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General Certificate of Education
June 2005
Advanced Level Examination



BIOLOGY (SPECIFICATION B)
Unit 6 Section A Applied Ecology

BYB6/A

Friday 24 June 2005 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 different parts of the specification 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			
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SECTION A

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

1 (a) Explain **two** ways in which crude oil spillages may kill aquatic organisms.

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(2 marks)

(b) Prawns are aquatic animals. The table shows the lethal concentrations of three types of oil spillage that can kill prawns.

Type of spillage	Lethal concentration/arbitrary units
Libyan crude oil	120
North Sea crude oil	70
Petrol	15

(i) Which type of spillage has the most severe effects? Use evidence from the table to explain your answer.

Type

Explanation

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(1 mark)

(ii) The lethal concentration is the concentration that kills 50 % of a population. Suggest why the concentration that kills 50 % is used as a measure of toxicity, rather than the concentration that kills 100 %.

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(2 marks)

2 (a) Give **two** aims of biological conservation.

1

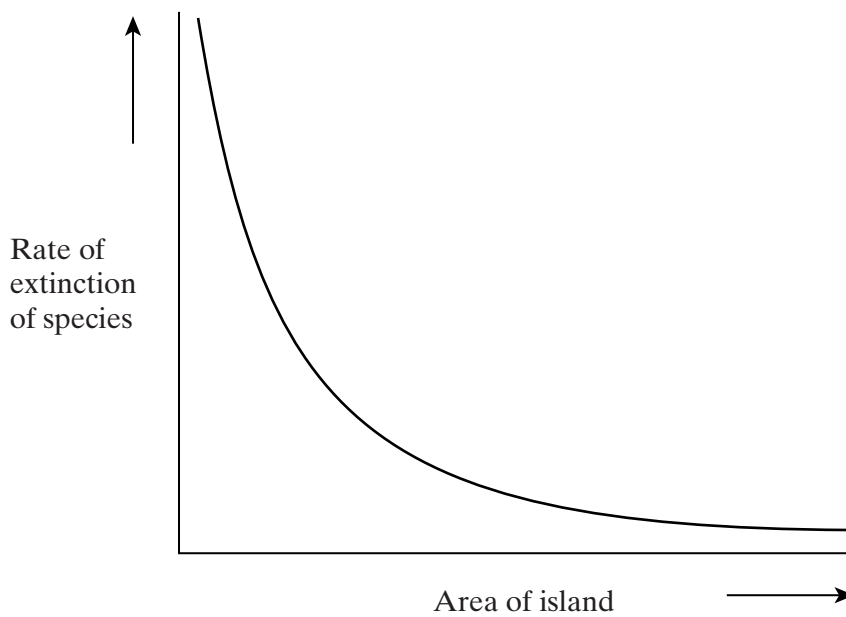
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2

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(2 marks)

(b) The graph shows the rate of extinction of species of birds on islands of different size.



(i) Describe the relationship between the rate of extinction of species and the areas of the islands.

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(2 marks)

(ii) Suggest **one** cause of this relationship.

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(1 mark)

Turn over

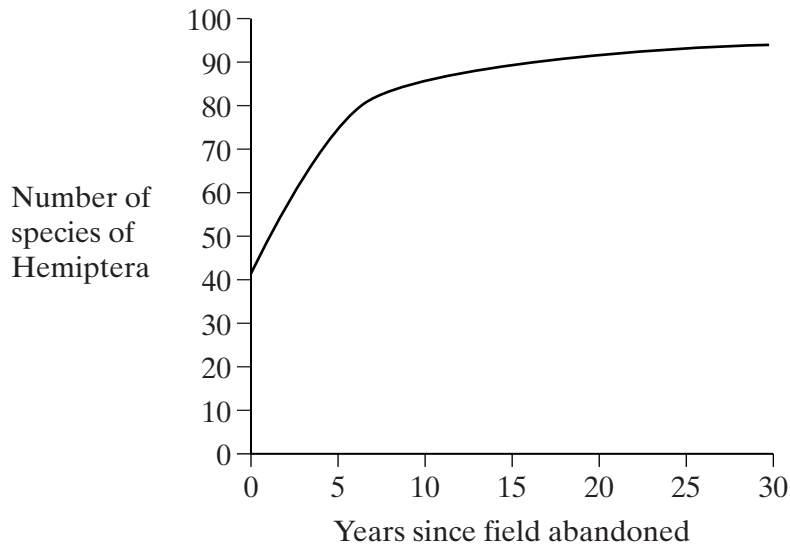
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3 S (a) What is meant by a community?

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(2 marks)

(b) A farmer stopped using a field for growing crops. Scientists studied succession in the field over the next 30 years. The graph shows the number of species of Hemiptera (an order of insects) present during that period.



Explain the increase in the number of species of Hemiptera.

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(3 marks)

(c) To calculate a diversity index at a given time, it is necessary to know the number of insects in each population. Name **one** method that could be used to estimate the total number of insects in a population.

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(1 mark)

Turn over ►

4 (a) Give **two** sea-fishing regulations and explain how each helps to maintain fish stocks.

Regulation 1

Explanation

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Regulation 2

Explanation

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(2 marks)

(b) Give **one** reason why farming salmon is more economical than catching wild salmon.

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(1 mark)

S (c) Fishermen often catch fish which are hybrids between farmed and wild salmon. Explain how you could investigate whether the hybrids were produced by crosses between different strains of the same species, or crosses between different species.

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(2 marks)

S (d) A disease of farmed fish caused by a virus has been a problem for many years. The same disease has recently appeared for the first time in wild fish. Samples of virus were obtained from farmed and wild fish. The sequence of bases in the DNA of each sample of virus was determined. 99.4% of their sequences were found to be the same.

(i) What conclusions can be drawn from this result? Explain your answer.

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(2 marks)

(ii) What caused the differences in the base sequence of the DNA in the viruses?

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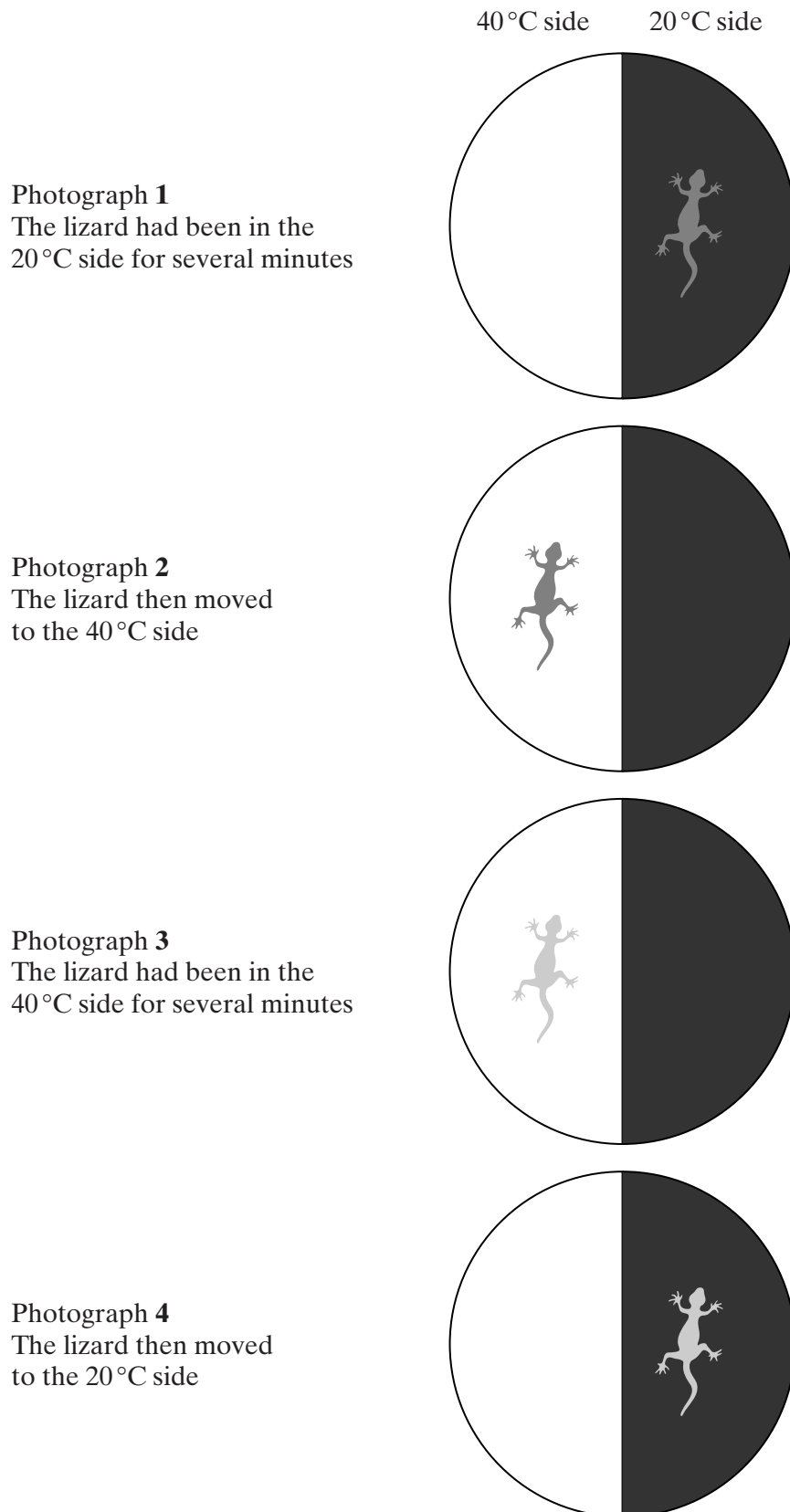
(1 mark)

8

TURN OVER FOR THE NEXT QUESTION

Turn over ►

- 5 The body temperature of desert-living lizards is greatly affected by the temperature of their environment. A lizard was placed in a chamber where one half was maintained at 20°C and the other at 40°C. The lizard was free to move from one half to the other. The lizard's behaviour was observed using an infra-red camera, which records 20°C surfaces as black and 40°C surfaces as white. Temperatures between 20°C and 40°C appear as shades of grey. A series of photographs was taken.



- (a) The position and appearance of the lizard, as recorded by the infra-red camera, changed during the experiment. Describe and explain these changes.

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(3 marks)

- (b) Suggest the advantage to the lizard of the behaviour shown.

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(2 marks)

- S** (c) The lizard responds to the stimulus of a change in its body temperature. Describe how the nervous system brings about this response.

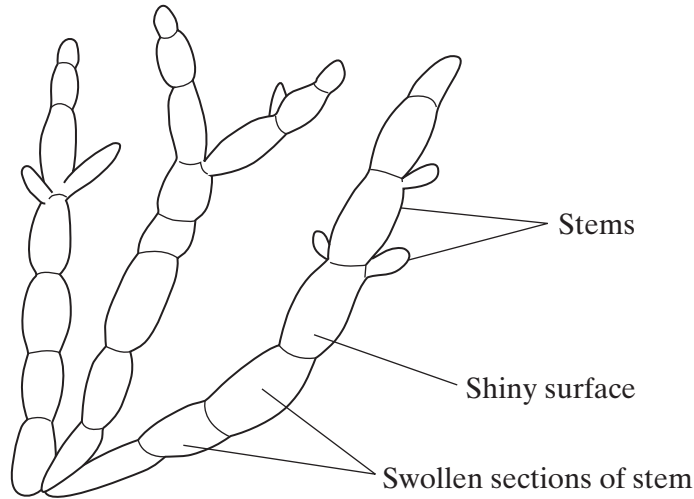
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(3 marks)

8

Turn over ▶

- 6 (a) Glasswort is a plant that grows in salt marshes. The plants are covered by seawater at each high tide. The roots grow in mud which contains a high concentration of salt. The drawing shows a shoot of the plant.



Explain how **two** features of the structure of the shoot help the plant to survive in conditions where it is difficult to take up water.

Feature 1

Explanation

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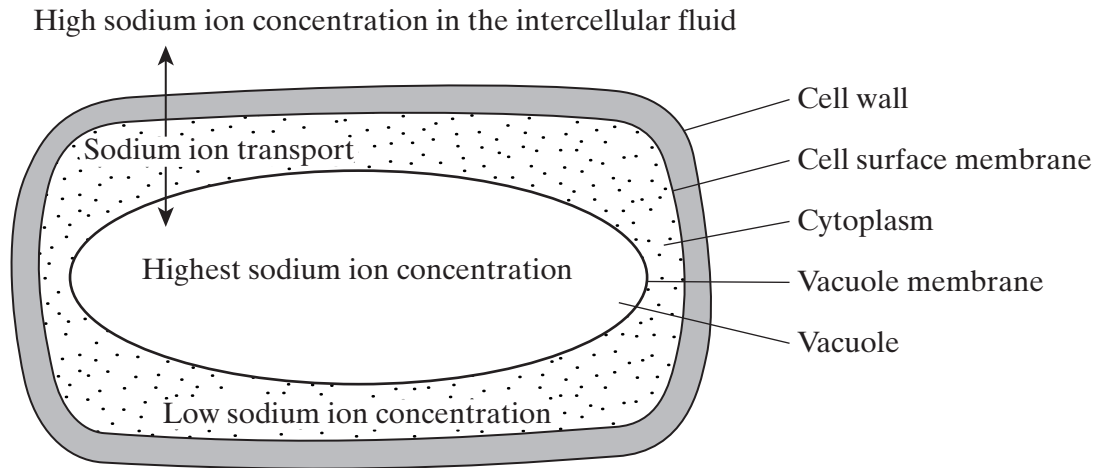
Feature 2

Explanation

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(2 marks)

In glasswort cells, sodium ions are transported from the cytoplasm outwards across the cell surface membrane and also into the cell vacuole. The concentration of sodium ions is greater inside the vacuole than in the intercellular fluid, which is the fluid between the cells in tissues. High sodium ion concentrations would disrupt metabolic processes in the cytoplasm. This information is summarised in the diagram below.



S (b) The total concentration of all ions in the cytoplasm is higher than in the intercellular fluid. Explain how this allows the cell to take up water.

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(2 marks)

S (c) (i) Explain how sodium ions are transported through the membranes.

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(2 marks)

(ii) There is a higher concentration gradient between the cytoplasm and the vacuole than between the cytoplasm and the intercellular fluid. Suggest how the vacuole membrane maintains this higher concentration gradient.

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(2 marks)

Turn over ▶

- 7 (a) Explain **one** advantage of using a combination of chemical and biological approaches to pest control.

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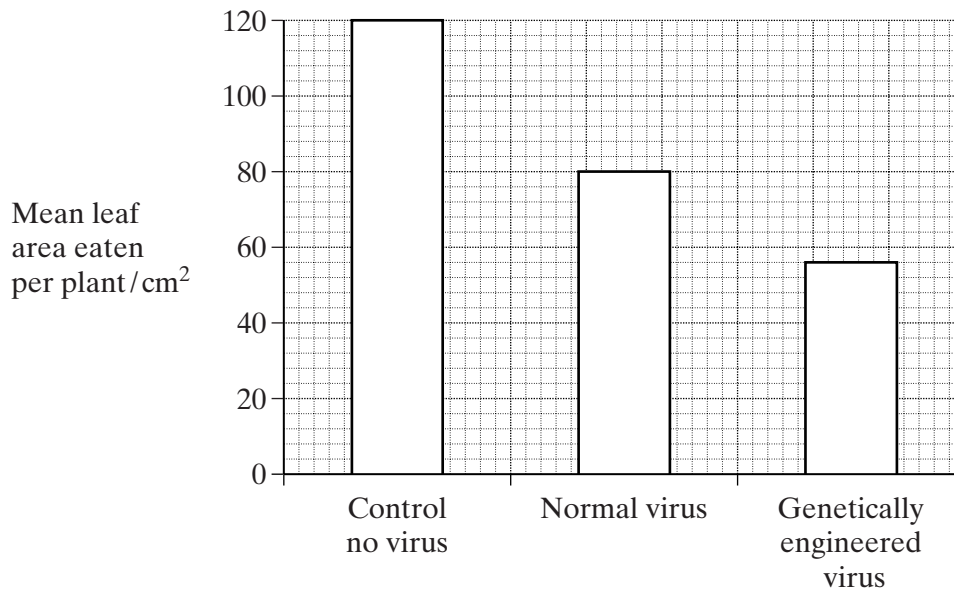
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(2 marks)

- (b) Caterpillars damage crop plants by eating the leaves. There is a virus which kills caterpillars within a few days of infecting them. A genetically engineered form of the virus has been produced which contains a gene from a scorpion. This gene codes for production of a toxin specific to insects.

In an investigation, sample areas of crop were treated with either the normal or the genetically engineered virus. The bar chart shows the damage caused by caterpillars to the leaves of the crop plants.



- (i) How much more effective is the genetically engineered virus than the normal virus? Show your working.

Answer

(2 marks)

(ii) Explain why the area of leaf eaten is less when caterpillars are infected with the genetically engineered virus rather than with the normal virus.

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(2 marks)

S (iii) Explain how the gene for the toxin could have been obtained and inserted into the DNA of the virus.

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(4 marks)

10

END OF SECTION A

SECTION B IS PROVIDED AS AN INSERT

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