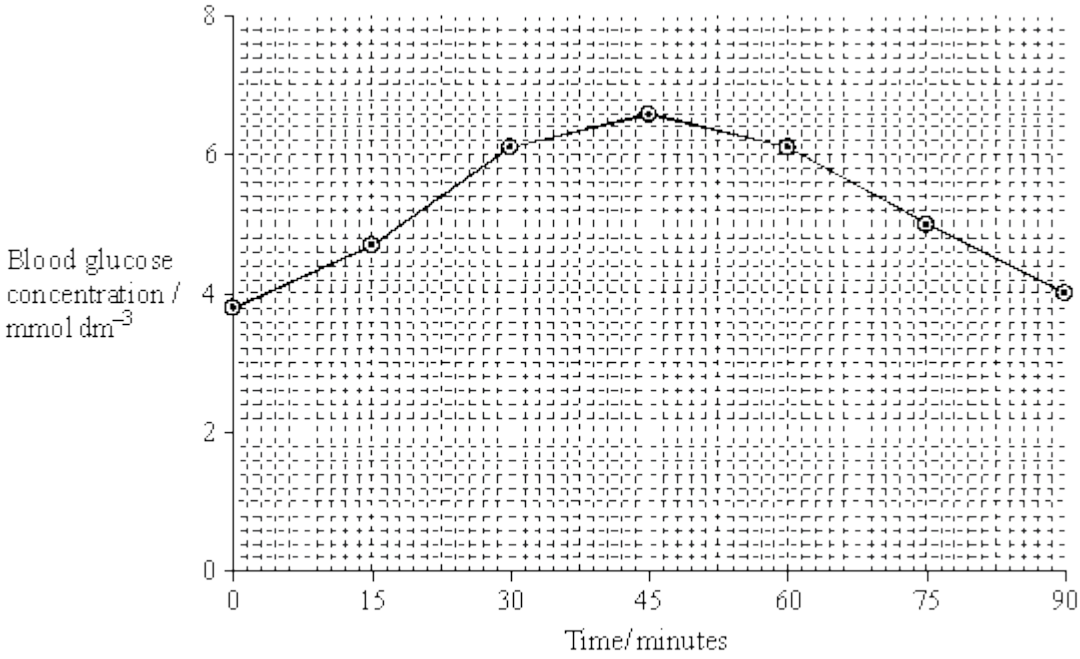
_____

_____

_____

(2)

(b) A woman was given a solution of sucrose to drink. Her blood glucose concentration was measured over the next 90 minutes. The results are shown on the graph.



(i) Describe how the woman's blood glucose concentration changed in the period shown in the graph.

(2)

(ii) Explain the results shown on the graph.

(2)

(Total 8 marks)