Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use Total EMPA Mark

General Certificate of Education
June 2009
Advanced Subsidiary Examination

BIOLOGY **BIO3X**
Unit 3X Externally Marked Practical Assignment
Written Test

For submission by 15 May 2009

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

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

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.
- Show all your working.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this test is 30.
- 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.

SECTION A

These questions relate to your investigation on the effect of pectinase concentration on the breakdown of pectin.

You should use Task Sheet 2, your results and your graph to answer the questions.

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

8 You were told to carry out your investigation at 30 °C. Suggest why.

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(1 mark)

9 Suggest an appropriate control experiment for this investigation. Explain why this control would be necessary.

Control experiment .....

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Explanation .....

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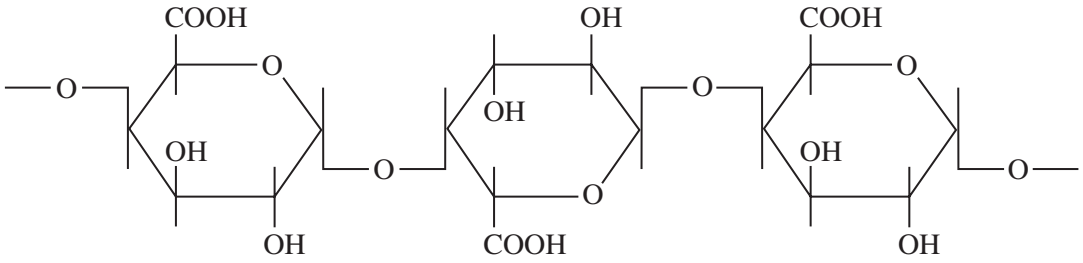
(2 marks)

10 Pectin is a polymer. **Figure 1** shows part of a pectin molecule.

Figure 1



10 (a) Pectin is also known as polygalacturonic acid. Draw a box around one acid group.

(1 mark)

10 (b) Describe the process by which the monomers within the pectin molecule are joined to each other.

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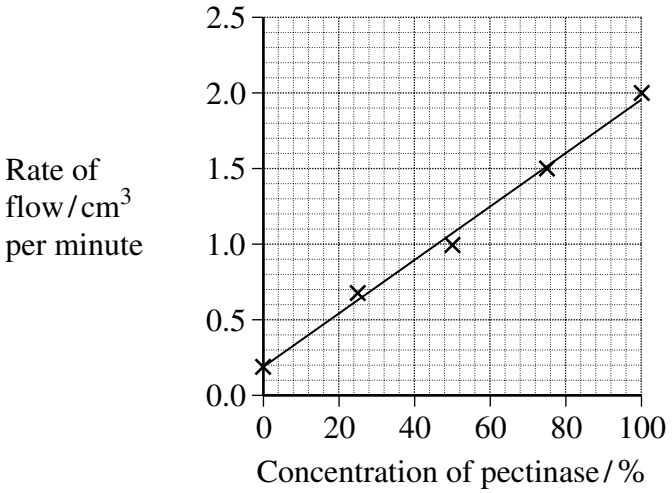
(2 marks)

Turn over for the next question

11 **Figure 2** shows the results obtained by a student who carried out the same investigation.

Figure 2



Use your knowledge of enzyme action to explain the shape of the curve on the graph.

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(4 marks)

(Extra space) .....

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LEAVE MARGIN BLANK

Surname		Other Names	
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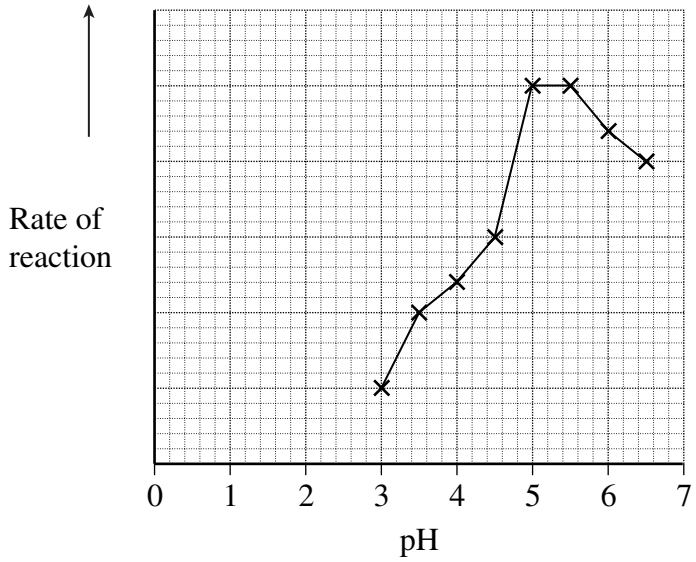
12 A student carried out an investigation into the effect of pH on the action of pectinase. **Figure 3** shows the results.

Figure 3



12 (a) The pectin solution you used in Task 2 was buffered. Use **Figure 3** to suggest the pH of the pectin solution you used in Task 2. Explain your answer.

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(2 marks)

12 (b) Explain why it is more appropriate to join the points in the graph in **Figure 3** with straight lines than with a curve.

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(2 marks)

Fasten this replacement page securely inside your Written Test.

14

RESOURCE SHEET

Introduction

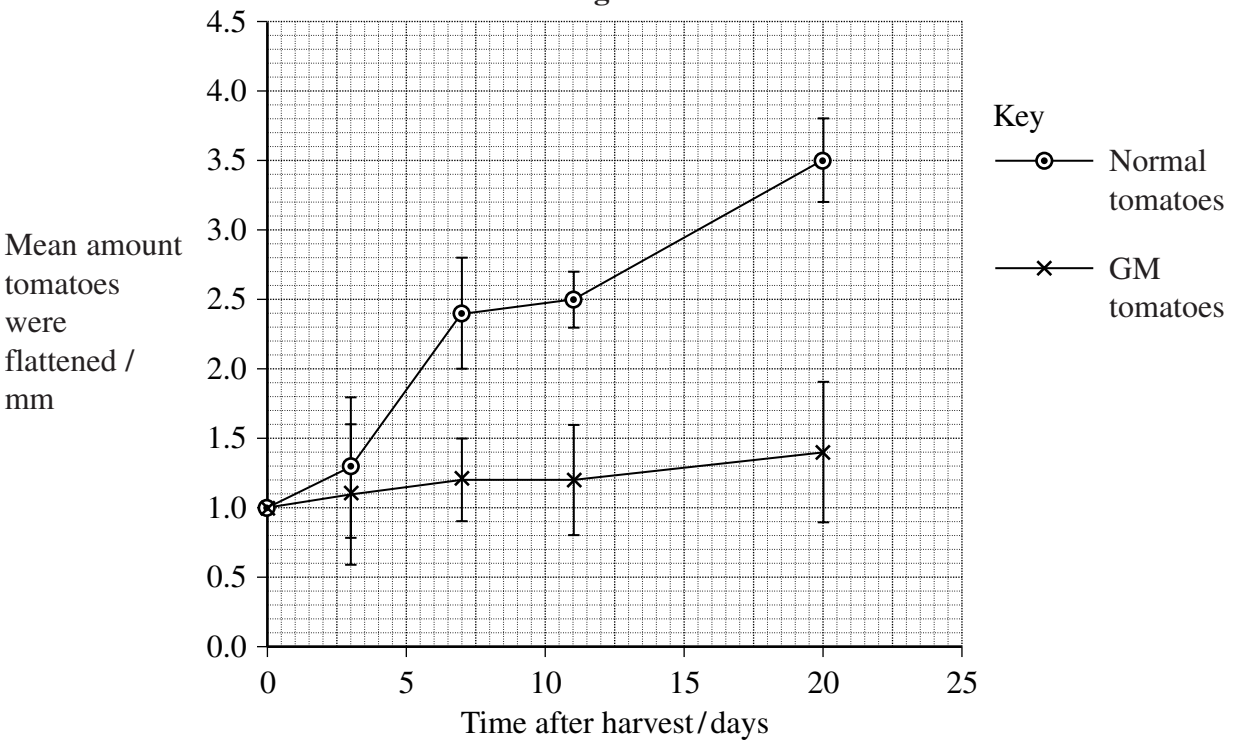
Tomatoes become softer as they ripen. This is due partly to the breakdown of pectin by the enzyme pectinase. Scientists have produced a genetically modified variety of tomato plant (GM tomato) that produces tomatoes that ripen more slowly. The DNA of the GM tomato plant has been altered so it does not produce pectinase.

This resource sheet gives some information about GM tomatoes and normal tomatoes.

Resource A

Scientists tested the ripeness of normal and GM tomatoes. They placed a 500 g mass on top of tomatoes at different times after they were harvested. The scientists measured the amount the tomatoes flattened. **Figure 4** shows the results. The error bars represent standard deviation.

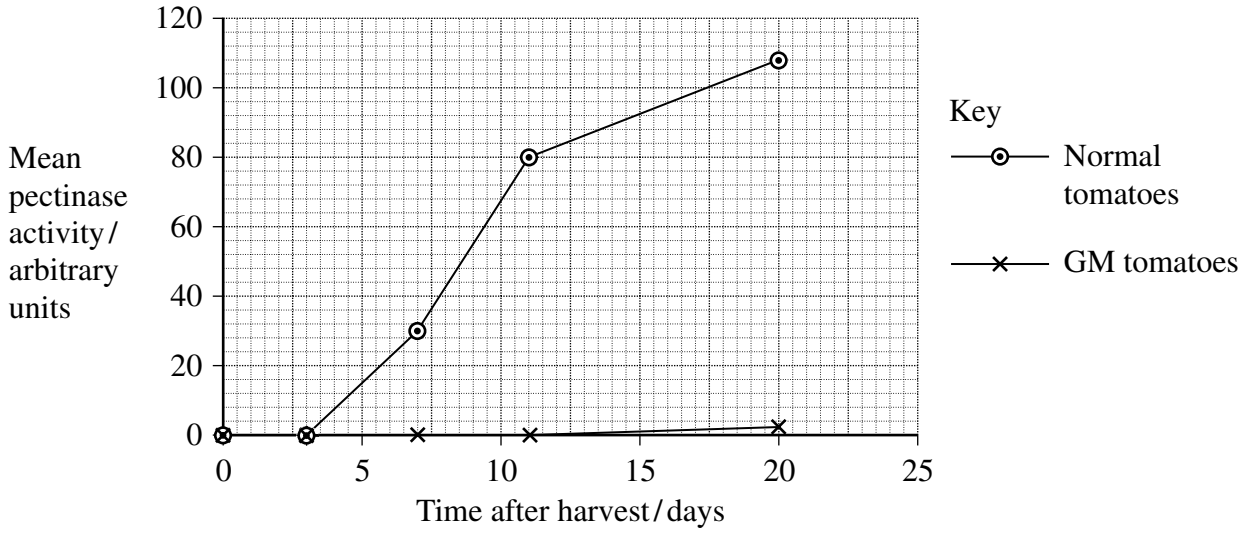
Figure 4



Resource B

Scientists measured the activity of pectinase in normal and GM tomatoes at different times after they were harvested. **Figure 5** shows the results.

Figure 5



Some tomato plants were watered with a sodium chloride solution from the beginning of flowering. This affected the mass and taste of the tomatoes produced.

Resource C The effect of watering tomato plants with sodium chloride solution on the mass of tomatoes

Type of tomato plant	Watered with	Mean mass of tomatoes /g	
		fresh mass	dry mass
Normal	Distilled water	115.9	6.5
Normal	Sodium chloride solution	87.8	6.6
GM	Distilled water	101.3	6.4
GM	Sodium chloride solution	57.4	6.5

Resource D The effect of watering tomato plants with sodium chloride solution on the taste of tomatoes

Fourteen people were asked to score the taste of tomatoes. They scored the taste on a scale of 1 to 3, with 3 having the most taste and 1 having the least taste. The table shows the results.

	Number of people giving a taste score for tomatoes from		
Taste score	Normal plants watered with distilled water	GM plants watered with distilled water	GM plants watered with sodium chloride solution
1	0	12	2
2	6	1	8
3	8	1	4
Mean taste score	2.57	1.21	2.14

SECTION B

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

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

Use the **Introduction** to answer **Question 13**.

13 Explain how altering the DNA has resulted in a GM tomato plant that does not produce pectinase.

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(1 mark)

Use **Resource A** to answer **Questions 14** and **15**.

14 The scientists used tomatoes of the same size in the technique described in **Resource A** to measure ripeness. Explain why.

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(2 marks)

15 What do the standard deviation bars suggest about the difference in ripeness of the two varieties of tomato at 7 days? Explain your answer.

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(2 marks)

Use **Resources A** and **B** to answer **Question 16**.

16 Is there any evidence to suggest that pectinase is involved in the ripening of tomatoes? Explain your answer.

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(3 marks)

(Extra Space) .....

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Use **Resource C** to answer **Questions 17** and **18**.

17 What conclusions can you draw about the effects of watering plants with sodium chloride solution on the mass of tomatoes?

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(2 marks)

18 Use your knowledge of water potential to suggest how watering plants with sodium chloride solution affects the fresh mass of the tomatoes.

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(3 marks)

(Extra space) .....

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Use **Resource D** to answer **Question 19**.

19 A newspaper journalist wrote an article about GM tomatoes. He wrote that watering GM plants with a sodium chloride solution improved the taste of GM tomatoes.

Give the evidence for and against this statement.

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(3 marks)

(Extra space) .....

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16

END OF QUESTIONS

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED