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General Certificate of Education
 January 2006
 Advanced Level Examination



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

BYB5/W

Tuesday 24 January 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.

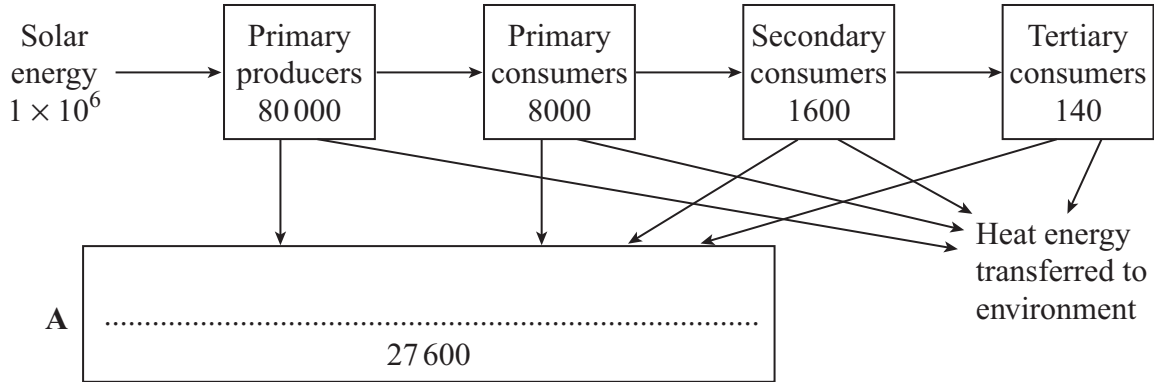
Information

- The maximum mark for this paper is 66.
- The marks for 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.

SECTION A

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

- 1 The diagram shows the energy transfer through the trophic levels in an ecosystem. The numbers in the boxes show the amounts of energy in the biomass at each trophic level.



- (a) Complete box **A** in the diagram with the name of a group of organisms. (1 mark)

- (b) Suggest suitable units for energy transferred between trophic levels.

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(2 marks)

- (c) Give **three** explanations for the difference between the amount of solar energy reaching the primary producers and the energy in the biomass of the primary producers.

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(3 marks)

6

2 Organochlorines are non-biodegradable insecticides which were widely used in the 1950s in the UK to treat cereal seeds before sowing. They are poisonous to fish, mammals and birds and are stored in their fat. The use of these insecticides caused a reduction in the population size of the peregrine, a bird which feeds on seed-eating birds.

(a) Explain how feeding on seed-eating birds could have resulted in the death of large numbers of peregrines.

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(3 marks)

(b) Suggest why treating seeds with insecticide was considered to be a better method of pest control than spraying insecticide on the soil.

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(1 mark)

S (c) One type of organochlorine is dieldrin. It inhibits the action of acetylcholinesterase in synapses. Explain how this would cause the death of mammals.

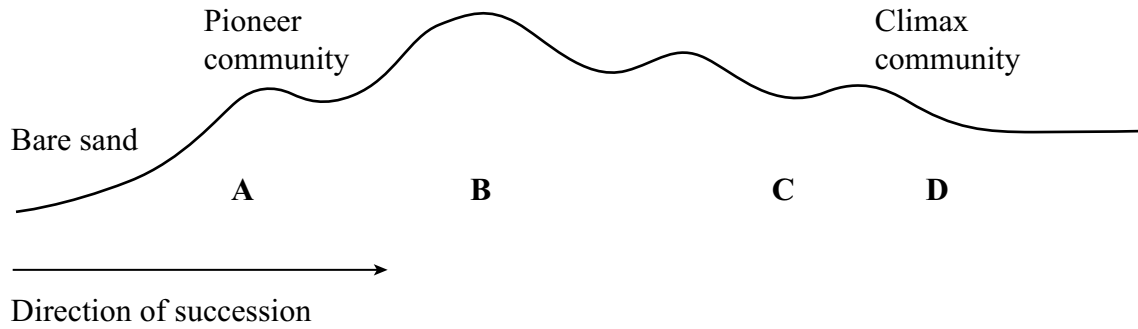
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(3 marks)

7

Turn over 

3 In a sand dune succession the pioneer community (A) colonises bare sand. This community is replaced over time by other communities (B and C) until a climax community of woodland (D) is formed.



(a) The communities A to D are composed of different species. Explain how the change in species composition occurs in a succession.

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(3 marks)

(b) Which community, A to D, is the most stable? Explain what makes this the most stable community.

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(2 marks)

S (c) Many species in the pioneer community are xerophytes. Suggest and explain how having sunken stomata is an advantage to these plants.

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(3 marks)

(d) Explain why it would be more appropriate to use a transect rather than random quadrats when investigating this succession.

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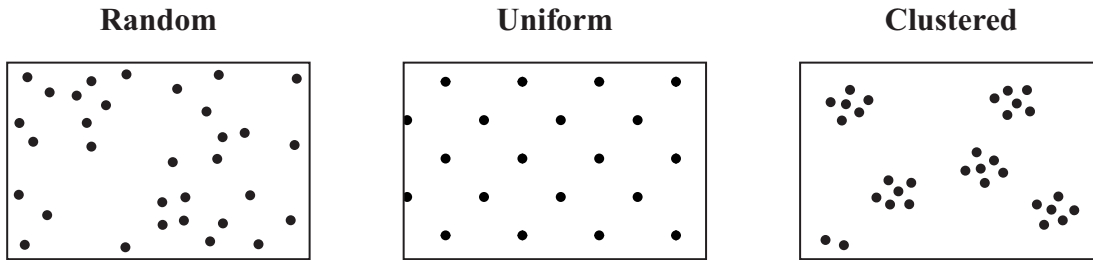
(1 mark)

9

Turn over for the next question

Turn over 

4 The diagrams show three types of plant distribution.



(a) Describe how you would use quadrats to determine whether a particular plant species has a clustered or a random distribution.

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(3 marks)

S (b) Explain why vegetative propagation in plants often results in a clustered distribution.

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(1 mark)

(c) Some plants in a dry, hot desert have a uniform distribution and are widely spaced. Suggest how this type of distribution is an advantage to the plants.

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(2 marks)

5 Yarrow is a herbaceous plant which grows in California at altitudes from 1500 m to 3000 m. The mean height of the stems of plants growing at 3000 m is smaller than that of plants growing at 1500 m.

S (a) The higher the altitude, the lower the mean temperature. Explain how the lower temperature at high altitude reduces the growth of plants.

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(4 marks)

S (b) The relative contribution of environmental and genetic factors on the growth of the plants was investigated. Samples of young plants were taken and grown outdoors in prepared plots at altitudes of 1500 m and 3000 m.

Altitude at which young plants were collected / m	Mean maximum height of stems of plants / cm	
	Grown at 1500 m	Grown at 3000 m
1500	80.4	35.3
3000	31.5	24.7

Describe the evidence from the table that the variation in height is

(i) partly genetically determined;

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(1 mark)

(ii) partly environmentally determined.

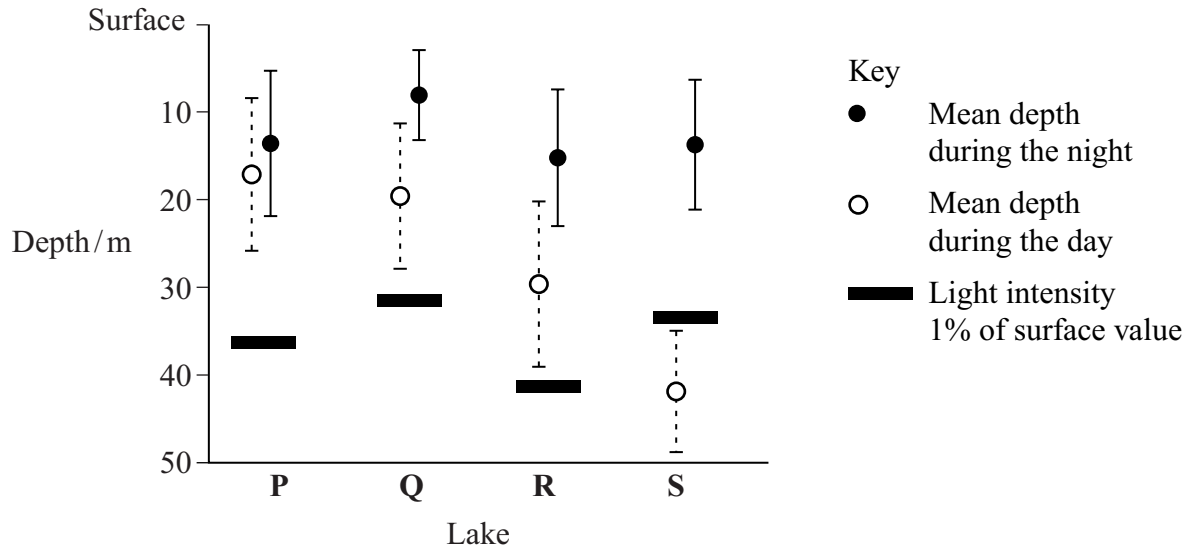
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(1 mark)

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Turn over ▶

6 Zooplankton are very small animals which feed on algae (green protocists) found in lakes. The chart shows the mean depth of zooplankton populations in four lakes, P to S, during the day and the night. It also shows the standard deviations of the means. The depth at which the light intensity is 1% of the surface light intensity is also shown.



S (a) Explain the evidence that the zooplankton feed at night.

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(3 marks)

(b) Predatory fish, which hunt by sight, are present in some of the lakes. These fish have been present in the lakes for different lengths of time.

Lake	Estimated length of time predatory fish have been present / years
P	0
Q	5
R	25
S	Over 1000

(i) Describe the relationship between the depth of the zooplankton during the day and the length of time predators have been present in the lake.

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(1 mark)

S (ii) Suggest how the differences in behaviour of the zooplankton populations in the four lakes might have evolved.

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(3 marks)

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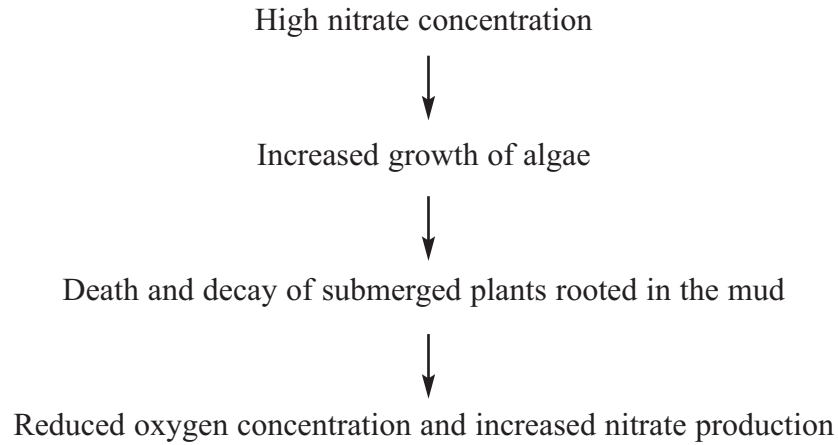
Turn over

SECTION B

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

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

7 The flow chart shows how high nitrate concentration can affect a river.



S (a) Explain how a high nitrate concentration increases the growth of algae.

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(2 marks)

(b) Suggest how increased growth of algae could lead to the death of the submerged plants.

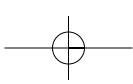
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(2 marks)



(c) Explain how the decay of dead plants results in reduced oxygen concentration and increased nitrate production.

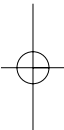
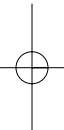
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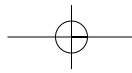
(6 marks)

(d) Describe how the reduced oxygen concentration of the water will change the composition of the communities in the river.

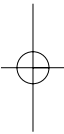
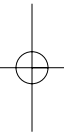
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(2 marks)





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8 The shore crab is common in Britain. It lives both in the sea and in river estuaries, where it feeds on a wide variety of species.

(a) The shore crab has recently spread to, and has established large populations in, the coastal waters of the USA, where it is not a native species. Explain how the shore crab has been able to establish large populations and why this is causing concern to ecologists in the USA.

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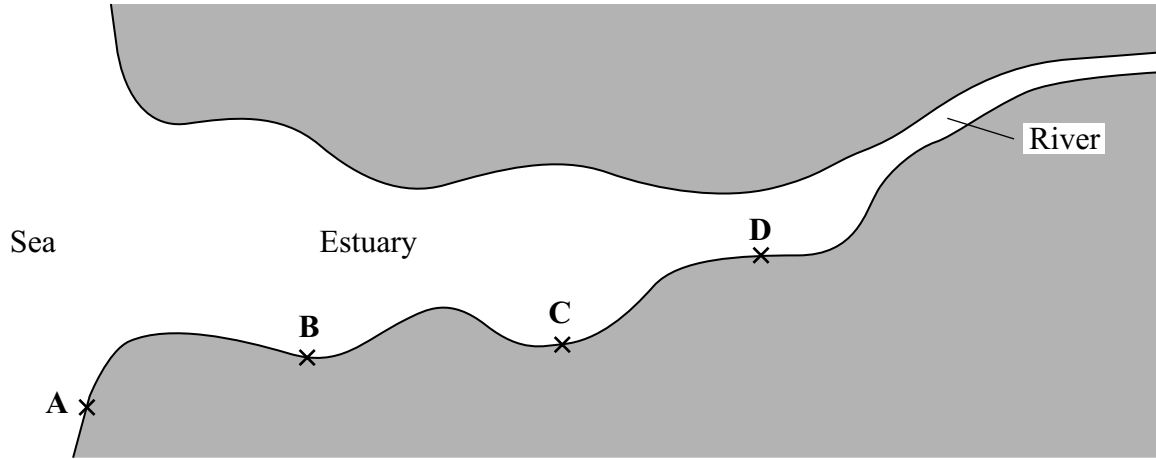
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(5 marks)

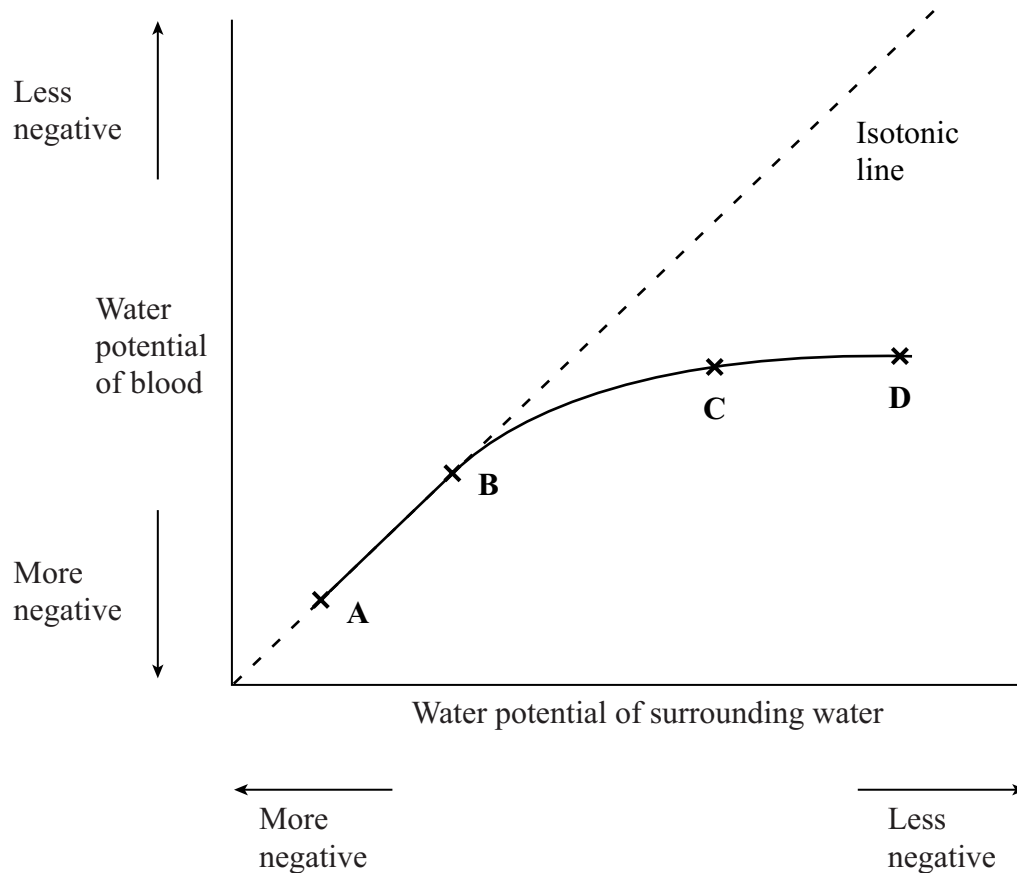
Question 8 continues on the next page

Turn over 

In Britain, crabs living in an estuary and along the neighbouring coast were studied. Crabs were collected from four different sites, **A** to **D**, as shown in the map.



The graph shows the mean water potential of the blood of samples of crabs from the four sites in relation to the water potential of the environment at the same sites. The isotonic line shows values at which the water potential of the blood and surrounding water would be the same.



(b) Describe the relationship between the mean water potential of the blood of the crabs and the water potential of the surrounding water.

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(1 mark)

S (c) Is there any net movement of water in or out of the blood of the crabs at sites A and B? Explain your answer.

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(1 mark)

S (d) Crabs living at sites C and D actively transport salts into their blood through their gills.

(i) Explain how this enables crabs to survive at these sites.

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(2 marks)

(ii) Crabs are unable to control their body temperature. In winter, when the water temperature falls, crab populations at sites C and D migrate towards the sea. Suggest the advantage of this behaviour.

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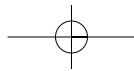
(3 marks)

12

END OF QUESTIONS

QWC

1



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