

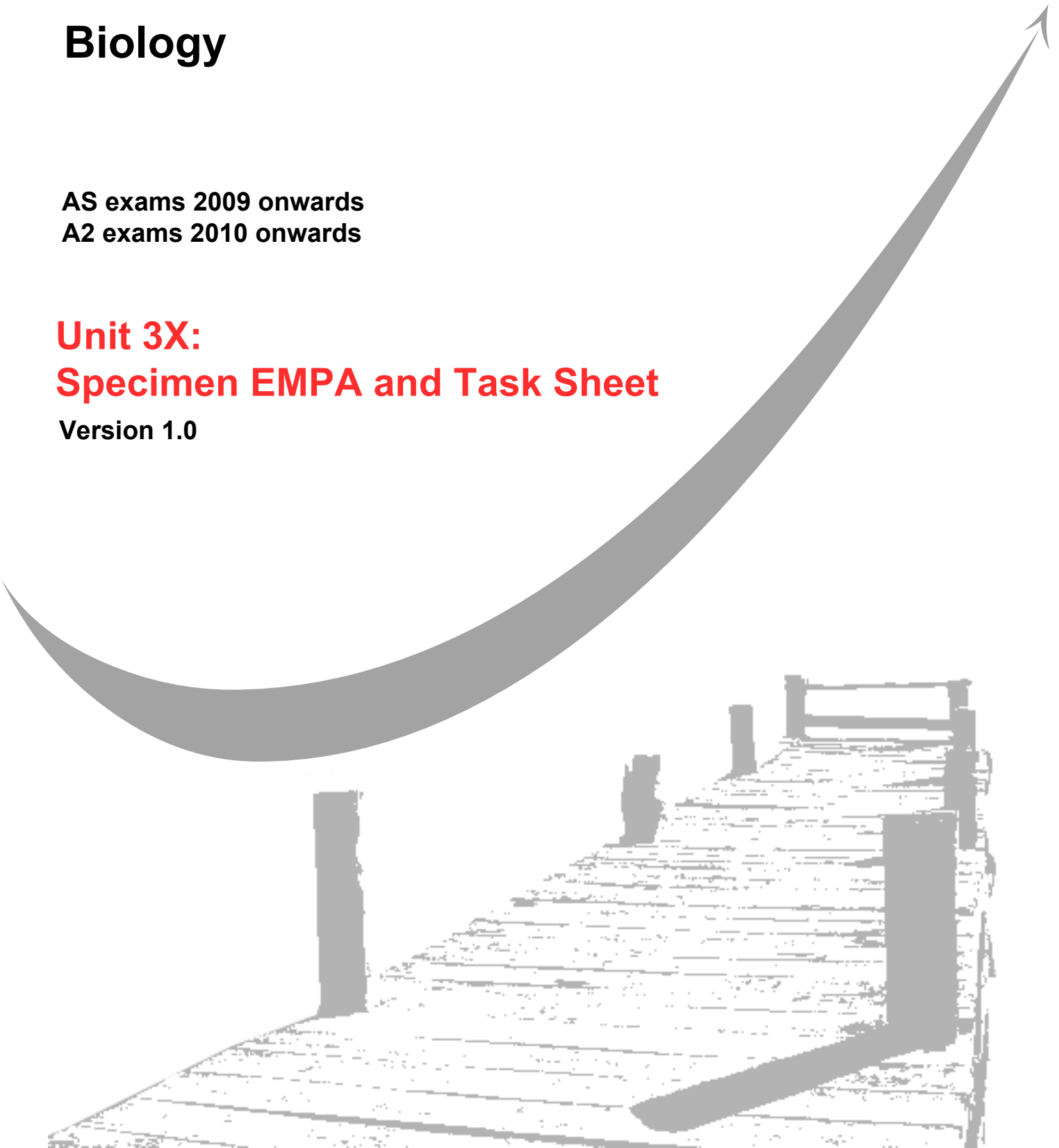
**GCE**  
**AS and A Level**

# **Biology**

**AS exams 2009 onwards**  
**A2 exams 2010 onwards**

## **Unit 3X:** **Specimen EMPA and Task Sheet**

**Version 1.0**



## INTRODUCTION

In some country areas in Mexico, mothers give a rice-flour and water mixture (a rice-flour mixture) to their children when they have diarrhoea. It is very effective in stopping the diarrhoea. Doctors in a hospital in Mexico are now trying to make an oral rehydration solution (ORS) based on this idea.

They started by making a rice-flour mixture but encountered a problem. The rice-flour mixture was so thick that a child with diarrhoea was unable to drink it. Somehow they had to make the mixture thinner. They did this by incubating it with the enzyme amylase.

You are going to look at the same problem and find out how the concentration of amylase affects the thickness of a rice-flour mixture. This task is divided into three steps:

### TASK 1

You will investigate one way of measuring the thickness of a rice-flour mixture and decide whether it will produce reliable data.

### TASK 2

You will be provided with a rice-flour mixture and a solution of amylase. You should then follow the instructions and use these to investigate the effect of amylase concentration on the thickness of the rice-flour mixture. You will be required to collect data from the investigation.

### TASK 3

You will plot the data from Task 2 as a suitable graph. You will also be awarded marks for the quality of your practical work

### The EMPA written test

You will be given some questions to answer. Some of these questions will be about the results of your investigation and some will involve other data.

**You will have 1 hour 15 minutes to answer these questions.**

**TASK SHEET 1**

**A Setting up your investigation**

You are provided with

- a rice-flour mixture
- a burette, clamp and stand, alternatively a measuring cylinder can be used
- a weight
- a stop watch

You may use any other apparatus you need.

**B Carrying out the investigation**

One method of measuring the thickness of the rice-flour mixture is to pour it into the burette and measure the time the weight takes to fall through the mixture in the burette. Find out whether this method gives reliable results by carrying it out five times.

**C Recording your results**

Record your results in the table.

Trial		Time taken/seconds
1		
2		
3		
4		
5		

**QUESTIONS ON TASK 1**

**Answer the questions in the space provided.**

**You may do this while you carry out your investigation or at the end of your investigation.**

- 1** Describe **two** precautions you took in carrying out this investigation to make sure that your method was a fair test.

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*(2 marks)*

- 2** Use the data in the table to calculate the mean time and standard deviation. You may use your calculator to do this.

Mean time..... Standard deviation.....

*(2 marks)*

- 3** The results collected from this investigation should be accurate. Explain what is meant by *accurate* results.

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.....

*(1 mark)*

- 4** A very small mean value could indicate that the results are inaccurate. Explain the link between a very small mean value and inaccurate results.

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*(2 marks)*

5 Describe **one** way in which you could modify the apparatus to produce a greater mean time for the weight to fall through the mixture in the burette.

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*(1 mark)*

6 Describe and explain the relationship between standard deviation and the reliability of the results.

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.....  
.....

*(2 marks)*

10
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**GCE BIOLOGY 1411/2411**

**ISA BIO3X SPECIMEN**

**Candidate Results Sheet TASK 1**



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

Centre Number

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Candidate Name .....

Candidate number

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**Results**

Present your results in an appropriate form in the space below.

**TASK SHEET 2**

In this step you will investigate the effect of amylase concentration on the thickness of the rice-flour mixture. You will be required to collect data from the investigation in a table and plot these data as a suitable graph.

**A**

You are provided with

- a rice-flour mixture
- the apparatus you used in **TASK 1**
- a solution of amylase. Your teacher will tell you its concentration.
- a water bath set at 40°C
- a pH 7 buffer solution

You may use any other apparatus you require

**B**

Use the solution of amylase, measuring apparatus and water to produce a series of five dilutions of amylase that you will investigate.

**C**

Investigate the effect of amylase concentration on the thickness of the rice-flour mixture. Follow this outline method.

- Mix 5 cm<sup>3</sup> of the amylase solution you are investigating with 5 cm<sup>3</sup> of the buffer solution in a boiling tube.
- Put 40 cm<sup>3</sup> of rice-flour mixture in a small beaker.
- Put the boiling tube and the beaker in the water bath for 5 minutes then pour the contents of the boiling tube into the beaker mix.
- Incubate the beaker with the rice-flour mixture and amylase-buffer for 25 minutes in the water bath.
- Use the technique from **Task 1** to measure the thickness of the rice-flour mixture for each of the amylase concentrations.

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1 Record the data you have collected from your investigation in a table.

*(3 marks)*

2 Plot the data in your table as a graph.

*(5 marks)*

You will be awarded up to 3 marks for the quality of your practical work.

*(3 marks)*

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**GCE BIOLOGY 1411/2411**

**ISA BIO3X SPECIMEN**

**Candidate Results Sheet TASK 2**



Centre Number

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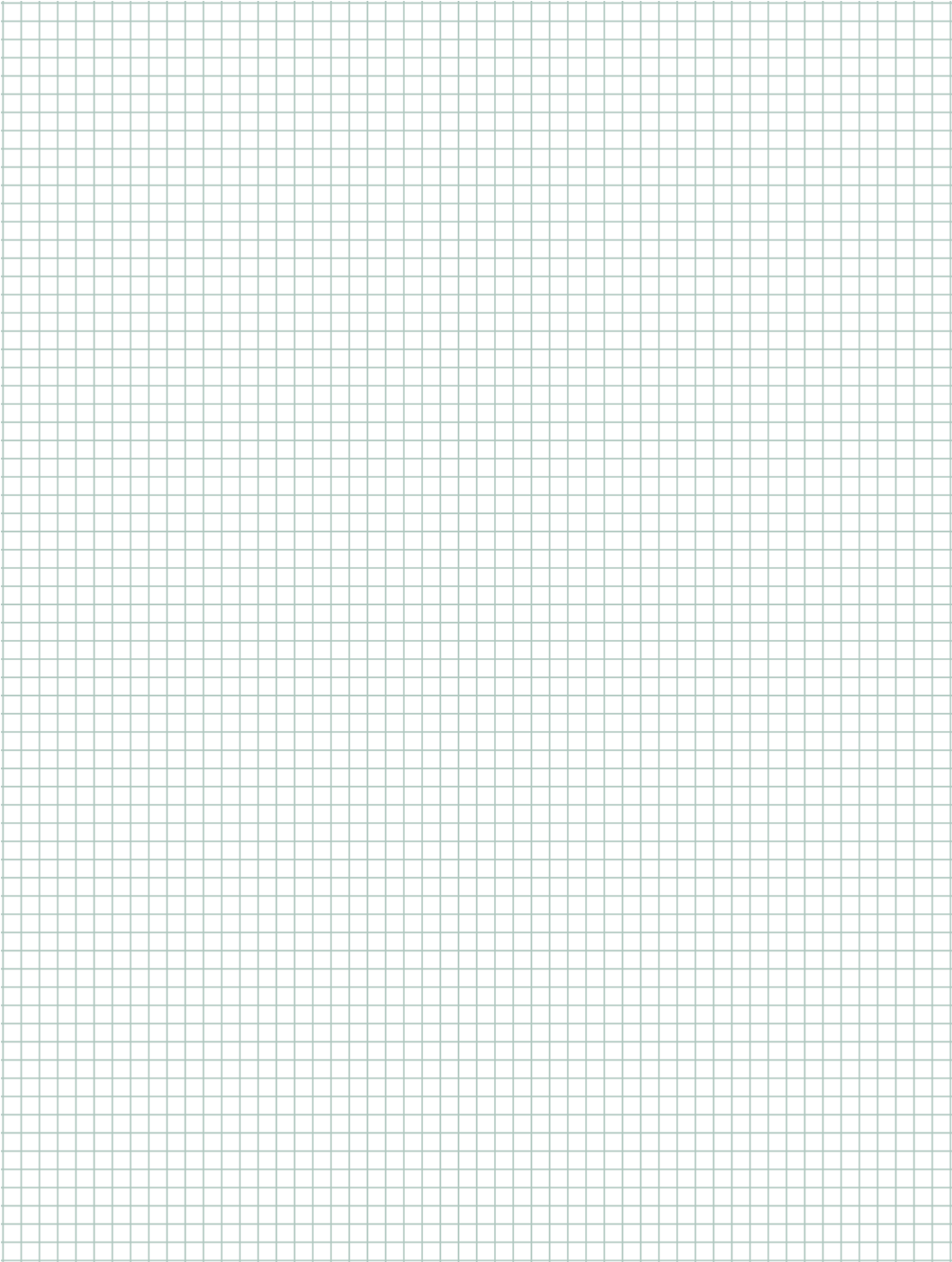
Candidate Name .....

Candidate number

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**Results**

Present your results in an appropriate form in the space below.



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Surname					Other Names				
Centre Number					Candidate Number				
Candidate Signature									

General Certificate of Education  
Advanced Subsidiary Examination



**BIOLOGY 1411/2411**  
**Externally Marked Practical Assignment (EMPA)**  
**Board Assessed Unit**

**BIO3X**

Specimen Paper

To be conducted between 1 March 2008 and 31 May 2008 (*provisional*)

For submission in May XXXX

**In addition to this paper you will require**

- task sheets and your Candidate Results Sheets

You may use a calculator.

Time allowed: 1 hour 15 minutes

**Instructions**

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

**Information**

- The maximum mark for this paper is 40.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in all answers.

**THE EMPA TEST: BIOLOGY AS SPECIMEN**

**SECTION A**

These questions are about your investigation on the effect of amylase concentration on the thickness of the rice-flour mixture.

You should use your instructions from **TASK 2**, your table and your graph when you answer them.

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

**1** You were provided with a pH 7 buffer solution.

(a) Explain why you should add the buffer solution to the amylase.

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*(1 mark)*

(b) Suggest why a pH7 buffer solution was used in this investigation.

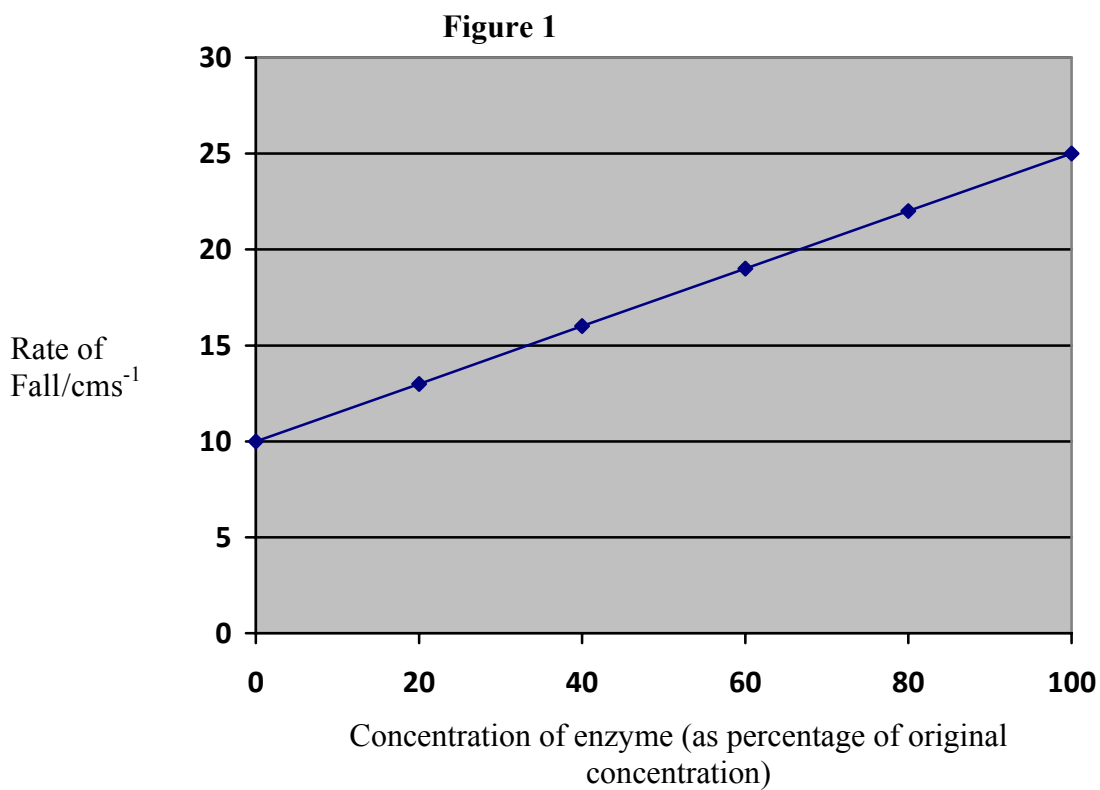
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*(1 mark)*

**2** (a) The instructions suggested that you put the amylase and the rice-flour mixture in the water bath for 5 minutes before you mixed them. Explain why this was necessary.

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.....  
*(2 marks)*

(b) Five minutes may not have been long enough to have left the amylase and the rice-flour mixture before mixing them. Suggest a better way of finding out when they should be mixed.

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*(1 mark)*



**Figure 1** shows the results obtained by another student who carried out this investigation.

**3** Explain the shape of the curve on the graph.

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*(3 marks)*

4 This investigation was carried out at a temperature of 40°C. How would you expect the curve to differ if you carried out the investigation at 30°C? Use your knowledge of the way in which temperature affects enzymes to explain your answer.

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*(2 marks)*

5 There is more reducing sugar in the mixture that was incubated with 2% amylase than there was in the mixture incubated with 1% amylase. Suggest how you could use Benedict's solution to compare the amount of reducing sugar in the two mixtures.

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*(3 marks)*

## THE EMPA TEST: BIOLOGY AS SPECIMEN

### SECTION B RESOURCE SHEET

Scientists have investigated other ways of improving oral rehydration solutions. Read the information below. It has been taken from a scientific paper about one of these investigations.

#### **The effectiveness of an oral rehydration solution (ORS) containing glucose and alanine on the treatment of diarrhoea**

The World Health Organisation (WHO) recommends an oral rehydration solution based on glucose. Alanine is an amino acid. Scientists thought that adding alanine to the glucose-based ORS would improve its efficiency in treating diarrhoea.

They divided 97 hospital patients randomly into two groups. All these patients were male and aged between 6 and 59 years old. They all had severe dehydration due to cholera.

One group, the control group, received the glucose-based ORS.

The other group, the experimental group, received this solution with alanine added to it.

**Table 1**

Table showing some information about the two groups of patients.

	<b>Control group</b>	<b>Experimental group</b>
Treatment	Glucose-based ORS	Glucose-based ORS + alanine
Number of patients in group	49	48
Mean duration of diarrhoea before treatment started/hours	8	9
Mean body mass on admission/kg	39.5	39.5

**Table 2**

Table showing some data collected from the investigation.

	<b>Control group</b>	<b>Experimental group</b>
Mean total output of faeces during treatment/cm <sup>3</sup> kg <sup>-1</sup>	393	236
Mean duration of diarrhoea/hours	52	44
Number of patients who had to receive extra intravenous rehydration fluid	18	2
Mean total intake of ORS solution drunk by patient/cm <sup>3</sup> kg <sup>-1</sup>	574	416
Mean total intake of water drunk by patient/cm <sup>3</sup> kg <sup>-1</sup>	39	25



**SECTION B**

You should use the information on the resource sheet to answer the questions.

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

- 6 Describe how the scientists made sure that the investigation was a fair test. Use information from the paper to support your answer.

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*(2 marks)*

- 7 (a) The hospital patients were randomly divided into two groups. Explain why they were divided randomly.

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*(2 marks)*

- (b) The scientists in this investigation did not know which patients received which treatment until after the results of the investigation had been analysed. Explain why this was important.

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*(1 mark)*

- 8 The total amount of faeces produced was recorded per kilogram of body mass. Explain the advantage of this.

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*(2 marks)*

9 The scientists collected information about the patients before the treatment was started. Explain why it was important to collect information about the duration of diarrhoea before treatment started.

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(2 marks)

10 The scientists concluded that the experimental group absorbed more of the ORS than the control group even though it had a higher solute concentration.

(a) Explain the evidence from **Table 2** that the experimental group absorbed more of the ORS than the control group.

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(2 marks)

(b) The scientists suggested that the higher solute concentration of the ORS containing alanine might have affected the uptake of water by from the intestine. Explain how.

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(3 marks)

**11** In their conclusion, the scientists suggested that before a new ORS formula was produced more studies would be required. Give **two** reasons why more studies would be required.

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*(2 marks)*

16
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**END OF QUESTIONS**