

Centre Number						Candidate Number					
Surname						Other Names					
Notice to Candidate. The work you submit for assessment must be your own. If you copy from someone else or allow another candidate to copy from you, or if you cheat in any other way, you may be disqualified.											
Candidate Declaration. I have read and understood the Notice to Candidate and can confirm that I have produced the attached work without assistance other than that which is acceptable under the scheme of assessment.											
Candidate Signature						Date					

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 2011

Human Biology

HBI3X

Unit 3X AS Externally Marked Practical Assignment

For submission by 15 May 2011

For this paper you must have: • your Task Sheet 2, your results and your calculations • 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 not write outside the box around each page or on blank pages. • 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.
Details of additional assistance (if any). Did the candidate receive any help or information in the production of this work? If you answer yes, give the details below or on a separate page. Yes ☐ No ☐	

Teacher Declaration:

I confirm that the candidate has met the requirements of the practical skills verification (PSV) in accordance with the instructions and criteria in section 3.8 of the specification.

Practical Skills Verification	Yes ☐
--------------------------------------	-------------------------------------

Signature of teacher Date

As part of AQA's commitment to assist students, AQA may make your coursework available on a strictly anonymous basis to teachers, examining staff and students in paper form or electronically, through the Internet or other means, for the purpose of indicating a typical mark or for other educational purposes. In the unlikely event that your coursework is made available for the purposes stated above, you may object to this at any time and we will remove the work on reasonable notice. If you have any concerns please contact AQA.

To see how AQA complies with the Data Protection Act 1988 please see our Privacy Statement at aqa.org.uk

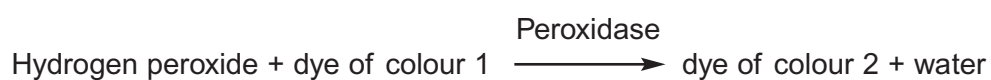
Section A

These questions relate to your investigation into the effect of lactase on lactose digestion.

Use your Task Sheet 2, your results, processed data and your graph to answer the questions.

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

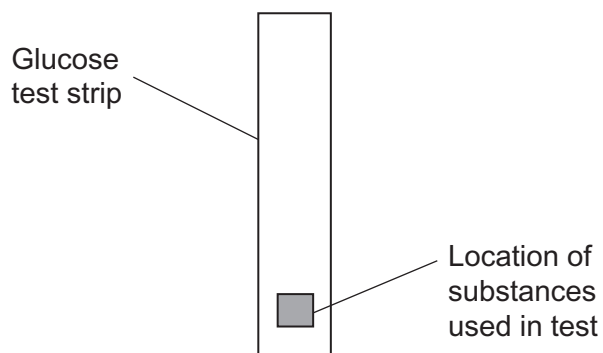
- 9** You used glucose test strips to measure the concentration of glucose in your samples. The following equations show how a glucose test strip works.



The colour change shown on the glucose test strip depends on the concentration of dye of colour 2 that is produced.

Figure 1 shows where the substances used in the test are located on the glucose test strip.

Figure 1



9 (a) Identify **all** the substances located on the end of the glucose test strip.

.....

.....

.....

.....

(2 marks)

9 (b) Glucose test strips can be used to determine the concentration of glucose in the milk samples. The Benedict's test cannot be used for this purpose. Explain why.

.....

.....

.....

.....

(2 marks)

10 Lactase only catalyses the hydrolysis of lactose. Explain why.

.....

.....

.....

.....

(2 marks)

11 A student carried out the same investigation as you but at 30 °C. She placed tube **1** and tube **2** into a water bath at 30 °C for 5 minutes. Explain why it was important to wait 5 minutes before mixing the contents.

.....

.....

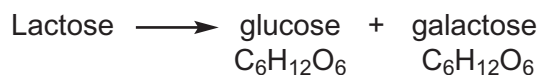
.....

.....

(2 marks)

Turn over ►

- 12** The diagram shows the hydrolysis of lactose. The chemical formulae for glucose and galactose are shown.



What is the chemical formula of lactose?

.....
(1 mark)

- 13** Another student carried out the same investigation as you. He also tested the two samples of milk for glucose before and after he added lactase to them. His results are shown in the table below.

Milk sample	Presence or absence of glucose	
	Before adding lactase during investigation	After adding lactase during investigation
A	Present	Present
B	Absent	Present

Which sample of milk was 'lactose free' milk? Explain your answer.

.....
.....
.....
.....
(2 marks)

- 14** Sterilised milk is milk that has been heated to 120 °C for 30 minutes and then cooled. A student investigated the effect of adding lactase to this milk. Assuming that temperature does not affect the structure of lactose, complete the table below to show the results you would expect for this investigation.

Milk sample	Presence or absence of glucose	
	Before adding lactase	After adding lactase
Sterilised milk		

(1 mark)

15

Explain **one** way in which you could change your method to improve the reliability of the results.

Change in method

.....

Explanation

.....

(2 marks)

14

Turn over ►

Resource Sheet

Introduction

Human infants produce the enzyme lactase which hydrolyses lactose in the milk they feed on. In most adults, the gene which codes for the production of lactase is switched off. As a result, worldwide, most adults are lactose intolerant.

Resource A

In people with lactose intolerance, the undigested lactose in their large intestine affects osmosis and results in watery faeces (diarrhoea). Bacteria in the large intestine digest lactose, producing carbon dioxide and hydrogen. These gases cause bloating and discomfort.

To help diagnose lactose intolerance, the hydrogen breath test is used. A person swallows a lactose-containing drink and then samples of breath are taken to measure the amount of hydrogen present. Hydrogen is not normally found in high concentrations in the breath.

Resource B

Some human populations have a lot of milk and dairy products in their diet. A researcher investigated the relationship between annual milk production by dairy farming and lactose intolerance in human populations. **Figure 2** and **Figure 3** show his results.

Figure 2

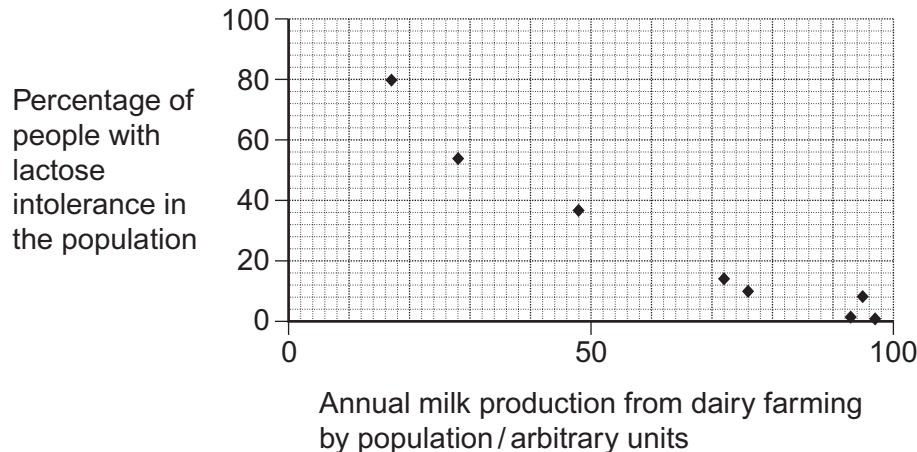


Figure 3

Population	Percentage of people with lactose intolerance
African Americans	96
African cattle herders	8
African hunter-gatherers	87
Greeks	48
Northern Europeans	4

Resource C

Milk and milk products are a major source of calcium. A shortage of calcium can produce bones that fracture easily. **Figure 4** shows suggested daily calcium intake by age group.

Figure 4

Age group / years	Suggested daily calcium intake / mg
0 to 0.4	210
0.5 to 0.9	270
1 to 3	500
4 to 8	800
9 to 18	1300
19 to 50	1000

Turn over ►

Section B

Use the information in the **Resource Sheet** to answer the questions.

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

Use the information in **Resource A** to answer Questions **16** to **18**.

- 16** One consequence of lactose intolerance is watery faeces. Use your knowledge of osmosis to explain why.

.....

.....

.....

.....

(2 marks)

- 17** The diet of an infant changes from milk to solid foods during weaning. Some doctors believe that lactose intolerant infants are likely to be more easily weaned. Suggest why their lactose intolerance may lead to their being easier to wean.

.....

.....

.....

.....

(2 marks)

- 18** A doctor suspected that a patient with symptoms of bloating and discomfort had lactose intolerance. Because the hydrogen breath test is expensive and time-consuming, the doctor suggested a simple course of action to the patient. Suggest and explain what this course of action would be.

.....

.....

.....

.....

(2 marks)

Use the information provided in **Resource B** to answer Question 19.

19 (a) What relationship is shown by the results in **Figure 2**?

.....

 (1 mark)

19 (b) Use **Figure 3** to identify the populations of people that are most likely to use milk and milk products as a major part of their diet. Explain why you think these people are most likely to use milk and milk products as a major part of their diet.

Populations of people

 Explanation

 (2 marks)

Use the information provided in **Resource C** to answer Question 20.

20 (a) Describe and explain the trend shown by the data for suggested daily calcium intake.

.....

 (2 marks)

20 (b) Between which two consecutive age groups in **Figure 4** is there the greatest percentage change in suggested daily calcium intake?

Between groups
 Percentage change =
 (2 marks)

Turn over for the next question

Turn over ►

21

Use the information provided in **Resources A, B and C** to suggest how lactose tolerance in adults may have evolved in human populations.

.....

.....

.....

.....

.....

.....

(Extra space)

(3 marks)

.....

.....

16

END OF QUESTIONS

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**