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| Centre Number       |  |  |  |  |  | Candidate Number |  |  |  |  |
| Surname             |  |  |  |  |  |                  |  |  |  |  |
| Other Names         |  |  |  |  |  |                  |  |  |  |  |
| Candidate Signature |  |  |  |  |  |                  |  |  |  |  |

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| For Examiner's Use<br>Total Task 1 |
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General Certificate of Education  
Advanced Subsidiary Examination  
June 2011

# Human Biology

## HBI3X/PM1

**Unit 3X AS Externally Marked Practical Assignment**

### Task Sheet 1

**To be completed before Task Sheet 2.**

**For submission by 15 May 2011**

**For this paper you must have:**

- a ruler with millimetre measurements
- a calculator.

## Showing the effect of the enzyme lactase

### Introduction

Lactose is a disaccharide found in milk and milk products. Some humans produce the enzyme lactase that digests lactose. During digestion, lactose is broken down into two monosaccharides, glucose and galactose. How much lactose has been broken down can be determined from how much glucose is produced.

Glucose test strips can be used to show the concentration of glucose in a solution. The presence of glucose will change the colour of a test strip as shown.

|                                            |        |                                                                |        |                                                                    |
|--------------------------------------------|--------|----------------------------------------------------------------|--------|--------------------------------------------------------------------|
| Test strip blue<br>(No glucose<br>present) | —————→ | Test strip green<br>(Low concentration of<br>glucose recorded) | —————→ | Test strip brown<br>(Highest concentration<br>of glucose recorded) |
|--------------------------------------------|--------|----------------------------------------------------------------|--------|--------------------------------------------------------------------|

By comparing the colour of the test strip to the range of colours on a standard colour chart, the concentration of glucose present can be determined.

### Task 1

In Task 1, you will investigate the effect of lactase, at room temperature, by measuring the concentration of glucose produced in a given length of time.

### Materials

You are provided with

- lactose solution
- pH7 buffer
- lactase (enzyme) solution
- glucose test strips
- colour chart
- test tubes
- test tube rack
- graduated pipettes or syringes
- timer
- marker pen

You may ask your teacher for any other apparatus you require.

## Outline method

**Read these instructions carefully before you start your investigation.**

The procedure for using glucose test strips is as follows:

- dip the coloured end of a test strip into the solution being tested for five seconds
- wipe the strip against the top of the tube to remove excess solution
- wait two minutes for any colour change to develop. Ignore colour changes that occur after the two minutes
- compare the test strip colour with the colour chart and record the concentration of glucose.

1. Label two test tubes as **X** and **Y**.
2. In tube **X**, mix together 2 cm<sup>3</sup> lactose solution and 1 cm<sup>3</sup> buffer.
3. Into tube **Y** put 2 cm<sup>3</sup> lactase solution.
4. Add the contents of tube **Y** to tube **X**, mix and immediately start the timer.
5. Measure the concentration of glucose immediately (time 0) and every 2 minutes for 10 minutes following the procedure for using glucose test strips.

## You will need to decide for yourself

- if the test strip colour is intermediate between two consecutive colours on the chart and whether an estimate of the concentration of glucose is required.

## Recording your results

Record your results in the table.

| Time / minutes | Colour of glucose test strip | Concentration of glucose /<br>mmol dm <sup>-3</sup> |
|----------------|------------------------------|-----------------------------------------------------|
| 0              |                              |                                                     |
| 2              |                              |                                                     |
| 4              |                              |                                                     |
| 6              |                              |                                                     |
| 8              |                              |                                                     |
| 10             |                              |                                                     |

**Questions on Task 1**

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

- 1** Lactase catalyses the hydrolysis of lactose. What is hydrolysis?

.....  
.....  
(1 mark)

- 2** Buffer solution was added to tube **X**.

- 2 (a)** Explain why buffer solution was added.

.....  
.....  
(1 mark)

- 2 (b)** Suggest why a buffer of pH7 was used.

.....  
.....  
(1 mark)

- 3** You were told to wipe the end of the test strip against the top of the tube to remove excess solution. If you had not done this it could have affected the accuracy of the measure of concentration of glucose. Explain why.

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

- 4** A student who carried out this investigation included another tube, **Z**, as a control experiment. Describe what tube **Z** should contain.

.....

.....

.....

.....

(2 marks)

- 5** Describe how you could use a graph of concentration of glucose against time to determine the rate of lactase activity.

.....

.....

.....

.....

(2 marks)

- 6** Another student did the same experiment as you but only recorded the colour shown on each of his test strips. He was not able to present his results as a line graph. Explain why.

.....

.....

(1 mark)

**END OF TASK 1**

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