

Surname						Other Names					
Centre Number						Candidate Number					
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General Certificate of Education
June 2006
Advanced Level Examination



BIOLOGY (SPECIFICATION B)

BYB678/B

Unit 6 Section B Applying Biological Principles

Unit 7 Section B Applying Biological Principles

Unit 8 Section B Applying Biological Principles

Friday 23 June 2006 1.30 pm to 3.45 pm

For this paper you must have:

- Section A
- 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** questions.
- Answer the questions in **Section B** in the spaces provided.
- **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 B** is 50.
- The marks for questions are shown in brackets.
- You are reminded that all questions in this **Section B** are synoptic (indicated by the letter **S**). You must use your knowledge of different parts of the specification when answering this section.
- You are advised to spend 1 hour 15 minutes on **Section B**.
- Use accurate scientific terminology in all your answers.
- You are reminded of the need for good English and clear presentation in your answers. Question 4 should be answered in continuous prose. Quality of Written Communication will be assessed in your answer.

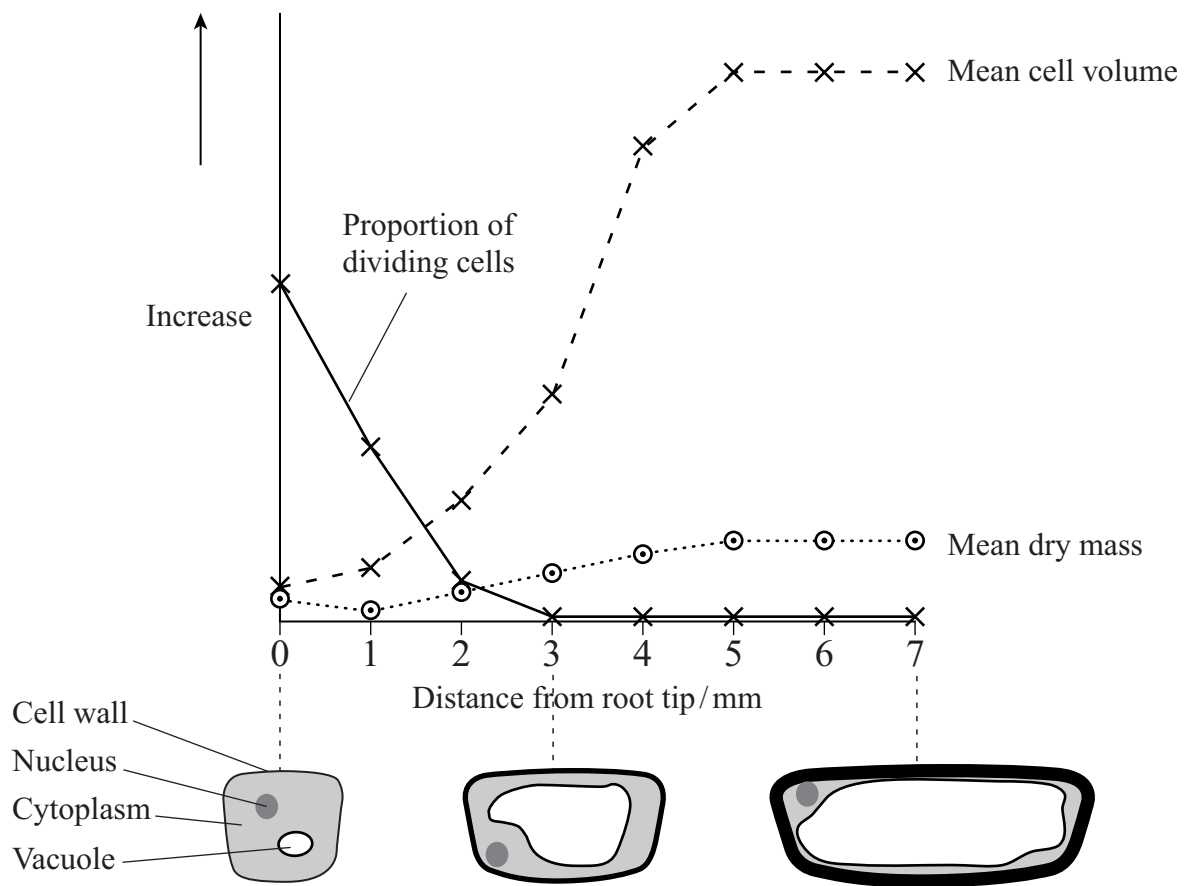
For Examiner's Use			
Number	Mark	Number	Mark
1			
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3			
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Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

SECTION B

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

- S 1** A large number of roots from many genetically identical bean plants were cut into short pieces. The pieces were sorted into groups, depending upon their distance from the root tip. Some pieces from each group were used to find the mean dry mass of their cells. Thin sections cut from other pieces were examined with a light microscope to find the proportion of dividing cells and the mean volume of the cells.

The graph shows the results. The diagrams below the graph show the appearance of cells in light microscope sections at different distances from the root tip.



(a) Suggest **two** variables, other than genotype, which need to be controlled to ensure similar root growth in different plants. In each case give the reason for your answer.

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(2 marks)

(b) Describe how you would find the dry mass of a sample of pieces of root.

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(2 marks)

(c) Suggest how the proportion of dividing cells in a thin section could be determined.

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(2 marks)

Question 1 continues on the next page

Turn over 

(d) Explain the change in the proportion of dividing cells with increasing distance from the root tip.

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(2 marks)

(e) Using the graph and diagrams, suggest how a root tip gets longer.

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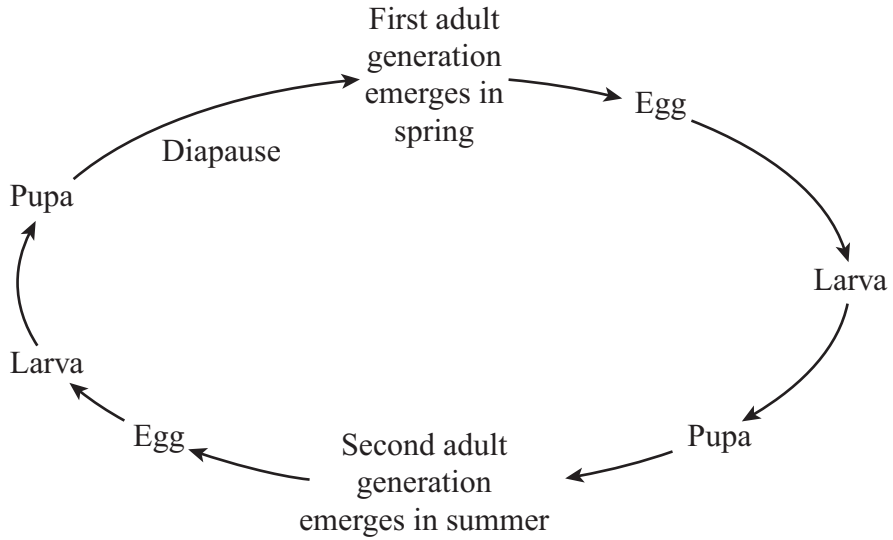
(3 marks)

Turn over for the next question

Turn over 

S 2 **Figure 1** shows the life cycle of a species of insect. Adults lay eggs which hatch into larvae. Larvae feed and grow and eventually turn into pupae. During the pupal stage, no feeding takes place and the adult body is formed. The adults and larvae feed on plants.

Figure 1



(a) Pupae that develop in late summer enter diapause, a state in which the rate of metabolism is very greatly reduced. Adults do not emerge from these pupae until the following spring. This is an adaptation to changes in food availability and abiotic conditions. Explain how a slower metabolic rate is of benefit to the insect.

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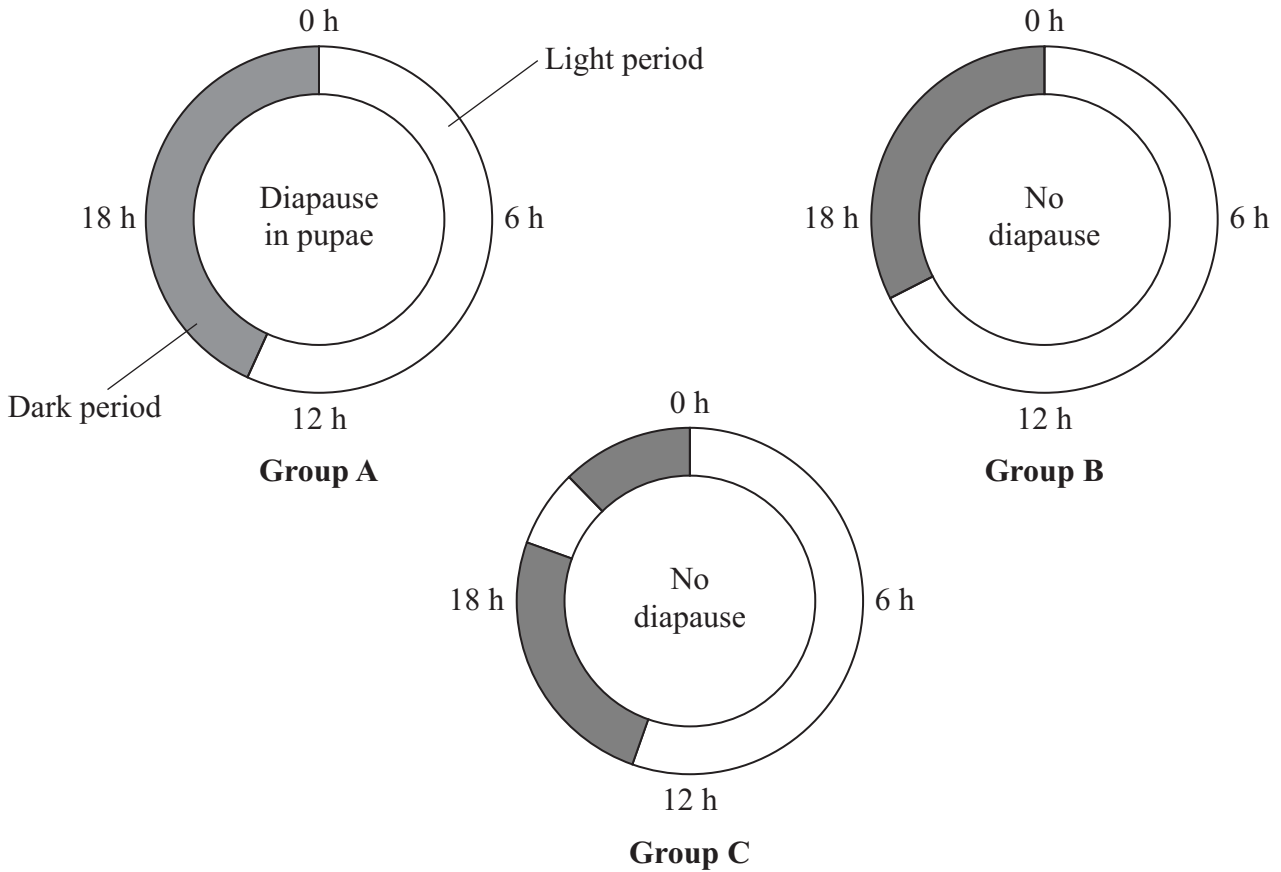
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(3 marks)

- (b) The factors which bring about diapause were investigated. Three groups of larvae, **A**, **B** and **C**, were exposed to different patterns of light and dark periods during each 24 hours for several days. It was noted whether or not diapause developed in the pupae that formed later. **Figure 2** shows the results.

Figure 2



Is it the length of the light period or the length of the dark period that affects whether diapause develops? Give evidence from **Figure 2** to support your answer.

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(3 marks)

S 3 Clover plants have leaves all through the year. Some clover plants have leaves that produce poisonous hydrogen cyanide gas when damaged. These cyanogenic plants are less likely to be eaten by snails. However, the leaves of these plants can be damaged by frost, resulting in the production of enough hydrogen cyanide to kill the plants. Acyanogenic plants do not produce hydrogen cyanide. This characteristic is genetically controlled.

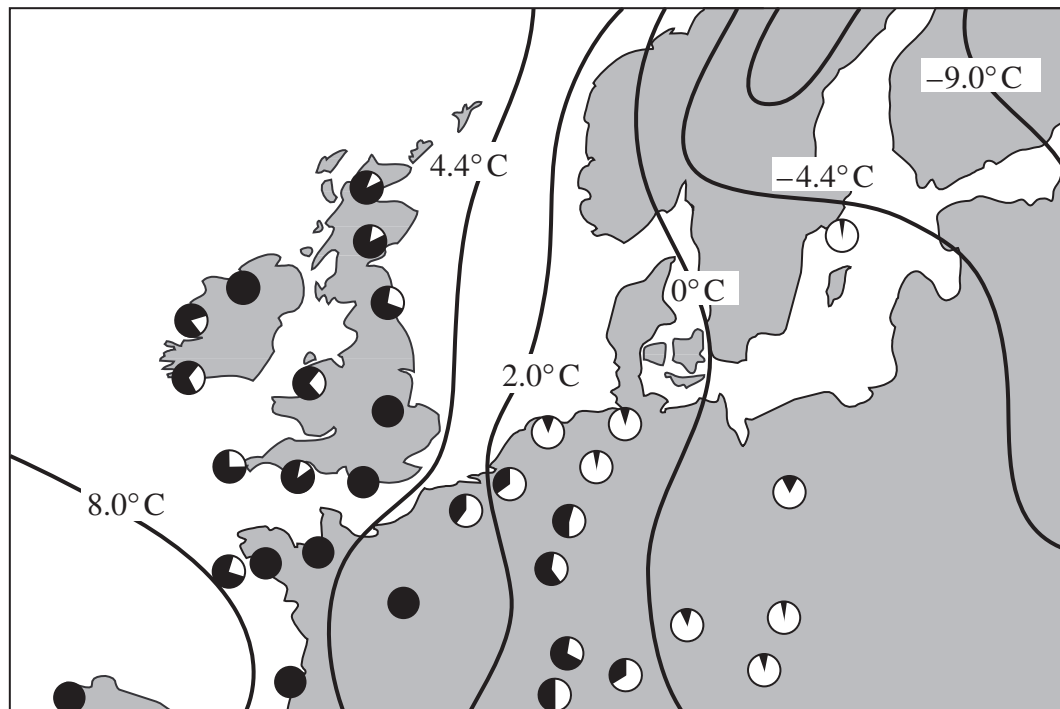
The map shows the proportions of the two types of plant in populations of clover from different areas in Europe. It also shows isotherms, lines joining places with the same mean January temperature.

Key

Black area represents
proportion of plants
able to produce
cyanide (cyanogenic)



White area represents
proportion of plants
not able to produce
cyanide (acyanogenic)



(a) Explain how different proportions of cyanogenic plants may have evolved in populations in different parts of Europe.

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(4 marks)

(b) Differences in cyanide production may affect the total number of clover plants growing in different areas. Describe how you would use quadrats in an investigation to determine whether or not there is a difference in the number of clover plants in two large areas of equal size.

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(4 marks)

8

Turn over 

S 4 Write an essay on **one** of the topics below.

EITHER

- (a) The transfer of substances containing carbon between organisms and between organisms and the environment (25 marks)

OR

- (b) Cells are easy to distinguish by their shape. How are the shapes of cells related to their function? (25 marks)

In the answer to this question you should select and use relevant principles and concepts from different parts of the specification.

Your essay will be marked not only for its scientific accuracy, but also for the selection of relevant material.

Write your essay in continuous prose.

The maximum number of marks that can be awarded is:

<i>Scientific content</i>	<i>16</i>
<i>Breadth of knowledge</i>	<i>3</i>
<i>Relevance</i>	<i>3</i>
<i>Quality of Written Communication</i>	<i>3</i>

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