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General Certificate of Education  
June 2003  
Advanced Level Examination



**BIOLOGY (SPECIFICATION B)**  
**Unit 6 Section A Applied Ecology**

**BYB6/A**

Thursday 19 June 2003 1.30 pm to 3.45 pm

**In addition to this paper you will require:**

- Section B provided as an insert (enclosed).
- a ruler with millimetre measurements.

You may use a calculator.

Time allowed: The total time for Section A and Section B of this paper is 2 hours 15 minutes.

**Instructions**

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** the questions in **Section A** in the spaces provided. All working must be shown.
- **Section A** and **Section B** will be marked by different examiners. You must ensure that any supplementary sheets are fastened to the appropriate question paper answer book.
- Do all rough work in this book. Cross through any work you do not want marked.

**Information**

- The maximum mark for **Section A** is 50.
- Mark allocations are shown in brackets.
- You are reminded of the need for clear presentation in your answers. All answers should be in good English and should use accurate scientific terminology.
- You are advised to spend 1 hour on **Section A**.
- You are reminded that **Section A** requires you to use your knowledge of Modules 1-5 as well as Module 6 in answering synoptic questions. These questions are indicated by the letter **S**.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
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7			
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

**SECTION A**

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

**1** The mark-release-recapture technique may be used to estimate population size.

(a) Give **two** assumptions that must be made when using this technique.

1 .....

.....

2 .....

.....

(2 marks)

(b) In estimating the size of a ladybird population, 70 ladybirds were trapped, marked and released. A week later, a second sample was captured. In this second sample, 27 were marked and 13 were not marked.

(i) Calculate the estimated size of the ladybird population.  
Show your working.

Answer .....

(2 marks)

(ii) Explain why it is important that the samples contain as many ladybirds as possible.

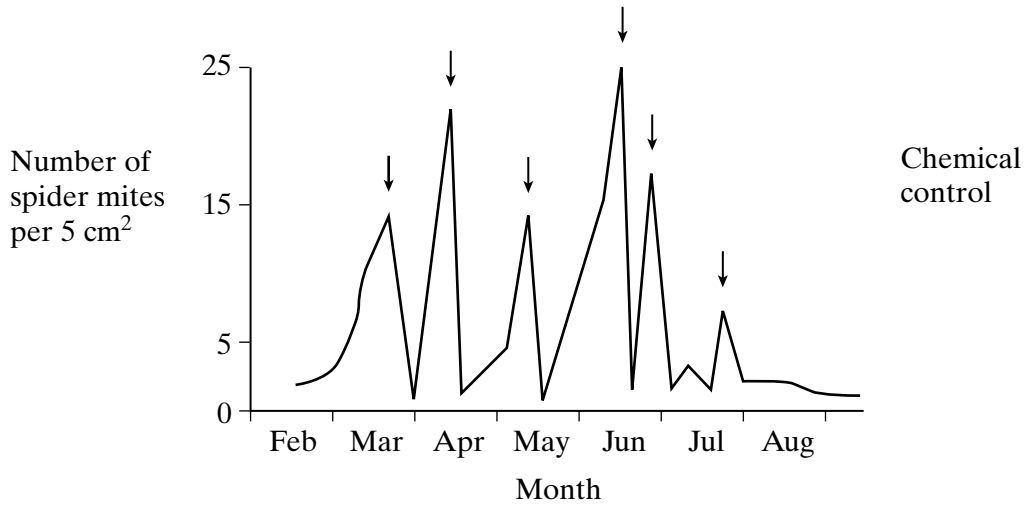
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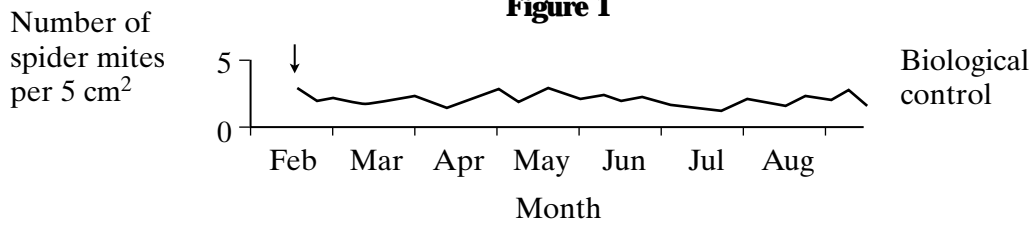
(1 mark)



2 Spider mites are a major pest of cucumbers. An investigation was carried out to compare the effectiveness of two methods of controlling this pest. Two plots of cucumber plants infested with spider mites were used. One plot was treated with a chemical pesticide; a biological control agent was used on the other plot. **Figures 1** and **2** show the results. The arrows show when the chemical pesticide was applied (**Figure 1**) and when the predator was introduced (**Figure 2**).



**Figure 1**



**Figure 2**

(a) Using evidence from the graphs, give **two** advantages of biological control over chemical control.

- 1 .....
- .....
- 2 .....
- .....

(2 marks)

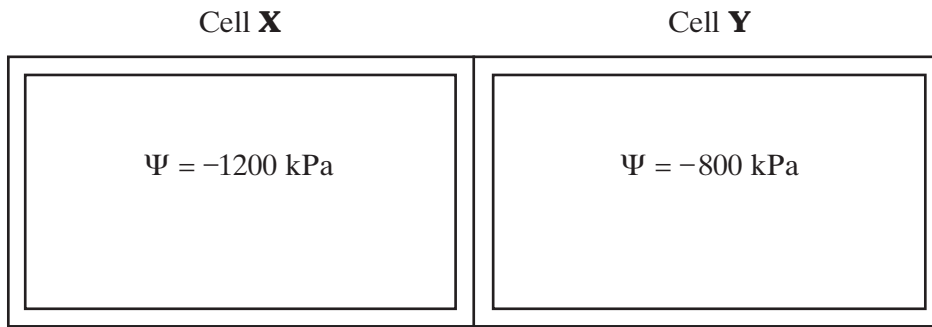
(b) Describe **two** features that a predator must have if it is to be a successful biological control agent.

- 1 .....
- .....
- 2 .....
- .....

(2 marks)

Turn over ►

**3** The diagram shows two adjacent plant cells (**X** and **Y**).



(a) In which direction would a net flow of water occur? Explain your answer.

.....  
 .....

(1 mark)

(b) *Plantago maritima* is a plant that grows in salt marshes around the coast of Britain. It is able to survive in its natural habitat without wilting by maintaining a higher concentration of solutes in its cells than in the surrounding water.

**S** (i) Suggest how *P. maritima* increases the concentration of solutes in its cells.

.....  
 .....

(1 mark)

(ii) Describe how changing the concentration of solutes will affect the water potential.

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 .....

(1 mark)

(iii) Explain why many species of plant are unable to survive in this habitat.

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(4 marks)

- 4 (a) Clover is a leguminous plant. A clover plant has root nodules, which contain nitrogen-fixing bacteria.

Describe the nutritional advantage gained as a result of this relationship by

- (i) the clover plant;

.....  
 .....

- (ii) the nitrogen-fixing bacteria.

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(2 marks)

- (b) Cereals may be grown in rotation with other crops, including clover. No fertiliser is added. Alternatively, cereals may be grown every year in the same field and supplied with fertiliser.

Explain **two** advantages of growing cereal crops in rotation with clover instead of growing them every year in the same field and applying fertiliser.

1 .....

.....  
 .....

2 .....

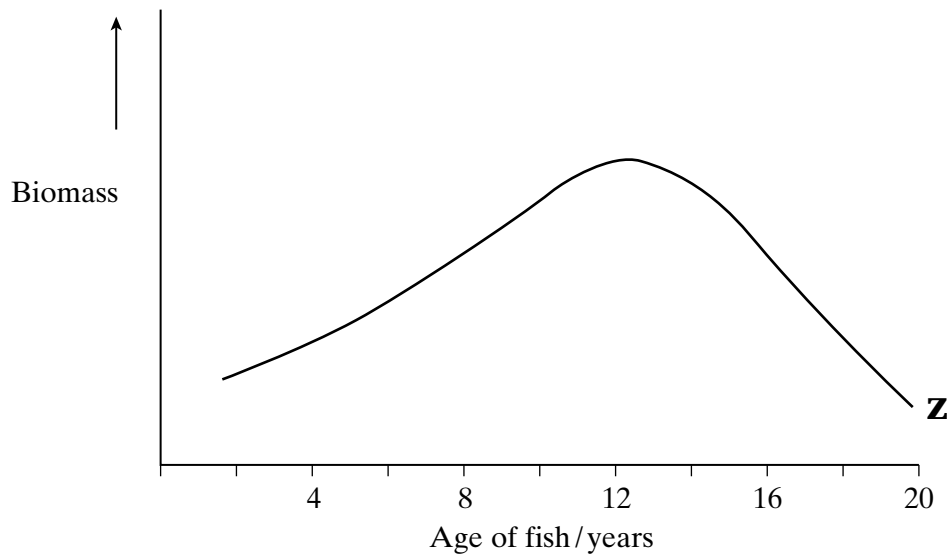
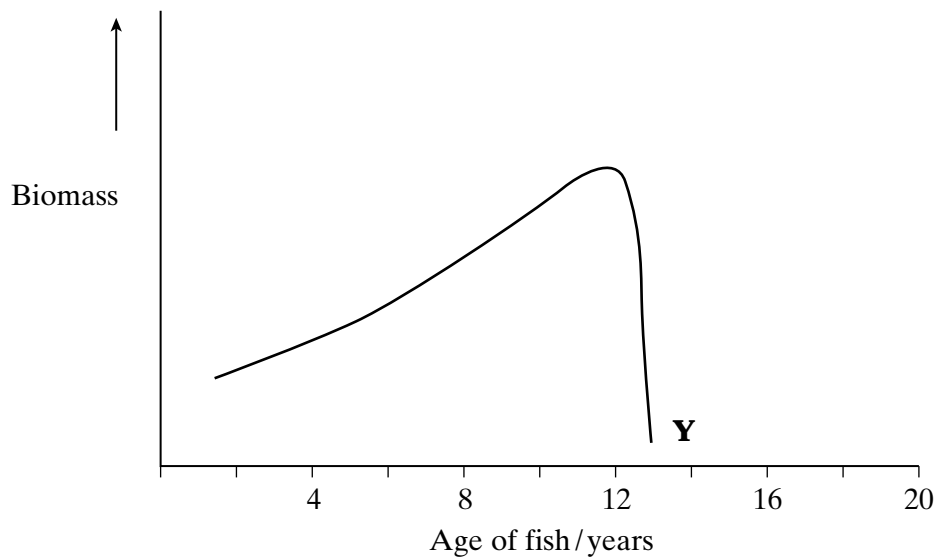
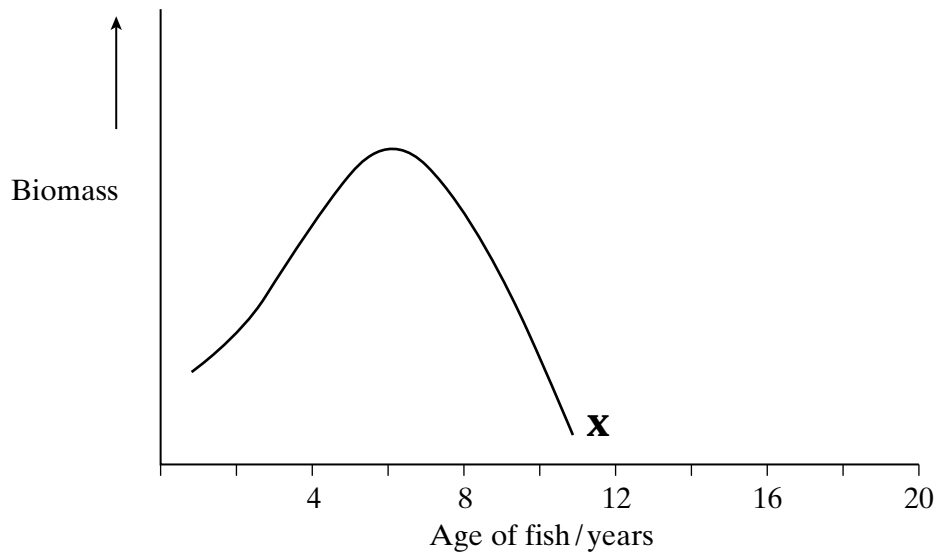
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(4 marks)



Turn over

- 5 (a) A species of marine fish reaches sexual maturity at five years and its life span is twenty years. The graph shows three different stocks, **X**, **Y** and **Z**, of this species of fish.



Giving an explanation for your answer in each case, which of the stocks, **X**, **Y** or **Z**

(i) is farmed;

Stock .....

Explanation .....

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.....  
.....  
.....

(2 marks)

(ii) is an example of an over-fished stock?

Stock .....

Explanation .....

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(2 marks)

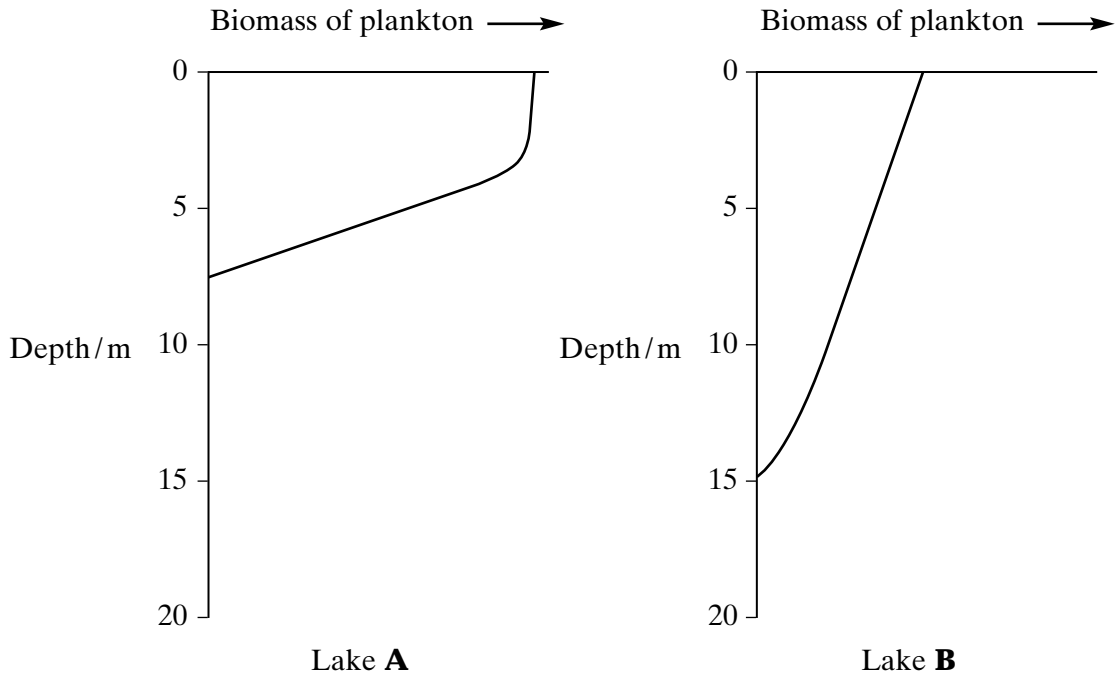
**S** (b) Fish can be genetically engineered so that they grow larger. Briefly describe how a fish could be genetically engineered.

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(4 marks)

Turn over 

**6** Phytoplankton are single-celled photosynthetic organisms which live in surface waters. The graphs show the biomass of phytoplankton at different depths in two lakes.



**S** (a) (i) Describe **one** difference in the distribution of phytoplankton in lake **A** when compared with lake **B**.

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 .....  
 (1 mark)

(ii) Suggest **one** explanation for this difference.

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 .....  
 .....  
 .....  
 (2 marks)



(b) Lake **A** was heavily polluted with nitrate fertiliser. Changes to farming practice were introduced to reduce this. The reduction in the nitrate pollution was monitored by using indicator species.

(i) Describe the change that you would expect in **one** abiotic factor in the lake, other than nitrate content. Explain your answer.

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(3 marks)

(ii) What is an indicator species?

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.....

(1 mark)

(iii) Describe how indicator species could be used to monitor water pollution in lake **A**.

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(2 marks)

**TURN OVER FOR THE NEXT QUESTION**

**Turn over** 

**7** Natural woodlands, which once covered 80% of Britain, are stable ecosystems with high levels of diversity. These natural woodlands were dominated by a range of species, such as oak and ash, which lose their leaves in winter. Much of today’s woodland consists of evergreen conifer plantations. Conifers are grown for timber. They are planted close together in straight lines. The trees are usually of the same age and the same species.

(a) Describe how you would obtain the necessary data to calculate the index of diversity for the tree species growing in a natural woodland.

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*(3 marks)*

**S** (b) Explain why the diversity of animals is higher in natural woodland than in conifer plantations.

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*(4 marks)*

- S** (c) The conifers used in plantations are the result of a long period of selection for desirable characteristics. Explain how a programme of selection might affect the variety of alleles in a population.

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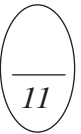
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(4 marks)



**END OF SECTION A**  
**SECTION B IS PROVIDED SEPARATELY**