

Surname		Other Names	
Centre Number			Candidate Number
Candidate Signature			

For Teacher's Use Total ISA mark

General Certificate of Education
June 2009
Advanced Subsidiary Examination



BIOLOGY
Investigative Skills Assignment (ISA)
Written test

BIO3T/P09/test

For submission by 15 May 2009

For this paper you must have

- the task sheet, your results and your graph
- a ruler with millimetre measurements.

You may use a calculator.

For Teacher's Use	
	Mark
Stage 1 skills	
Stage 2 skills	
Section A	
Section B	
TOTAL ISA MARK	

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.
- 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 maximum mark for this test is 34.
- 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.

Signature of Teacher marking this ISA Date

SECTION A

These questions relate to your investigation on the effect of temperature on the rate of the reaction catalysed by trypsin.

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

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

- 1 You used a buffer solution in your investigation. What are buffer solutions used for?

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(1 mark)

- 2 You left the test tubes in the water bath for 10 minutes before you added the enzyme to the milk powder solution. Explain why.

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(1 mark)

- 3 Did you use a water bath at room temperature? Give the reason for your answer.

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(1 mark)

- 4 Describe and explain what you did to make sure the temperatures of the water baths were as reliable as possible.

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(2 marks)

5 Explain why you set up three experiments at each temperature.

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(2 marks)

6 A student decided to improve this investigation with control experiments. At each temperature she set up a test tube containing a solution of milk powder and buffer. She did not add trypsin. What would these control experiments show?

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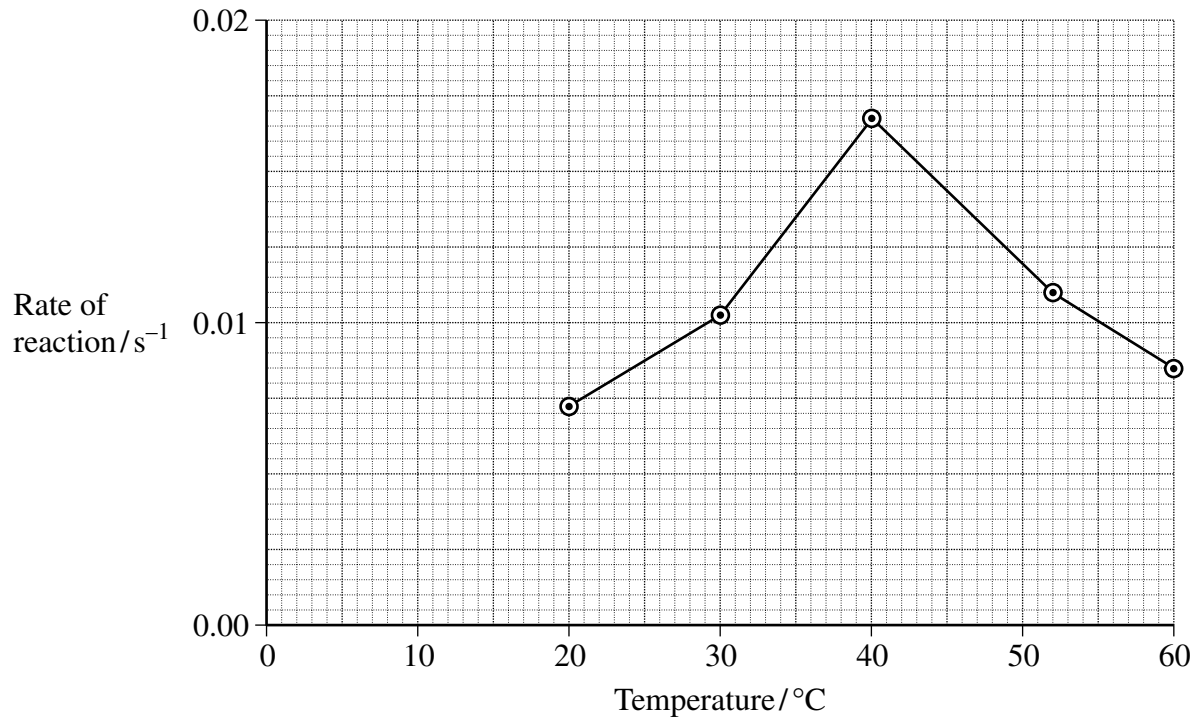
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(1 mark)

Turn over for the next question

Turn over ►

7 The graph was drawn by one student.



7 (a) Explain these results.

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(5 marks)

- 7 (b) The student concluded that the optimum temperature for the enzyme was 40 °C. Is this conclusion valid? Use information from the graph to support your answer.

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(1 mark)

- 8 It is difficult to decide when the solution of milk powder goes clear. Suggest **one** better way of determining when the solution of milk powder goes clear.

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(2 marks)

16

Turn over for the next question

Turn over ►

RESOURCE SHEET

INTRODUCTION

Bromelain is a protein-digesting enzyme found in pineapples. Some people claim that bromelain tablets have beneficial effects on health. These effects include reducing swelling and pain after surgery and reducing growth of cancers.

Resource A

Bromelain is absorbed from the gut into the blood. Scientists gave a group of volunteers 3 g of bromelain in tablets each day for three days. They then measured the maximum mass of bromelain in the blood of each volunteer. The mean value for the maximum mass of bromelain in the blood of the volunteers was 0.025 mg.

Resource B

In a second investigation, scientists divided 32 dental patients into two groups. They gave those in one group bromelain tablets each day for 72 hours before and 72 hours after dental surgery. They treated the second group as a control.

The table shows the number of patients with swelling and pain in the gums after the surgery.

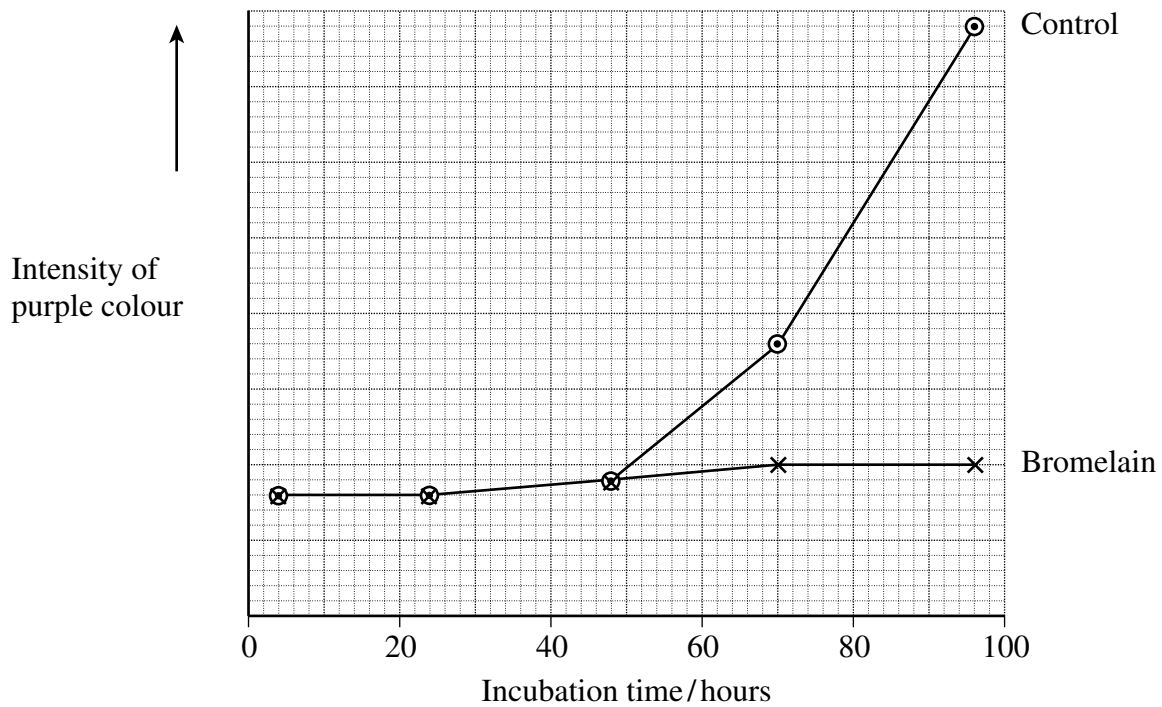
Treatment	Number of patients	Number of patients with swelling in the gums 24 hours after surgery	Number of patients with pain in the gums 24 hours after surgery	Number of patients with pain in the gums 72 hours after surgery
Bromelain	16	4	10	4
Control	16	13	14	10

Resource C

Scientists investigated the effect of bromelain on cancer cells. They took cells from skin cancers in mice and added them to a liquid growth medium in two dishes.

Four hours later they added a solution of bromelain to one of the dishes. They left the other dish as a control. They also added a substance to both dishes that is turned purple by respiring cells.

Both dishes were placed in an incubator. The scientists measured the intensity of the purple colour at intervals over a period of 100 hours.



Turn over for the next question

Turn over ►

SECTION B

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

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

Use **Resource A** to answer **Questions 9** and **10**.

- 9** There is a difference between the mass of bromelain that the volunteers were given and the maximum mass of bromelain in their blood. Suggest **one** explanation for this difference.

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(1 mark)

- 10** The scientists measured the concentration of bromelain in the blood. What else did they need to measure to calculate the total mass of the bromelain in the blood of a volunteer?

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(1 mark)

Use **Resource B** to answer **Questions 11** to **14**.

- 11** Suggest how the scientists divided the patients in this investigation into the two equal groups.

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(1 mark)

- 12** What treatment should those in the control group have received? Explain your answer.

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(2 marks)

13 It is not essential to have the same number of people in the experimental and control groups in an investigation like this. Explain why it is not essential.

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(1 mark)

14 The scientists concluded that bromelain reduces swelling and pain after dental surgery. Suggest **two** reasons why this conclusion may **not** be valid.

1

2

(2 marks)

Use **Resource C** to answer **Questions 15 to 17**.

15 The scientists put the same number of skin tumour cells in each dish at the start of this investigation. Explain why it was important to put the same number of cells in each dish.

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(1 mark)

16 The scientists concluded that bromelain did not kill cancer cells but stopped them dividing. Does the graph support this conclusion? Explain your answer.

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(2 marks)

Turn over ►

17 An article in a newspaper claimed that these data show that bromelain can be used to treat cancer.

Give **three** reasons why we should be careful about accepting this claim.

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(3 marks)

18 The rate of cell division is important in investigations into cancer. Suggest why.

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(2 marks)

19 Scientists have investigated the effects of bromelain on cancer growth in humans. Suggest why they gave bromelain in addition to, rather than instead of, the usual treatment.

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(2 marks)

END OF QUESTIONS