Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use Total EMPA mark	
Examiner's Initials	
Section	Mark
Task 1	
Task 2	
Section A	
Section B	
TOTAL EMPA MARK	

General Certificate of Education
Advanced Subsidiary Examination
June 2010

Biology BIO3X

Unit 3X AS Externally Marked Practical Assignment

Written Test

For submission by 15 May 2010

For this paper you must have:
- Task Sheet 2, your results and your graph
- a ruler with millimetre measurements
- a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 30.
- You will be marked on your ability to:
  – use good English
  – organise information clearly
  – use scientific terminology accurately.

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

Section A

These questions are about your investigation into the effect of pH on the breakdown of lactose by lactase.

Use your Task Sheet 2, your results and your graph to answer them.

Answer **all** questions in the spaces provided.

8 (a) You were told to leave the tubes in the water bath for 3 minutes before adding the enzyme to the milk and buffer (Step 3). Explain why.

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(1 mark)

8 (b) Explain how you would know if 3 minutes was long enough to leave the tubes before mixing.

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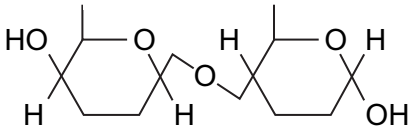
(1 mark)

9 The diagram shows the structure of a molecule of lactose.

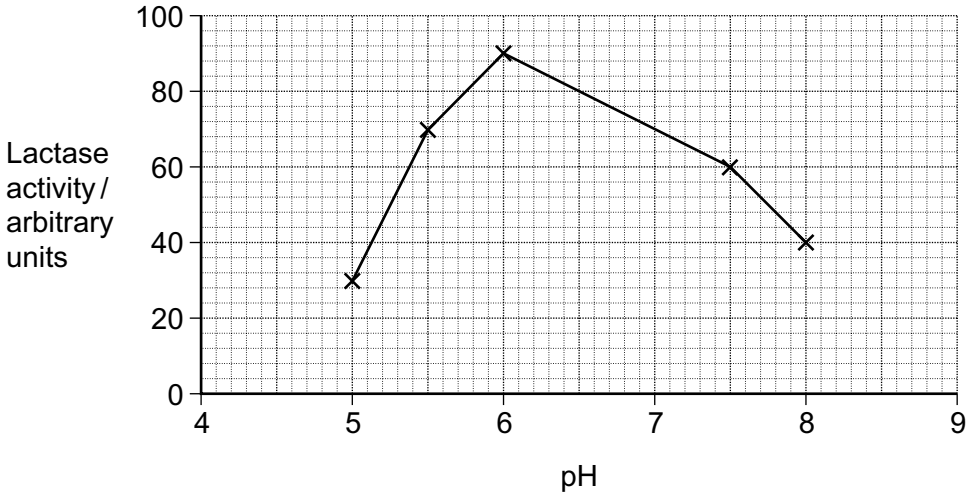


Draw a diagram to show the monosaccharides formed when lactose is hydrolysed.

(2 marks)

Turn over ▶

10 A student carried out an investigation into the effect of pH on the activity of lactase. The graph shows the results.



10 (a) Explain the shape of the curve.

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(3 marks)

(Extra Space) .....

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10 (b) This student concluded that the optimum pH for the action of lactase was pH 6.0. Was this a valid conclusion? Explain your answer.

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(2 marks)

10 (c) Glucose test strips contain immobilised enzymes. Immobilised enzymes are not usually affected by the changes in pH in the range used in this investigation.

Describe how you would investigate whether the enzymes on the glucose test strips were affected by the pH of the buffers used in your investigation.

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(3 marks)

(Extra Space) .....

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TURN OVER FOR THE NEXT QUESTION

12

Resource Sheet

Resource A

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)

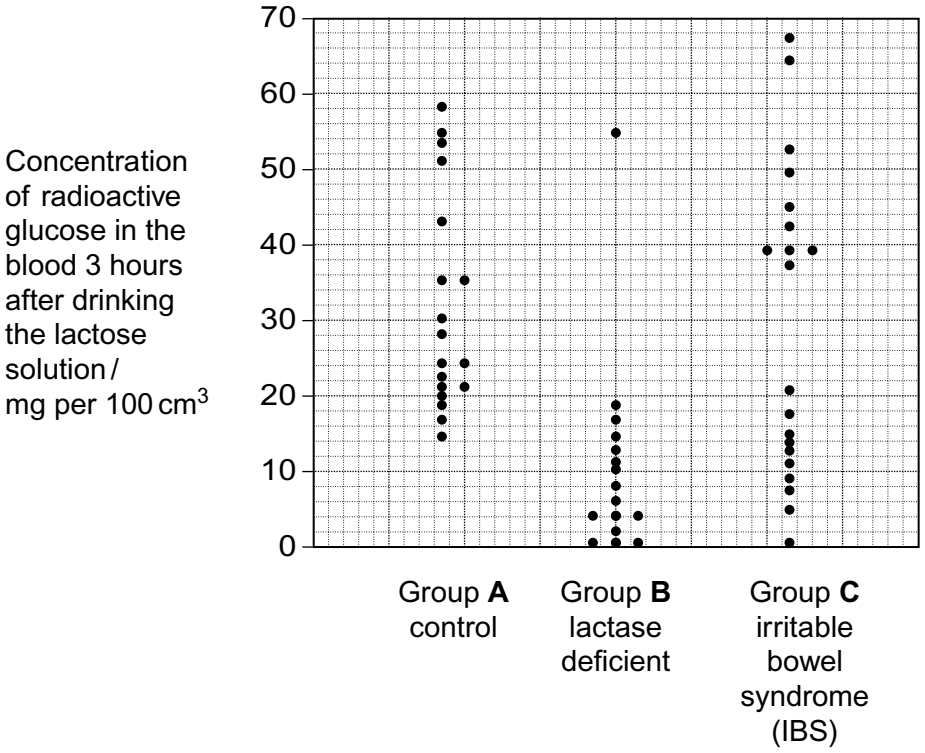
Both lactase deficieny and irritable bowel syndrome have similar symptoms.

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.

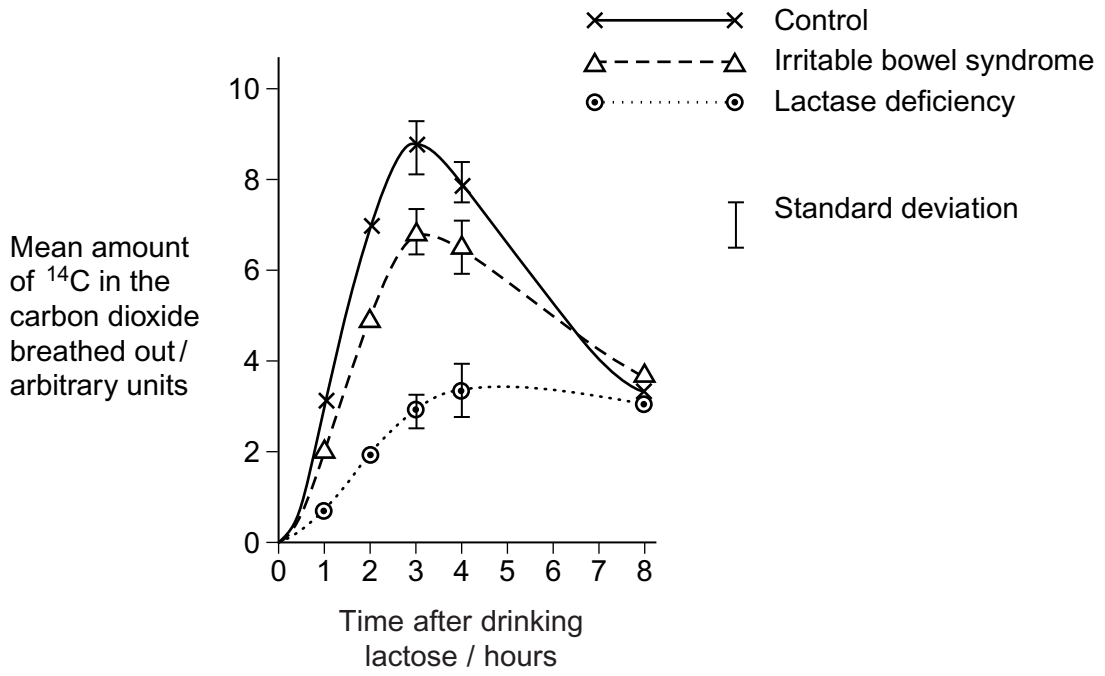
Figure 1



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



Resource B

Biologists divided new-born rats randomly into four groups.

They fed the rats in each group on a standard diet which only differed in the carbohydrate content. When these rats were adult, the biologists measured the activity of lactase in the digestive system of the rats. **Figure 3** shows the mean results for each group.

Figure 3

Diet	Mean lactase activity / µmol of lactose digested per hour (± standard deviation)
Low sucrose	57.9 (± 14.5)
High sucrose	184.2 (± 30.8)
Low starch	86.9 (± 13.3)
High starch	221.4 (± 25.4)

Turn over ▶

Section B

You should use the information on the Resource Sheet to answer these questions.

Answer **all** questions in the spaces provided.

Use **Resource A** to answer Question **11**.

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

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(2 marks)

Use **Figure 1** to answer Questions **12** and **13**.

12 (a) Give the range of results for the control group (group **A**)

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(1 mark)

12 (b) Each person in the control group was given 50 g of lactose containing the same amount of radioactive carbon. All the products of lactose digestion were absorbed into their blood. The concentration of glucose was measured in mg per 100 cm^3 of blood.

Explain why the variation in the results may be due to differences in body mass.

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(2 marks)

13 In **Test 1** the doctors obtained different results for the three groups.

Would **Test 1** be useful to identify people who were lactase deficient? Use the data from all three groups to explain your answer.

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(3 marks)

(Extra space) .....

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Use **Figure 2** to answer Questions **14** to **17**.

14 Describe the common trend shown by **all** the curves in **Figure 2**.

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(1 mark)

15 Explain why the doctors stopped measuring the amounts of ^{14}C in the carbon dioxide breathed out after 8 hours.

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(2 marks)

16 Carbon dioxide in the breath contained the radioactive form of carbon, ^{14}C. Explain how ^{14}C in carbon dioxide came from ^{14}C in glucose in the blood.

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(2 marks)

17 The doctors concluded that measuring the amount of ^{14}C in the carbon dioxide in the breath after 3 hours was a better way of diagnosing lactase deficiency than the lactose tolerance test. Do you agree with the doctors' conclusion? Give the reasons for your answer.

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(2 marks)

You should use **Resource B** to answer Questions **18** and **19**.

18 Give **one** piece of evidence from **Figure 3** that indicates lactase activity is affected by diet.

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(1 mark)

19 Some students suggested from these data that increasing starch in the diet was the most effective way to increase lactase activity in lactase deficient people. Is this conclusion valid? Explain your answer.

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(2 marks)

18

END OF QUESTIONS

There are no questions printed on this page

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