

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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General Certificate of Education
 June 2005
 Advanced Level Examination



**BIOLOGY (SPECIFICATION B)
 Unit 5 The Environment**

BYB5/W

Tuesday 21 June 2005 Morning Session

In addition to this paper you will require:

- a ruler with millimetre measurements.

You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
6			
7			
QWC			
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

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 in **Section A** and **Section B** 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.

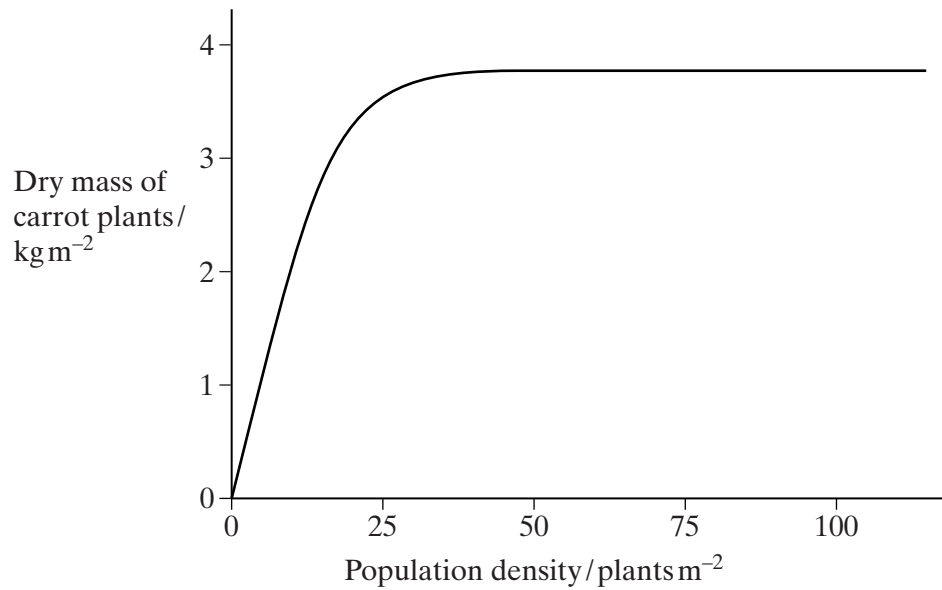
Information

- The maximum mark for this paper is 66.
- Mark allocations are shown in brackets.
- Answers for **Section A** are expected to be short and precise.
- Questions in **Section B** should be answered in continuous prose where appropriate. Quality of Written Communication will be assessed in these answers.
- In addition to the mark allocations indicated within **Section B**, you will be awarded up to 1 mark for your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate. The legibility of your handwriting and the accuracy of your spelling, punctuation and grammar will also be taken into account.
- You are reminded that this test requires you to use your knowledge of different parts of the specification as well as Module 5 in answering synoptic questions. These questions are indicated by the letter **S**.

SECTION A

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

- 1 (a) In an investigation, carrot seeds were planted at different densities. After 120 days, the dry mass of the carrot plants was measured. The results are shown in the graph.



- (i) What is the advantage of measuring the dry mass rather than the total mass of the carrot plants?

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(1 mark)

- (ii) What type of competition is shown in this investigation?

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(1 mark)

- (iii) Explain the shape of the curve.

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 (2 marks)

S (b) Commercial growers want all the carrots to be the same size when harvested. Suggest **two** ways in which they can try to ensure this.

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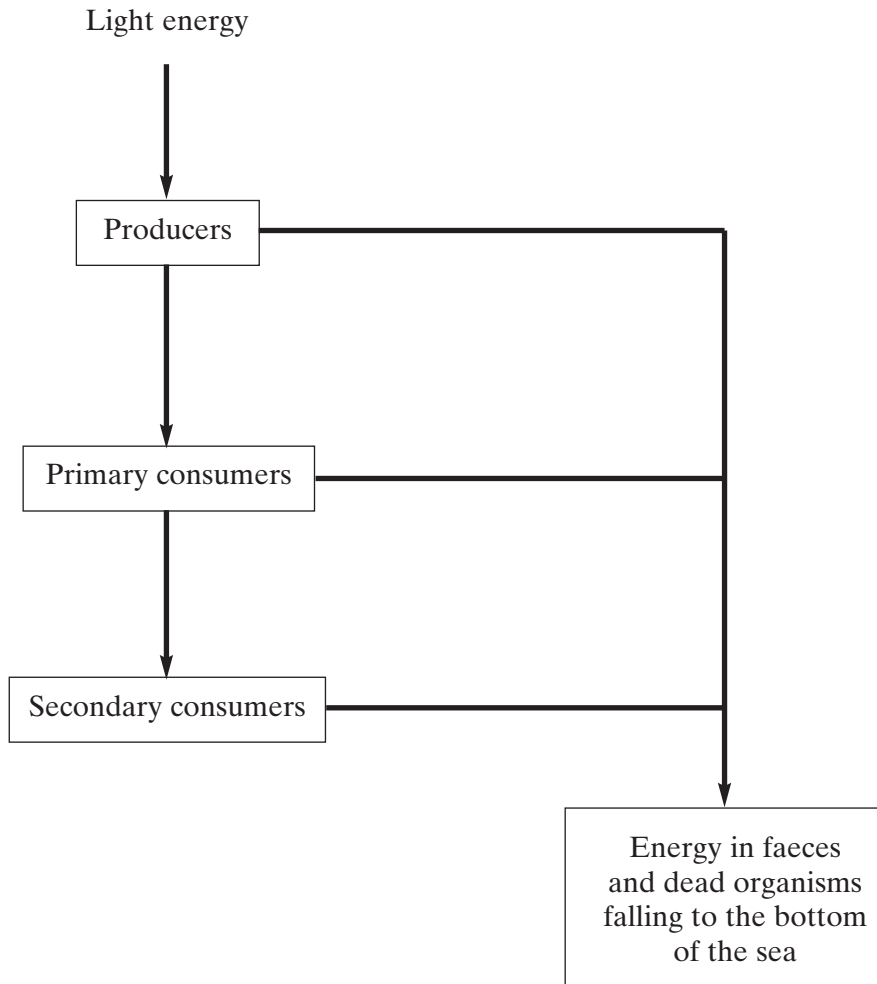
(2 marks)

$\frac{\quad}{6}$

TURN OVER FOR THE NEXT QUESTION

Turn over 

2 The diagram shows the flow of energy through a marine ecosystem.



(a) Give **one** reason why not all the light energy falling on the producers is used in photosynthesis.

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(1 mark)

(b) Describe what happens to the energy in faeces and dead organisms which fall to the bottom of the sea.

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(3 marks)

S (c) The producers in this ecosystem are seaweeds, which have a large surface area to volume ratio. Give **two** advantages to seaweeds of having a large surface area to volume ratio.

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(2 marks)

S (d) Some species of seaweed are submerged in water for most of the time. Explain how being under water might affect the rate of photosynthesis.

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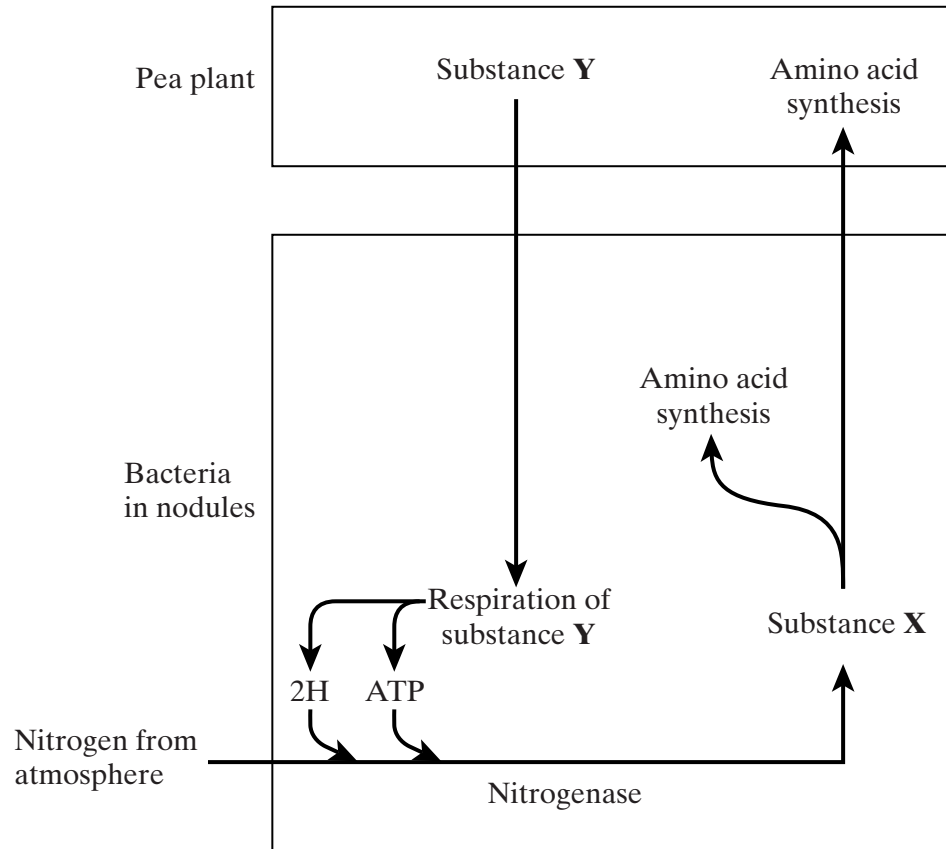
(3 marks)

9

TURN OVER FOR THE NEXT QUESTION

Turn over 

3 Pea plants are leguminous and have nodules on their roots which contain bacteria that are able to fix nitrogen. The diagram shows some of the processes involved in nitrogen fixation by these bacteria.



(a) Name

(i) substance X;

..... (1 mark)

(ii) substance Y.

..... (1 mark)

S (b) Pea plants respire aerobically, producing ATP which can be used for amino acid synthesis. Describe the role of oxygen in aerobic respiration.

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(2 marks)

S (c) The bacteria respire anaerobically. This produces hydrogen and ATP used in nitrogen fixation. The hydrogen comes from reduced NAD. Explain how the regeneration of NAD in this way allows ATP production to continue.

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(2 marks)

S (d) The enzyme nitrogenase is specific to the reaction shown. Explain how **one** feature of the enzyme would contribute to this specificity.

Feature

Explanation

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(2 marks)

S (e) Sodium ions act as a non-competitive inhibitor of the enzyme nitrogenase. Explain how the presence of a non-competitive inhibitor can alter the rate of the reaction catalysed by nitrogenase.

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(3 marks)

11

Turn over ▶

4 A hedgerow is a line of shrubs and trees bordering a field, together with the herbaceous plants at their base. In the last 50 years farmers have removed many hedgerows.

(a) Explain **two** advantages for a farmer of removing hedgerows.

1

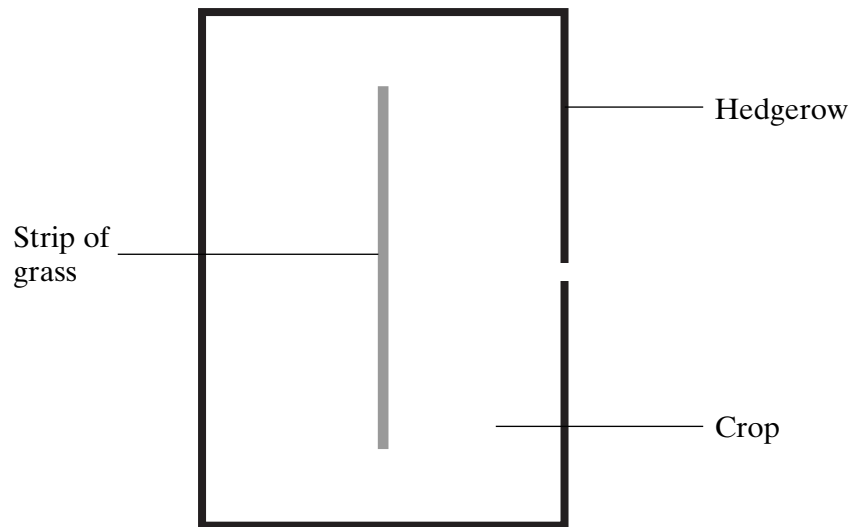
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2

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(2 marks)

(b) In recent years some hedgerows have been replanted. Ground beetles, which are unable to fly, are predators of crop pests. The beetles overwinter in the shelter of grasses at the base of the hedgerow. In some large fields, a permanent strip of grass is left as shown in the diagram.



Suggest and explain the advantage of leaving the strip of grass in the middle of the field.

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(2 marks)

(c) Apart from providing a habitat for predators of crop pests, give **two** biological benefits of replanting hedgerows.

1

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2

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(2 marks)

S (d) A species of insect that feeds on crop plants has individuals that may be either black or green. Colour in this insect is a genetically determined characteristic. The colour of these insect pests in two fields of the same crop was recorded. Ground beetles were present in one field but not in the other. The proportion of black insect pests in the field with beetles was much smaller than in the field without beetles. Explain how the presence of the beetles may have caused this difference.

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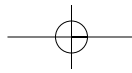
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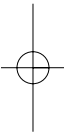
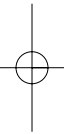
(4 marks)

10

Turn over 



NO QUESTIONS APPEAR ON THIS PAGE



5 (a) Growing the same crop over a large area year after year is known as monoculture. Explain why an outbreak of pests is more of a problem in monoculture than where a mixture of crops is grown.

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(3 marks)

(b) S (i) Insect pests have developed resistance to pesticides. If the resistance is due to a single gene, explain how resistant insects could be produced when both parents are susceptible to the pesticide.

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(3 marks)

(ii) Other than resistance, give **two** disadvantages of using pesticides.

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(2 marks)

8

Turn over ▶

SECTION B

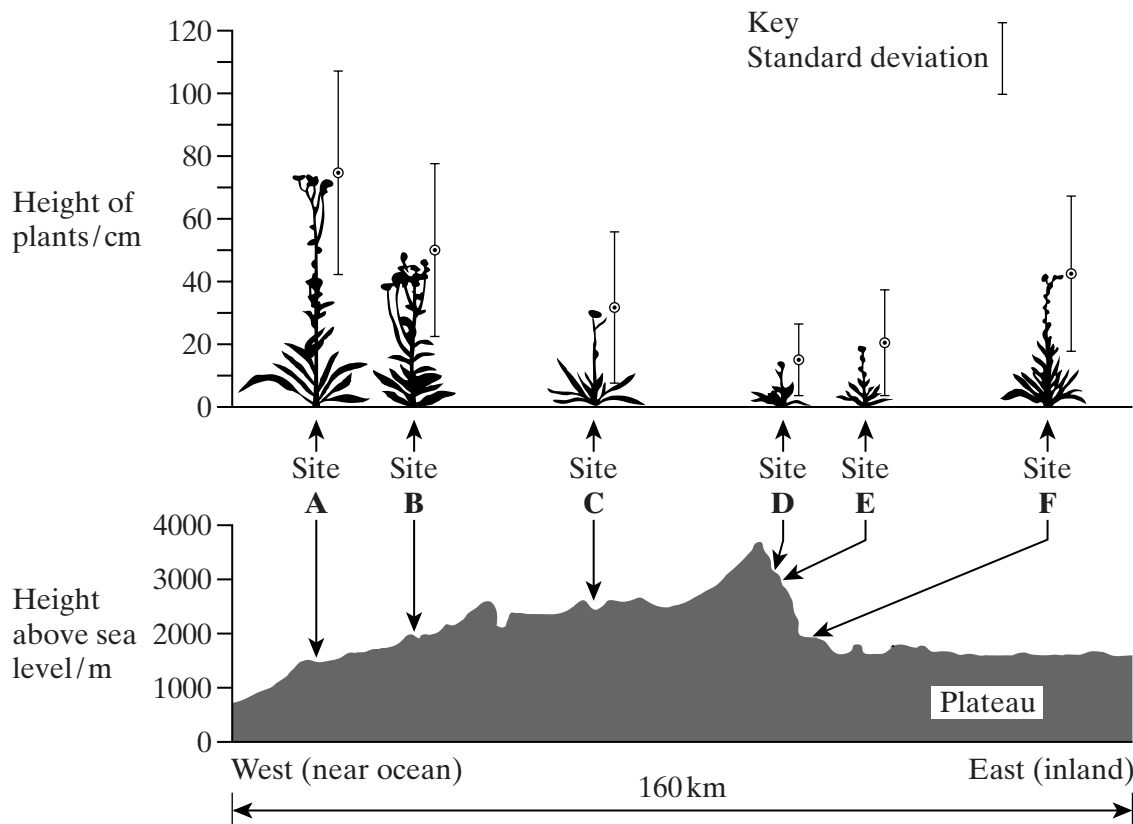
Answer **all** questions in the spaces provided.

Questions should be answered in continuous prose, where appropriate.
Quality of Written Communication will be assessed in these answers.

6 Climatic factors, such as temperature and rainfall, vary greatly over short distances across mountain ranges. In an investigation, populations of the plant, *Achillea lanulosa*, were sampled from several sites on a transect across a mountain range. At each sampling site, seeds were collected at random. Each batch of seeds was germinated and grown to maturity under the same experimental conditions.

The diagram shows

- a profile indicating the position and altitude of the sampling sites
- the mean height of mature plants grown from each sample of seeds
- the standard deviation of heights of the mature plants grown from each sample of seeds.



(a) (i) Give **one** limitation of using a line transect to collect these data.

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(1 mark)

(ii) Suggest how plants should be chosen at each sampling site to avoid bias and to be representative.

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(2 marks)

(b) (i) What information does the bar representing standard deviation give about the plants in a sample?

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(1 mark)

(ii) Describe what the results show about the variation of the height of the plants in relation to altitude.

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(2 marks)

S (iii) There was a significant difference between the mean heights of the plants grown from seeds taken from sites **A** and **D**. Describe the evidence from the information given which shows that this is likely to be due to genetic differences between the two populations.

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(1 mark)

QUESTION 6 CONTINUES ON THE NEXT PAGE

Turn over ▶

S (c) The plateau has a very low annual rainfall. Describe and explain the structural adaptations for dry conditions that plants growing on the plateau may show.

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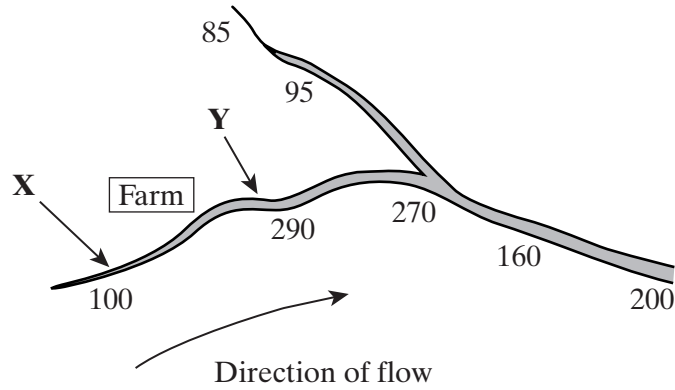
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(4 marks)

11

7 The diagram shows a river system in an area of farmland. The numbers show the nitrate concentration in parts per million (ppm) in water samples taken at various locations along the river. Concentrations above 250 ppm encourage eutrophication in the river.



(a) (i) Explain how farming practices might be responsible for the change in nitrate concentration in the water between point X and point Y.

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(2 marks)

(ii) Describe the effect the nitrate concentration may have in the river at point Y.

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(5 marks)

QUESTION 7 CONTINUES ON THE NEXT PAGE

Turn over ▶

S (b) Single-celled organisms were cultured from samples of river water. Give **three** characteristics of the cells that would enable you to distinguish prokaryotes from eukaryotes.

1

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3

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(3 marks)

$\frac{\quad}{10}$

END OF QUESTIONS

QWC

$\frac{\quad}{1}$