

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

General Certificate of Education  
 January 2006  
 Advanced Subsidiary Examination

**ENVIRONMENTAL SCIENCE**  
**Unit 3 The Biosphere**

**ESC3**



Tuesday 17 January 2006 9.00 am to 10.00 am

**You will need no other materials.**  
 You may use a calculator.

Time allowed: 1 hour

**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 the spaces provided.
- Do all rough work in this book. Cross through any work you do not want marked.

**Information**

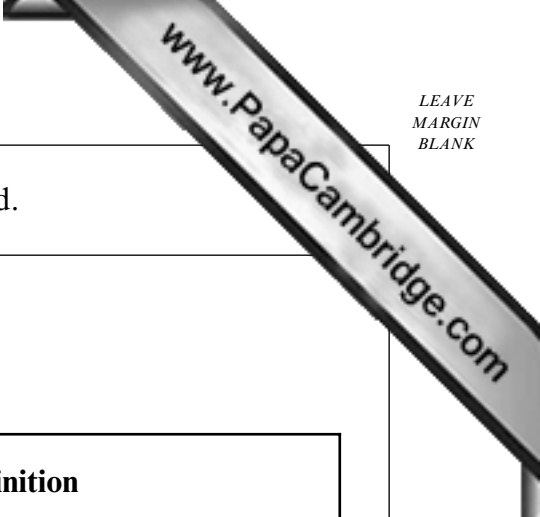
- The maximum mark for this paper is 60.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English, clear presentation and appropriate use of specialist vocabulary. Question 6 should be answered in continuous prose. Quality of Written Communication will be assessed in this answer.

For Examiner's Use			
Number	Mark	Number	Mark
1		5	
2		6	
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Total (Column 1) →			
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Answer **all** questions in the spaces provided.

1 (a) Complete the table.

Term	Definition
	A large area dominated by a major vegetation type associated with a specific climate and/or soil
Population	
	A community of organisms interacting with its abiotic environment

(3 marks)

(b) What is the difference between habitat and niche?

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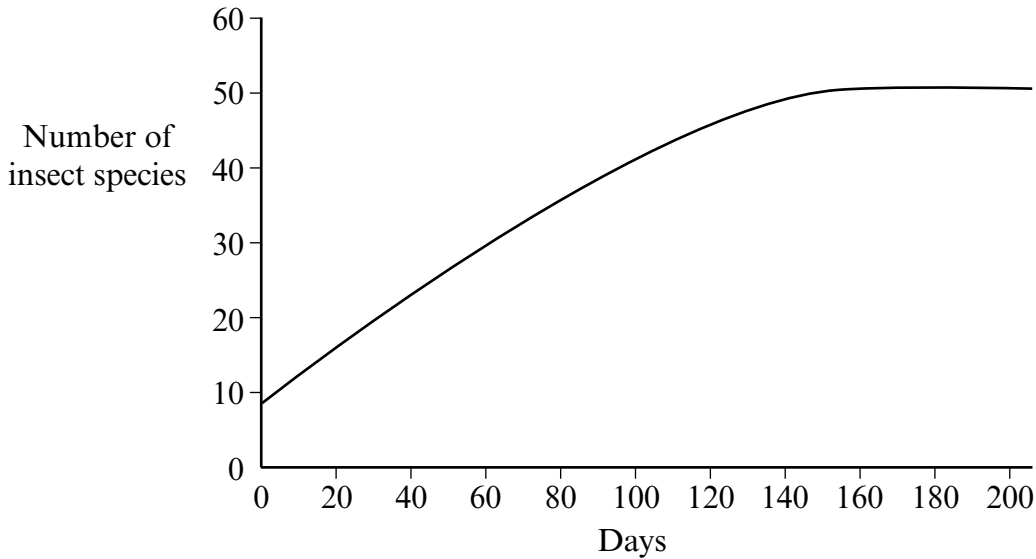
(2 marks)

5

**Turn over for the next question**

2 In an experiment, an area of grassland, grazed by sheep for hundreds of years, cleared of sheep. After this clearance, the number of insect species found in the area was estimated every 20 days.

The graph shows the number of insect species present in the area over a period of 200 days.



(a) Describe the trends in the number of insect species shown in the graph.

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(2 marks)

(b) Suggest a reason for the trend in the number of insect species:

(i) up to 140 days; .....

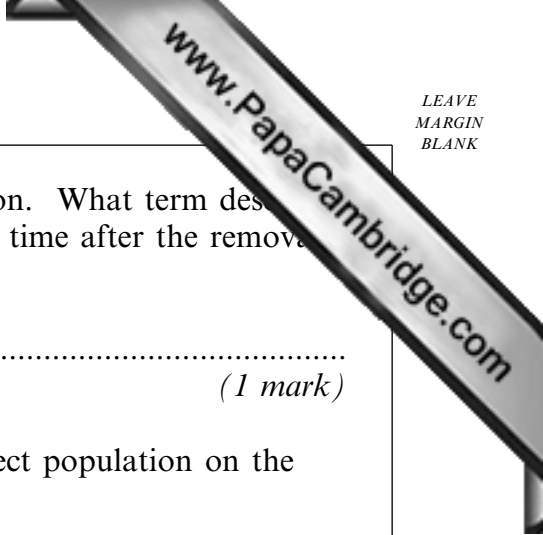
.....

(1 mark)

(ii) from day 140. ....

.....

(1 mark)



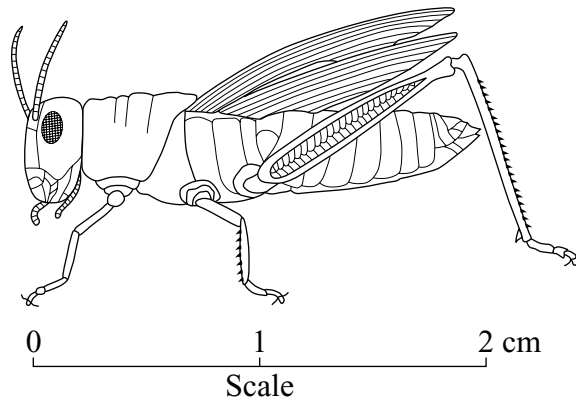
- (c) Grazed grassland is an example of a deflected succession. What term describes the changes in community structure that occurred with time after the removal of the sheep?

.....  
(1 mark)

- (d) (i) Suggest a suitable apparatus for sampling the insect population on the ground.

.....  
(1 mark)

- (ii) One of the insect species found on chalk grassland is the meadow grasshopper.

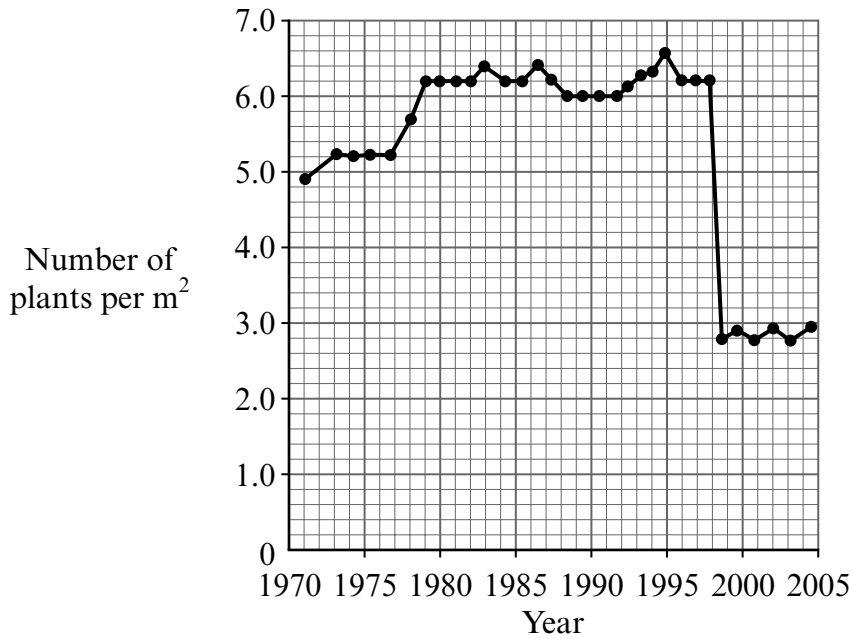


Suggest how the population size of this insect species could be estimated.

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(4 marks)

3 The graph shows the population density of cowslip plants in a meadow over a 35 year period. The area of the meadow is 5000 m<sup>2</sup>.



(a) Giving full practical details, describe how the population density of cowslips would have been estimated.

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(4 marks)



- (b) The total cowslip population of the meadow in 1990 was 30 000 plants.
  - (i) Use the graph to estimate the total cowslip population in 2005.  
Show your working.

Answer .....  
(1 mark)

- (ii) Explain how a **named** abiotic factor could account for the difference between the population of 1990 and that of 2005.

Abiotic factor .....

Explanation .....

.....

.....  
(2 marks)

- (c) Explain the meaning of carrying capacity.

.....

.....  
(1 mark)

- (d) Explain the need to conserve habitats, such as meadows for:

- (i) an ethical reason;

.....

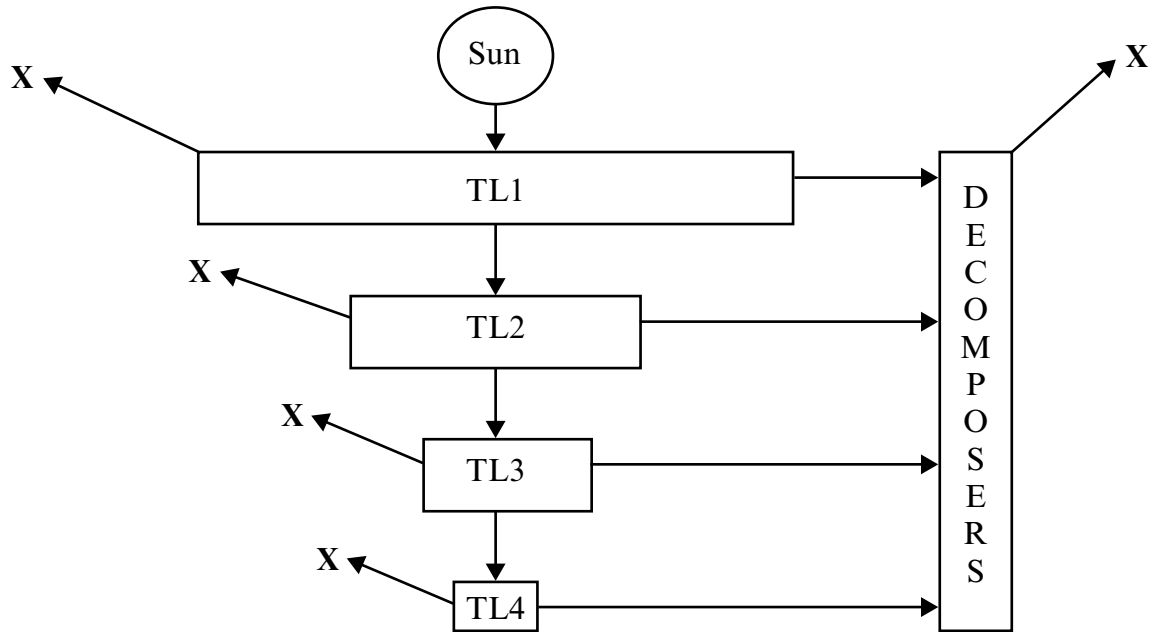
.....  
(1 mark)

- (ii) an aesthetic reason.

.....

.....  
(1 mark)

4 The diagram shows energy flow between trophic levels (TL).



Source: Curriculum Press

(a) (i) What process is indicated by X in the diagram?

.....  
(1 mark)

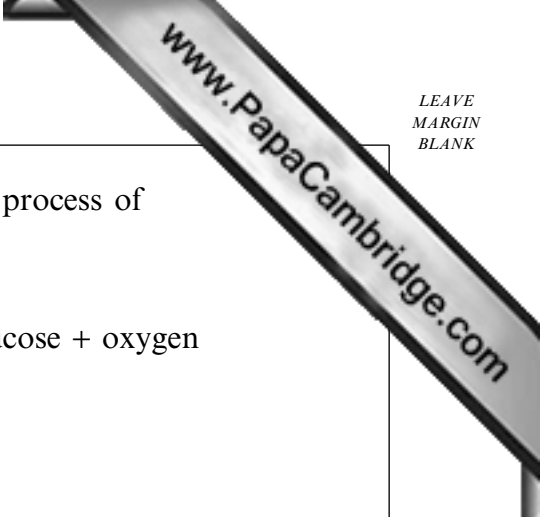
(ii) What type of organism would be present at trophic level 1 (TL1)?

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(1 mark)

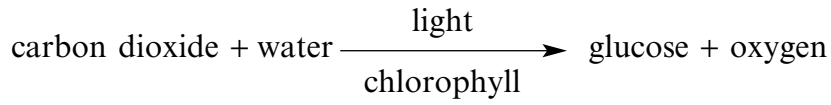
(iii) Explain why the amount of energy decreases at each trophic level.

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(3 marks)





- (b) The diagram shows a simplified word equation for the process of photosynthesis.



Outline the role of light in photosynthesis.

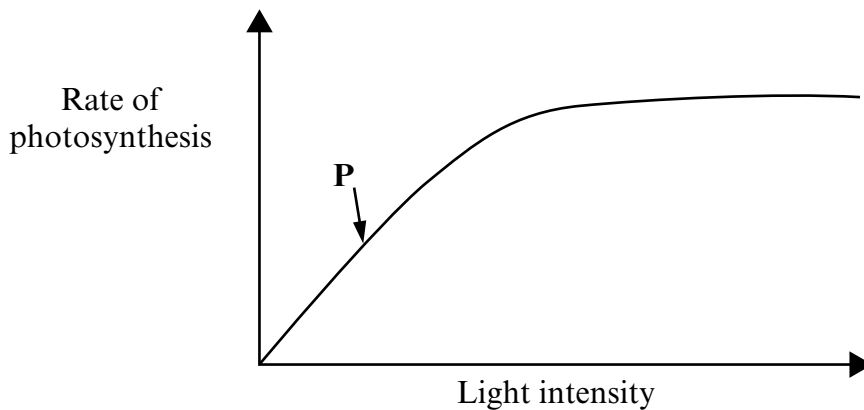
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(2 marks)

- (c) The diagram shows the effect of increasing light intensity on the rate of photosynthesis of a lettuce crop grown in a glasshouse at 15 °C and at 0.04 % carbon dioxide concentration.



- (i) What is the factor limiting the rate of photosynthesis at point P?

.....

(1 mark)

- (ii) Suggest **two** ways, other than increasing light intensity, in which the farmer might increase the growth of this crop.

1. ....

.....

2. ....

.....

(2 marks)

5 Concern that the rate of extinction of species is increasing has prompted politicians from many countries to sign conventions in an attempt to conserve biodiversity and to maintain the gene pool.

(a) Explain the meaning of the terms:

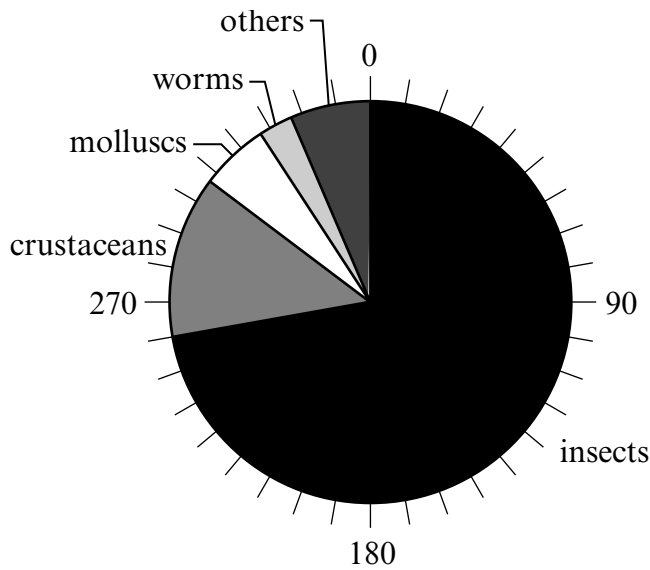
(i) *biodiversity*;

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(1 mark)

(ii) *gene pool*.

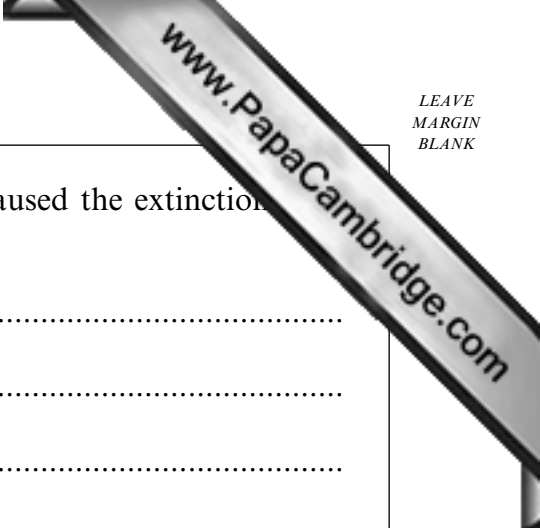
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(1 mark)

(b) The graph shows the number of species of invertebrates (animals without backbones) known at the present time.  
The total number of known invertebrate species is 1 080 000.



(i) Use the graph to calculate the number of known species of insects.  
Show your working.

Answer ..... species  
(1 mark)



(ii) Suggest **three** ways by which humans may have caused the extinction of some invertebrate species.

- 1. ....  
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- 2. ....  
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- 3. ....  
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(3 marks)

(iii) Explain how the extinction of some invertebrate species may have led to the extinction of other species of animal.

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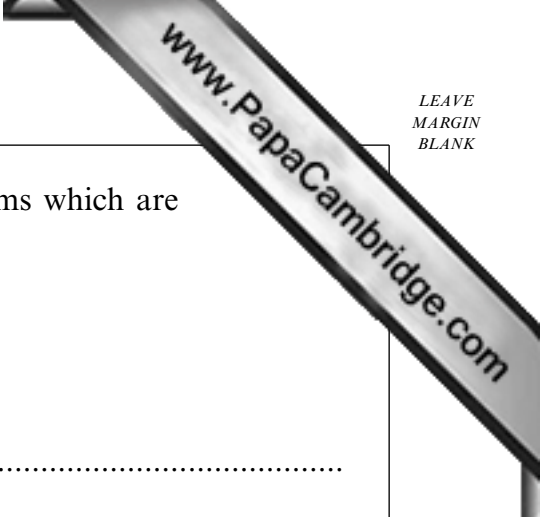
(2 marks)

(c) Describe how **one named** example of an international convention has been used to help conserve species.

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(2 marks)

Turn over for the next question



6 (a) A community contains many different types of organisms which are interdependent.

Suggest ways in which:

(i) animals depend on green plants;

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(2 marks)

(ii) green plants depend on animals;

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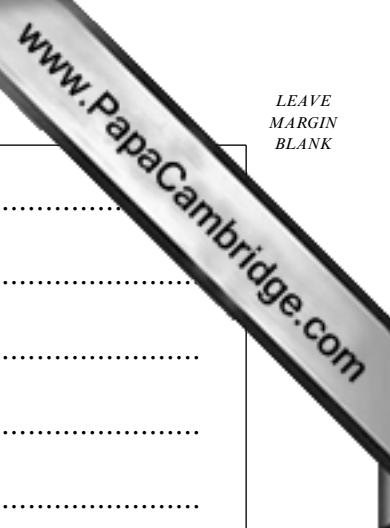
(2 marks)

(iii) all living organisms depend on decomposers.

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(2 marks)





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*(9 marks)*

15

**END OF QUESTIONS**

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