

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

Leave blank

General Certificate of Education  
 June 2004  
 Advanced Level Examination



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

**BYB5/W**

Tuesday 22 June 2004 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.

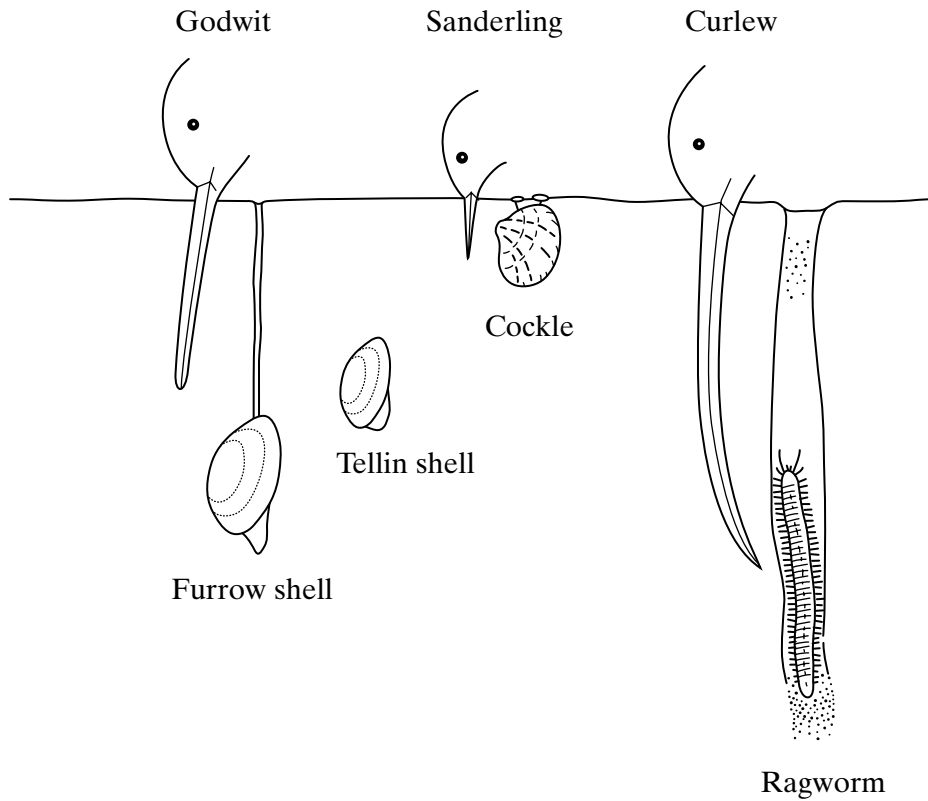
**Information**

- 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 Some birds feed on animals found in mud in estuaries. The drawing shows the heads of three species of these birds and their prey.



- (a) Use the information in the drawing to explain how interspecific competition between the birds is reduced.

.....

.....

.....

.....

.....

(2 marks)

**S** (b) Explain how competition might have played a part in the evolution of the long curved beak of the curlew.

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

(4 marks)

**S** (c) Mud higher up the shore receives fresh water draining from the land. Ragworms are able to survive in this mud because they can tolerate the absorption of water into their tissues. Explain what causes a ragworm to absorb water when higher up the shore.

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

(2 marks)

8

**TURN OVER FOR THE NEXT QUESTION**

Turn over 

2 In an investigation of leaf decay, discs cut from oak leaves were placed in a number of bags. These bags were made from nylon mesh with 1 mm diameter holes. The bags were buried in soil. Each month one bag was removed and the surface areas of the remaining leaf discs were measured.

(a) Suggest **two** precautions that should be taken when carrying out this investigation to ensure a valid comparison between the results from the bags of leaf discs. In each case give a reason for the precaution.

1 .....

.....

.....

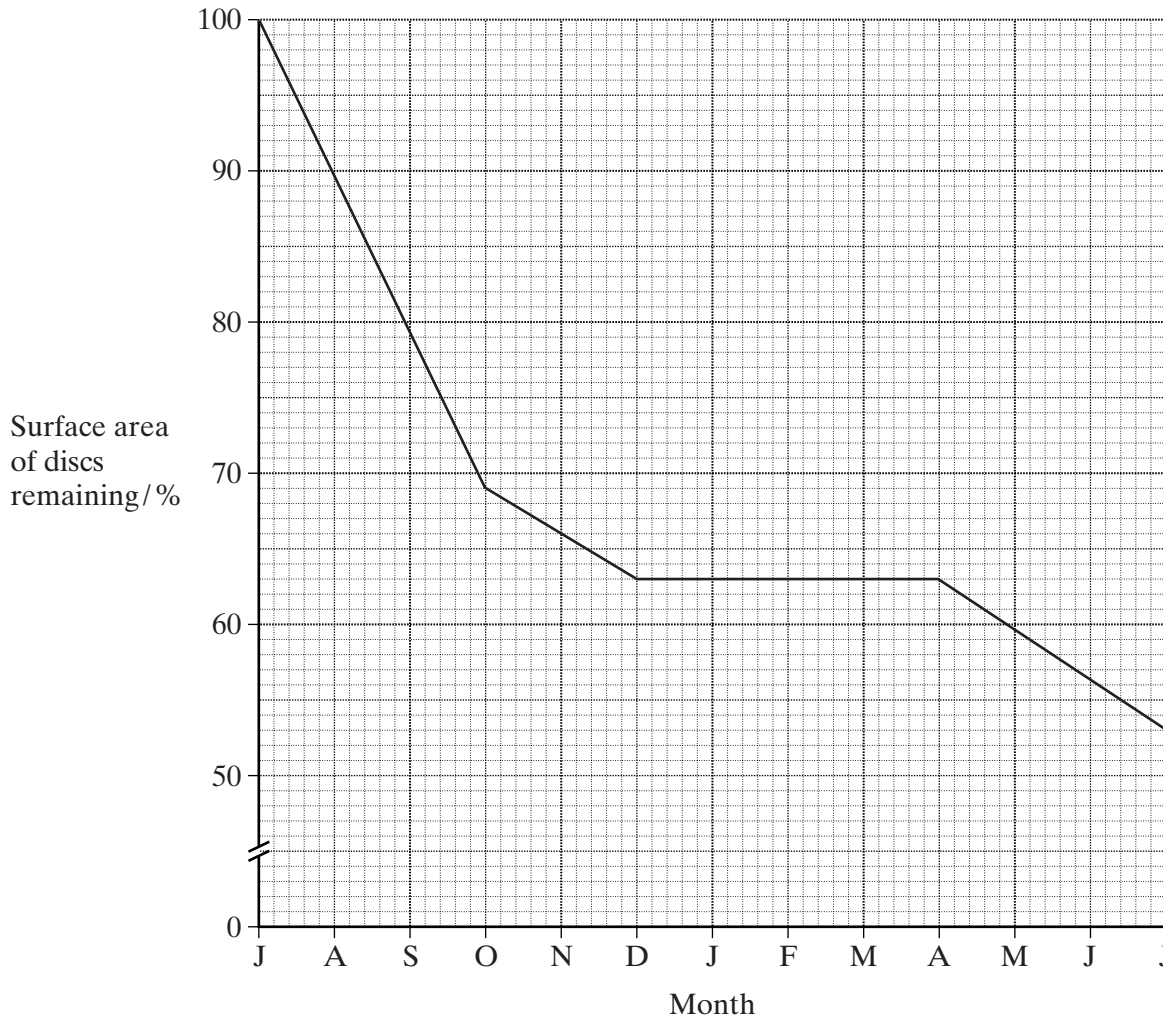
2 .....

.....

.....

(3 marks)

S (b) The graph shows the surface area of the discs remaining each month as a percentage of the area at the start of the investigation.



Describe and explain the shape of the curve.

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

(3 marks)

**S** (c) Explain how microorganisms obtain the carbon compounds from cell walls.

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

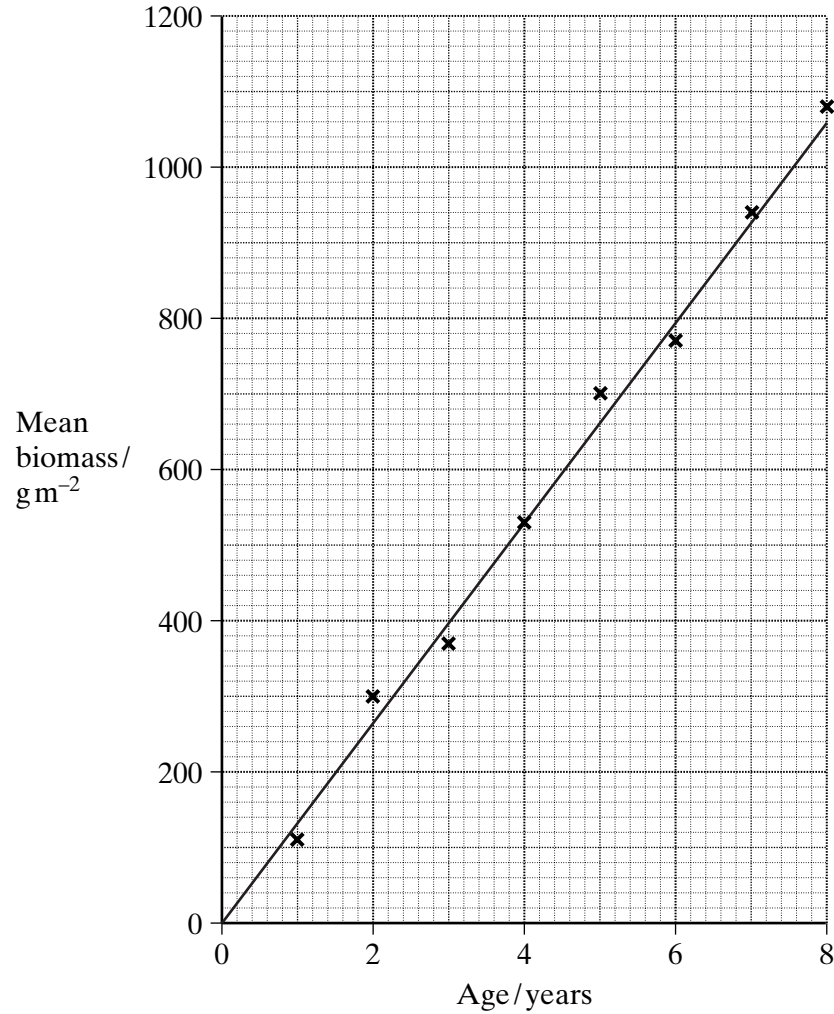
(3 marks)

9

**TURN OVER FOR THE NEXT QUESTION**

Turn over 

3 The graph shows the mean biomass of heather plants of different ages growing on a moor.



- (a) (i) When completely burned, 1 g of heather releases 22 kJ of energy. Use the graph to calculate the mean amount of energy stored as heather biomass per year.

Answer .....  $\text{kJ m}^{-2}$   
(1 mark)

- (ii) The total amount of light energy falling on the leaves of heather plants per year is  $3\,150\,000\text{kJ m}^{-2}$ . The chlorophyll in the leaves of the heather absorbs only 45% of this energy.

Calculate the percentage of the total amount of energy absorbed by the chlorophyll per year which is stored as heather biomass. Show your working.

Answer ..... %  
(2 marks)

- (iii) Only a small percentage of the light energy absorbed by the chlorophyll is stored as biomass. Suggest **two** explanations for this.

1 .....  
.....  
2 .....  
.....  
(2 marks)

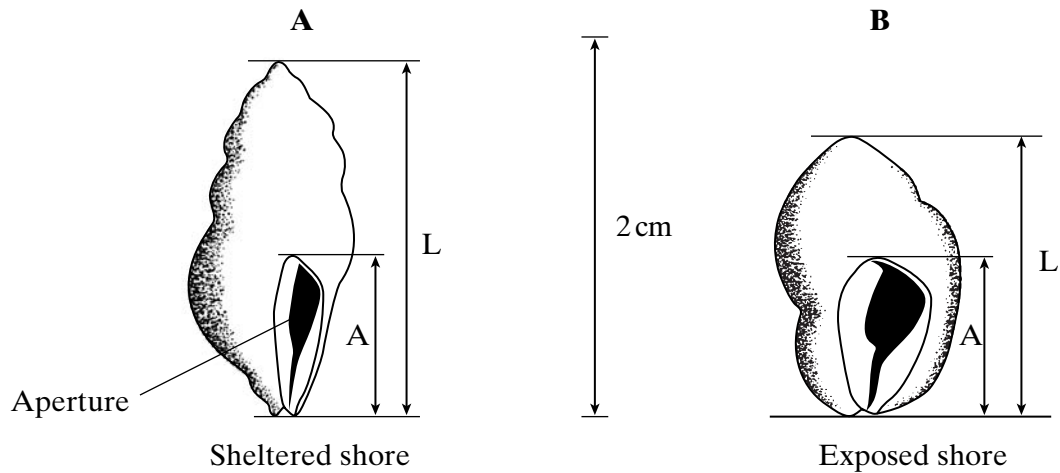
- (b) Explain why only a small percentage of the energy in the heather biomass is transferred to the biomass in the next trophic level.

.....  
.....  
.....  
.....  
.....  
.....  
(3 marks)

8

Turn over ▶

4 The drawings show two dogwhelks taken from two different populations. Dogwhelk **A** came from a sheltered shore and dogwhelk **B** from a shore exposed to heavy wave action. The dogwhelks attach themselves to rocks with a muscular foot which comes out through the aperture. The shell length:aperture length ratios (L/A) were calculated. The mean and standard deviation for each population are shown under the drawings.



(a) Describe how you would collect a random sample of each population.

.....

.....

.....

.....

.....

(3 marks)

(b) What do the standard deviations tell you about the two populations of dogwhelks?

.....

.....

.....

.....

(2 marks)



S (c) Suggest how the effect of wave action on the two populations of dogwhelks could result in differences between

(i) the mean L/A ratios; .....

.....

.....

.....

(ii) the standard deviations. ....

.....

.....

.....

(4 marks)

9

**TURN OVER FOR THE NEXT QUESTION**

Turn over ▶

5 Glaciers are masses of moving ice. When glaciers shrink, the thick covering of ice gradually disappears to leave behind bare land. Land exposed by a shrinking glacier in Alaska became covered by dense forest in 150 years.

(a) Explain how succession resulted in the formation of the forest.

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

(4 marks)

(b) In areas of poor drainage the soil is waterlogged. In these areas the climax community is bog dominated by the moss, *Sphagnum*. Explain why bog is described as the climax community.

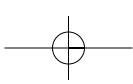
.....  
.....

(1 mark)

S (c) Waterlogged soils lack oxygen. Suggest why trees are unable to survive in waterlogged soils.

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

(2 marks)



LEAVE  
MARGIN  
BLANK

S (d) The water and soil in *Sphagnum* bogs are usually acidic. Suggest why *Sphagnum* is not fully decomposed after it dies.

.....

.....

.....

.....

.....

.....

.....

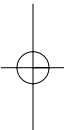
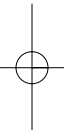
.....

(3 marks)

$\frac{\quad}{10}$

**TURN OVER FOR THE NEXT QUESTION**

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** In autumn when there is no crop, farm land may be used to grow mustard. The mustard absorbs nitrates which otherwise can leach out of the soil at this time of the year. The mustard is ploughed back into the soil just before sowing of the main crop in the spring.

(a) Nitrogen compounds in the mustard plants are made available for the main crop after ploughing in spring. Describe the role of microorganisms in this process.

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

(5 marks)

(b) Explain why it is important for the farmer to reduce the leaching of nitrates.

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

(2 marks)

S (c) Plants absorb a number of other nutrients from the soil including phosphates. Describe why phosphates are needed by a growing plant.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

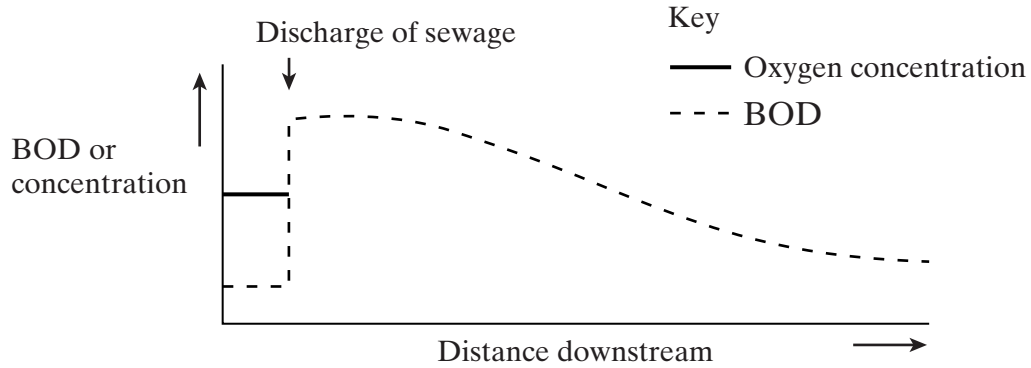
11

**TURN OVER FOR THE NEXT QUESTION**

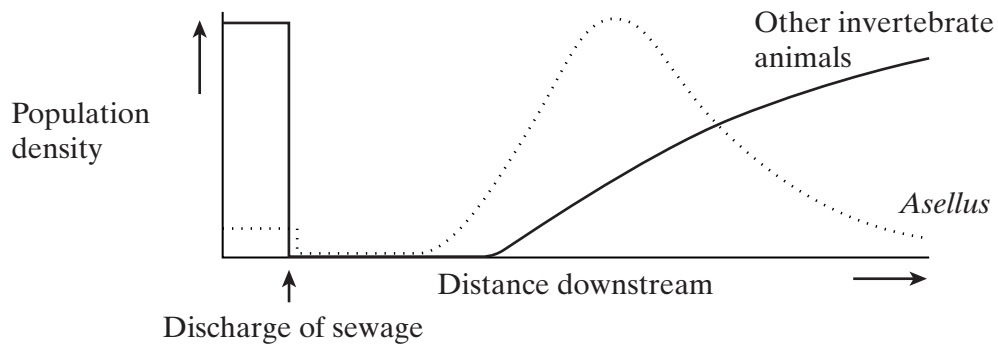
Turn over 

7 When sewage is discharged into a river, the river becomes polluted with small particles of organic material. The population density of animals and the biochemical oxygen demand (BOD) were recorded from a river immediately upstream from a sewage outlet and at different distances downstream. **Figures 1 and 2** show the results.

*Asellus* is an invertebrate animal that feeds on dead organic matter and is able to live in water mildly polluted by organic waste.



**Figure 1**



**Figure 2**

- (a) On **Figure 1** continue the line for oxygen concentration to show how this would be expected to change downstream from the point of discharge of sewage. (1 mark)
- (b) Explain the decrease in biochemical oxygen demand with distance downstream from the sewage outlet.

.....

.....

.....

.....

.....

.....

(3 marks)

- (c) Suggest an explanation for the changes in the population density of *Asellus* with distance downstream from the sewage outlet.

.....

.....

.....

.....

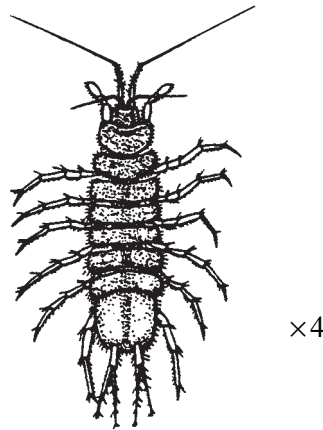
.....

.....

.....

(3 marks)

- S (d) The diagram shows *Asellus*. *Asellus* has external gills on the underside of its abdomen. These gills can move up and down. When the temperature of the water increases, the oxygen content decreases and the rate of movement of the gills increases.



*Asellus*

Explain the advantage of the increase in the rate of movement of the gills as the temperature increases.

.....

.....

.....

.....

.....

.....

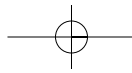
(3 marks)

END OF QUESTIONS

QWC

10

1



**THERE ARE NO QUESTIONS PRINTED ON THIS PAGE**

