

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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General Certificate of Education
June 2006
Advanced Level Examination



BIOLOGY (SPECIFICATION B)
Unit 5 The Environment

BYB5/W

Tuesday 20 June 2006 9.00 am to 10.15 am

For this paper you must have:

- 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			
8			
Total (Column 1) →			
Total (Column 2) →			
Quality of Written Communication			
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.
- Answer the questions in **Section A** and **Section B** in the spaces provided.
- 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.
- The marks for part 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 your answers.
- Answers for **Section A** are expected to be short and precise.
- Answer questions in **Section B** in continuous prose where appropriate. Quality of Written Communication will be assessed in these answers.
- You are reminded that this test requires you to use your knowledge of Modules 1-4 as well as Module 5 in answering synoptic questions. These questions are indicated by the letter **S**.

BYB5/W

SECTION A

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

1 (a) Name the type of bacteria which convert

(i) nitrogen in the air into ammonium compounds;

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(ii) nitrites into nitrates.

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(2 marks)

(b) (i) Other than spreading fertilisers, describe and explain how **one** farming practice results in addition of nitrogen-containing compounds to a field.

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(2 marks)

(ii) Describe and explain how **one** farming practice results in the removal of nitrogen-containing compounds from a field.

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(2 marks)

2 (a) Explain what is meant by monoculture.

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(1 mark)

(b) (i) Where monoculture takes place on a large scale, farmers often remove hedges. Explain **two** benefits to the farmer of removing hedges.

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(2 marks)

(ii) Usually, the older a hedge the more species of shrub it contains. Explain why removal of hedges that are several hundred years old affects more animal species than the removal of young hedges.

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(2 marks)

(c) Monoculture often involves the use of large amounts of pesticides. Some of these pesticides are toxic to species that are not pests. These animals may be killed immediately when the pesticide is applied. Explain **one** other way by which the use of pesticides can lead to the death of animals that are not pests.

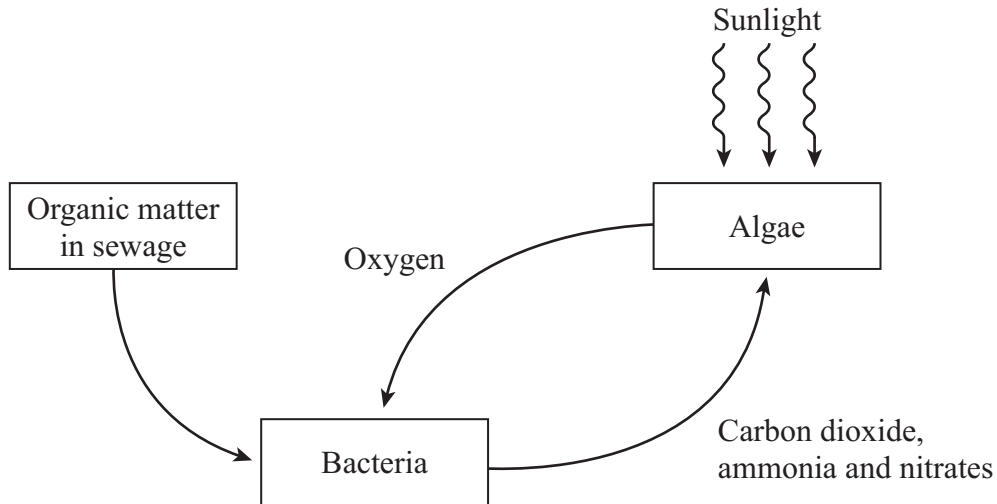
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(2 marks)

- 3 Purification ponds can be used in warm climates to break down sewage. The ponds are about 1m deep and contain bacteria and green algae. The diagram summarises the processes involved in the breakdown of sewage in a purification pond.



- (a) Explain the advantage of having both algae and bacteria in a purification pond.

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(4 marks)

S (b) Purification ponds only work efficiently when they are shallow and warm. Explain why.

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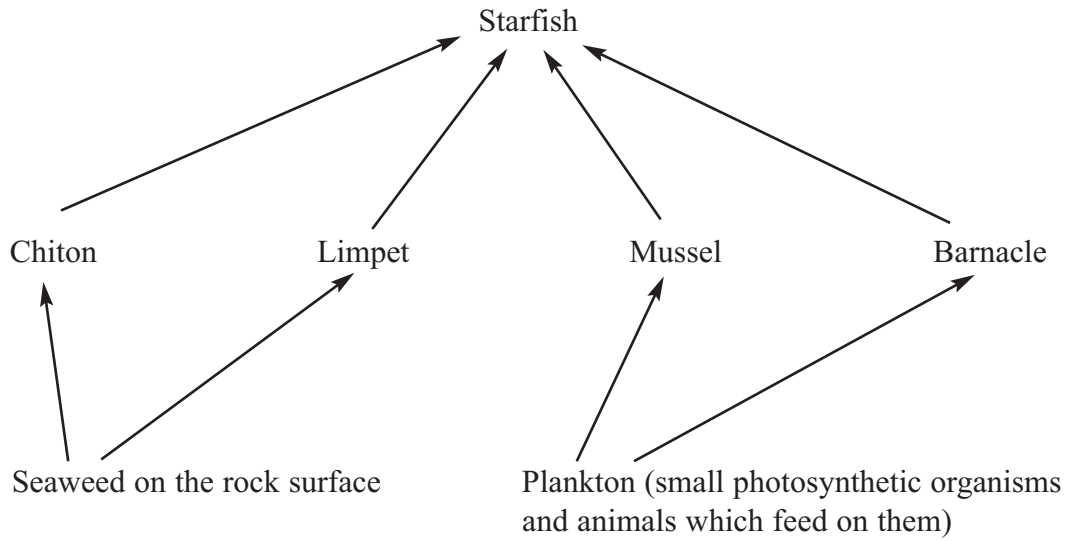
(4 marks)

8

Turn over for the next question

Turn over 

- 4 Starfish feed on a variety of invertebrate animals that are attached to rocks on the seashore. The diagram shows part of a food web involving a species of starfish.



- (a) Explain why a starfish can be described as both a secondary and a tertiary consumer.

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(1 mark)

- (b) When starfish feed on mussels they leave behind the empty shell. Explain how quadrats could be used to determine the percentage of mussels that had been eaten by starfish on a rocky shore.

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(3 marks)

(c) The table shows the composition of the diet of starfish.

	Prey species			
	Chitons	Limpets	Mussels	Barnacles
Percentage of total number of animals eaten	3	5	27	65
Energy provided by each species as a percentage of total energy intake	42	5	38	15

- (i) The percentage of barnacles in the diet is much higher than the percentage of energy they provide. Suggest **one** explanation for this difference.

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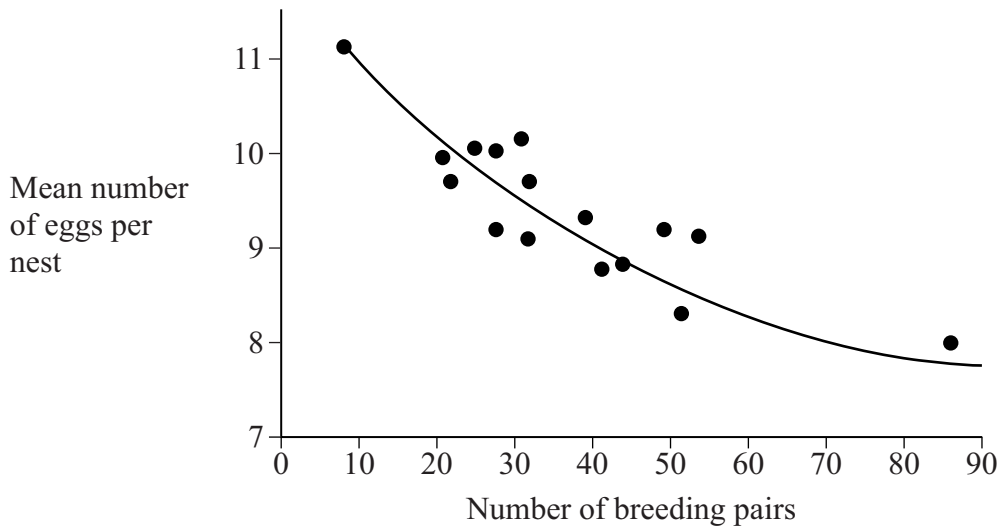
(1 mark)

- (ii) The table shows that the amount of energy provided by chitons is greater than the amount of energy provided by limpets. Calculate the number of limpets a starfish would need to eat in order to obtain the same amount of energy as it would obtain from one chiton.

Number of limpets

(1 mark)

5 Great tits are small birds. The graph shows the relationship between the number of breeding pairs in the population and the mean number of eggs per nest in different years in a wood.



(a) Explain the relationship shown by the graph.

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(2 marks)

S (b) Female great tits usually lay between 3 and 14 eggs in a nest.

(i) In the same year, the birds do not all lay the same number of eggs. Explain how **one** factor, other than the number of breeding pairs, could influence the number of eggs laid by a great tit.

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(1 mark)

(ii) Natural selection influences the number of eggs laid. Explain why great tits that lay fewer than 3 eggs per nest or more than 14 eggs per nest are at a selective disadvantage.

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(3 marks)

6

Turn over for the next question

Turn over 

6 (a) Explain what is meant by

(i) succession;

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(2 marks)





(ii) a climax community.

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(1 mark)

Heather plants are small shrubs. Heather plants are the dominant species in the climax community of some moorlands. The structure and shape of a heather plant changes as it ages. This results in changes in the species composition of the community. A large area of moorland was burnt leaving bare ground. The table shows four stages of succession in this area.

Time after burning/ years	Appearance of heather plant	Mean percentage cover of heather	Other plant species present
4		10	Many
12		90	Few
19		75	Several
24		30	Many

(b) Explain why the number of other plant species decreases between 4 and 12 years after burning.

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(2 marks)

S (c) The rate at which a heather plant produced new biomass was measured in g per kg of heather plant per year. This rate decreased as the plant aged. Use the information in the table to explain why.

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(3 marks)

8

Turn over for the next question

Turn over 

S (b) Lemmings often live in isolated populations. From time to time some lemmings move and join other populations. Explain how this movement is important in maintaining genetic variability in lemming populations which have large fluctuations in size.

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(2 marks)

S (c) James Bay is a large ocean bay in northern Canada. It was formed by the melting of glaciers. One species of lemming inhabits the eastern side of James Bay and another species of lemming inhabits the western side. Before the glaciers melted there was only one species of lemming present.

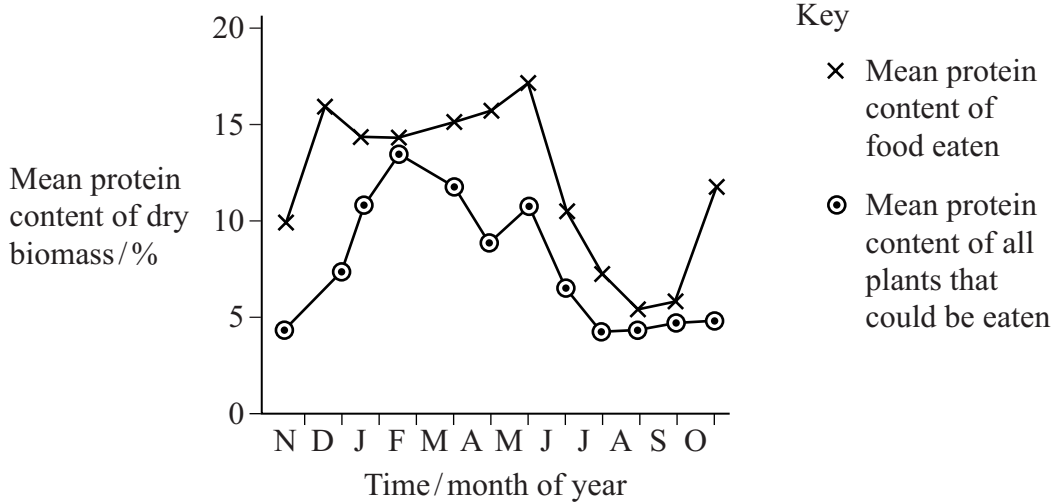
Explain how two species of lemming evolved from the original species.

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(4 marks)

- 8 The wildebeest is a large mammal that lives on grasslands in Africa and feeds on a number of species of plant. A lot of rain falls from April to May and also in November. In the dry season between July and October very little rain falls.

The graph shows changes in the mean protein content of all the plants that could be eaten at different times of year. It also shows the mean protein content of the food the wildebeest actually eat.



- S (a) During the dry season the protein content of the plants decreases. Suggest **one** way in which a lack of rain could account for this change.

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(2 marks)

- S (b) Throughout the year the mean protein content of all the plants which could be eaten and the mean protein content of the food actually eaten differs. Suggest **one** explanation for this difference.

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(2 marks)

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