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Surname						Other Names					
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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 Level Examination
June 2014

Biology

BI06X

Unit 6X A2 Externally Marked Practical Assignment Written Test

For submission by 15 May 2014

For this paper you must have: <ul style="list-style-type: none"> the Task Sheet 2, including your results and statistical calculations a ruler with millimetre measurements a calculator. 	Time allowed <ul style="list-style-type: none"> 1 hour 15 minutes
Instructions <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> The marks for questions are shown in brackets. The maximum mark for this paper is 35. You will be marked on your ability to: <ul style="list-style-type: none"> 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 <input type="checkbox"/>
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Signature of teacher Date

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There are no questions printed on this page

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

Section A

These questions relate to your investigation into the movement of maggots.

Use your copy of Task Sheet 2, your results and your statistical analysis to answer the questions.

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

9 All the maggots should have been kept in the same environmental conditions before the investigation.
Give **two** environmental conditions that should have been kept the same. **[2 marks]**

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2

10 The behaviour shown by the maggots in Task 1 and Task 2 was a kinesis.
What is a kinesis? **[2 marks]**

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11 How could you calculate the rate of movement of a maggot in mm s^{-1} ? **[2 marks]**

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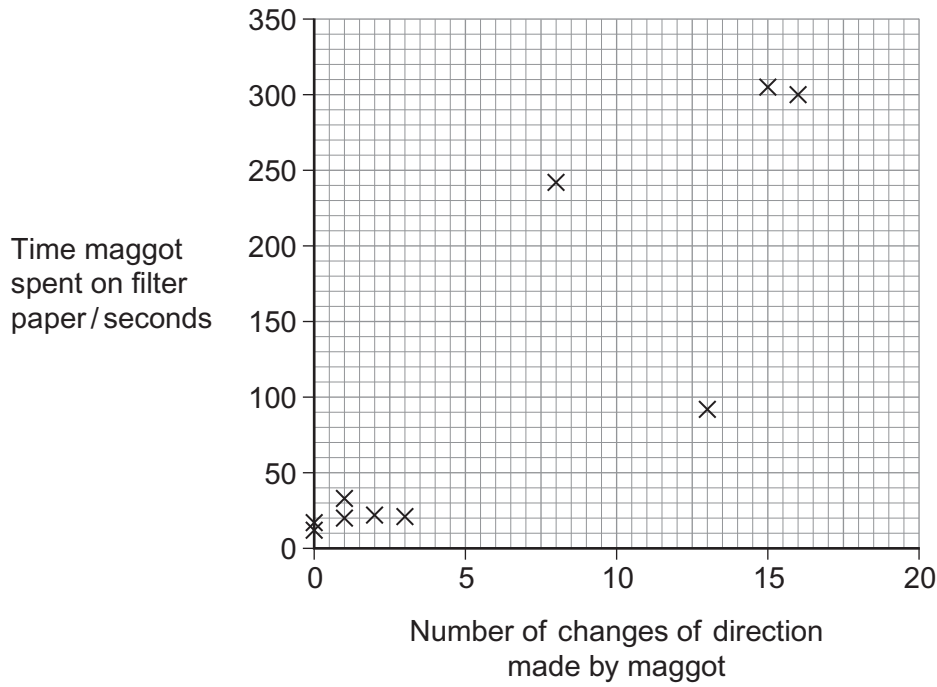
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Turn over ►

12 A student carried out the same investigation as you did in Task 2. He plotted his data as shown in **Figure 1**.

Figure 1



12 (a) Why did the student draw this type of graph?

[1 mark]

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12 (b) Other than environmental factors, suggest **two** reasons why maggots showed variation in the number of times they changed direction during the investigation.

[2 marks]

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12 (c) The student proposed the hypothesis that 'by changing direction more often, a maggot stays in a favourable environment'.
Do his results support the hypothesis? Explain your answer.

[3 marks]

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[Extra space]

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Turn over for the Resource Sheet

Turn over ►

Resource Sheet

Introduction

Push-pull stimuli can be used together as part of a pest control system.

- A push stimulus drives the pest away from the crop plant.
- A pull stimulus attracts the pest towards a different species of plant or to a pesticide.

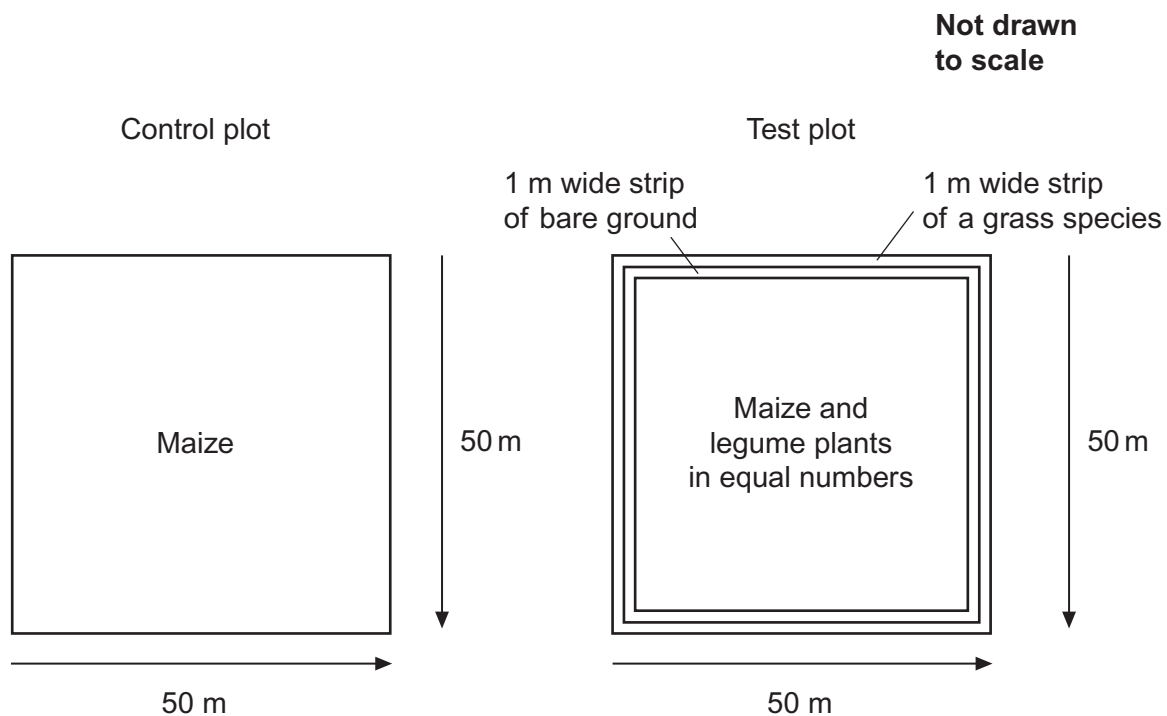
Resources A and **B** are both investigations of the use of **push-pull** stimuli.

Resource A

Stemborers are insect pests that feed on maize plants. Scientists investigated the effect of **push-pull** stimuli on the control of these pests.

For this investigation, the scientists divided a large field into plots measuring 50 m × 50 m. They then designated each plot as a control plot or a test plot. **Figure 2** shows what they planted in each type of plot.

Figure 2



The legumes planted with the maize drive stemborers away.
The grass species attracts stemborers.

Table 2 shows the scientists' results.

Table 2

Plots	Mean percentage damage to maize plants	Mean maize grain yield / tonnes per hectare (\pm standard deviation)	Mean production costs per farmer / \$ per hectare (\pm standard deviation)	Mean total income for farmer / \$ per hectare (\pm standard deviation)
Control	29.6	1.5 (± 0.2)	250 (± 0.7)	329 (± 5.9)
Test	6.7	3.7 (± 0.3)	278 (± 1.1)	679 (± 10.2)

Turn over for Resource B

Turn over ►

Resource B

Scientists carried out an investigation to find out whether using **push-pull** stimuli could improve control of an insect pest.

In control experiments, insects had a choice between:

- food without pesticide and
- food with a pesticide added.

The scientists recorded how much of each food the insects ate.

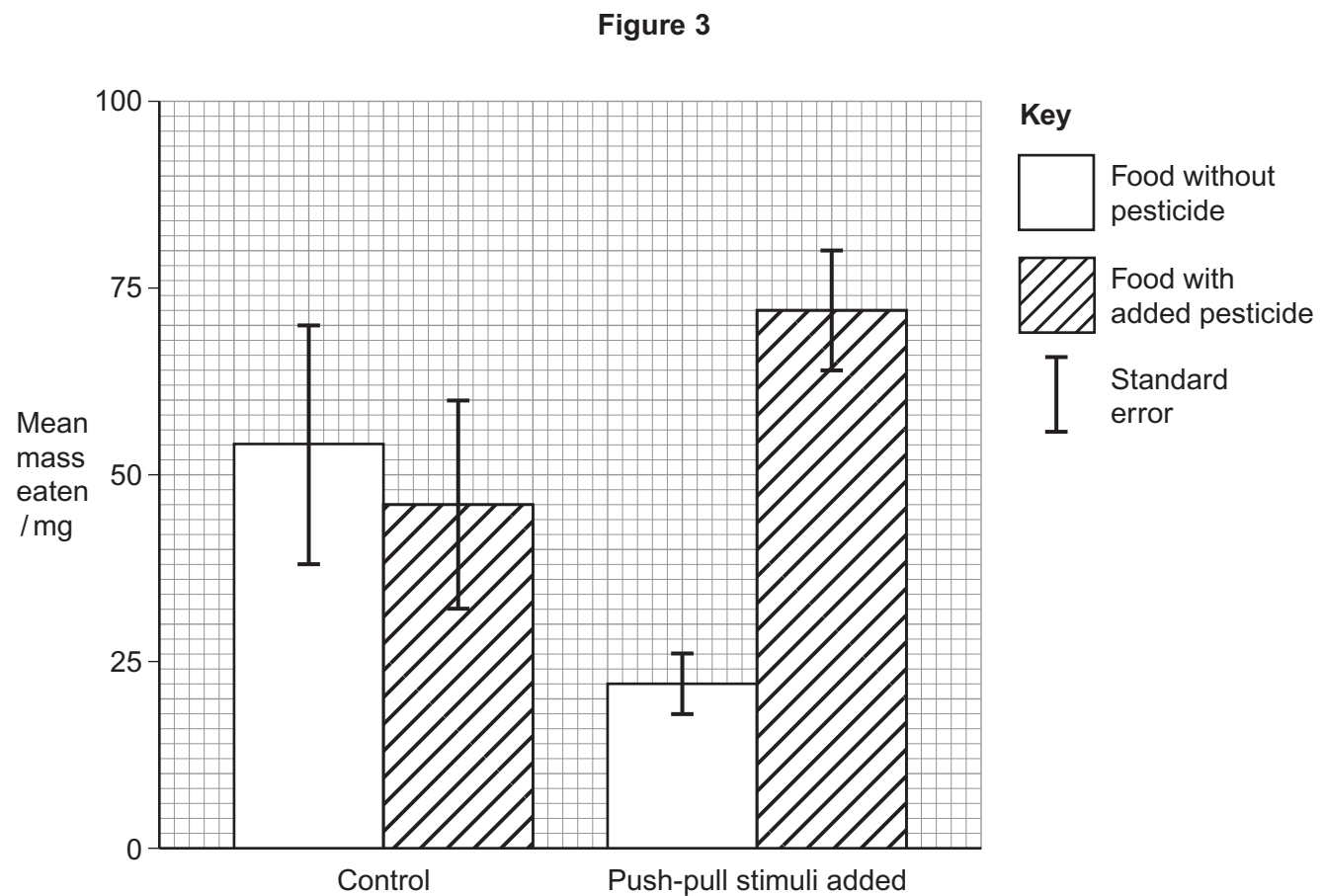
In the other experiments:

- a push stimulus was added to the food without pesticide and
- a pull stimulus was added to the food with pesticide.

Again, the scientists recorded how much of each food the insects ate.

The push stimulus was a chemical that repels the insect.
The pull stimulus was a hormone that attracts the insect.

Figure 3 shows the mean mass of each type of food eaten in the control experiments and when the **push-pull** stimuli were added.



Section B

Use the information in the **Resource Sheet** and your own knowledge to answer the questions.

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

Use **Resource A** to answer **Questions 13 to 17**.

13 In the test plot of land, identify the push stimulus and the pull stimulus. **[1 mark]**

Push stimulus

Pull stimulus

14 When measuring the mean percentage damage to maize plants, 60 plants from each test plot were selected at random and examined.
Describe how the maize plants could be selected at random. **[3 marks]**

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15 In the test plot, bare ground was left between the maize and the grass species.
Suggest an explanation why. **[2 marks]**

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16 The legume plants have nodules containing nitrogen-fixing bacteria on their roots.
Explain how nitrogen-fixing bacteria could increase the growth of the maize. **[2 marks]**

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17 A year after this investigation, the government of one country decided that their
farmers should use these **push-pull** stimuli.
How do these data support this decision? **[3 marks]**

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Use **Resource B** to answer **Questions 18 to 21**.

18 (a) It was essential to include a control experiment in this investigation.
Explain why.

[1 mark]

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18 (b) Describe the results of the control experiment.

[2 marks]

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19 Name the type of behaviour the insects showed in response to the hormone.

[1 mark]

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20 The scientists concluded that the **push-pull** stimuli would improve control of the insect pest.
How do these data support this conclusion?

[3 marks]

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Turn over for the next question

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21 The scientists' investigations were aimed at developing an integrated system of pest control.
What is meant by an integrated system of pest control?

[2 marks]

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Use both **Resource A** and **Resource B** to answer **Question 22**.

22 A journalist read about the use of **push-pull** stimuli and wrote an article entitled 'The days of chemical pesticide use are numbered!' Evaluate this statement.

[3 marks]

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END OF QUESTIONS