

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

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General Certificate of Education
 January 2003
 Advanced Subsidiary Examination



ENVIRONMENTAL SCIENCE
Unit 3 The Biosphere

ESC3

Wednesday 15 January 1.30 pm to 3.00 pm

No additional materials are required.
 You may use a calculator.

Time allowed: 1 hour 30 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 the spaces provided. All working must be shown.
- Do all rough work in this book. Cross through any work you do not want marked.

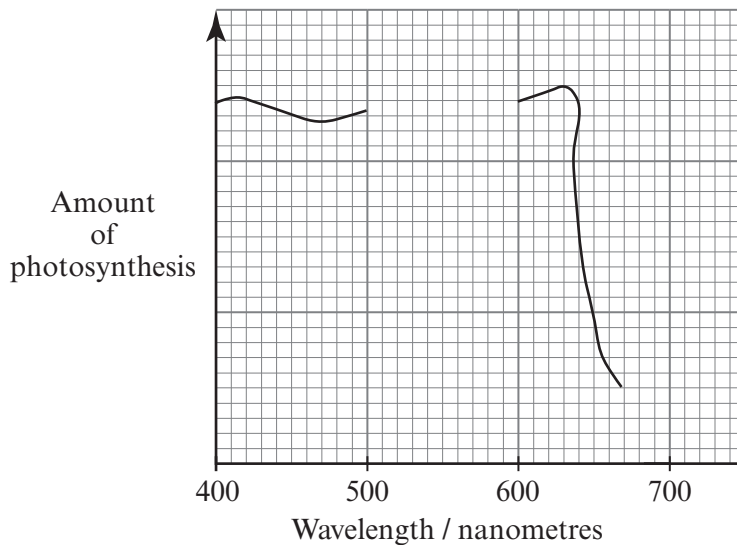
Information

- The maximum mark for this paper is 70.
- Mark allocations are shown in brackets.
- You will be assessed on 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 degree of legibility of your handwriting and the level of accuracy of your spelling, punctuation and grammar will also be taken into account.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
6			
7			
8			
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

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

1 The graph shows a partly completed action spectrum for photosynthesis in green plants.



(a) Complete the line on the graph to show the approximate amount of photosynthesis between 500 and 600 nanometres (green light). (1 mark)

(b) Explain how increasing the temperature may affect the rate of photosynthesis.

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(2 marks)

(c) Suggest how the evolution of green plants may have led to a reduction in the amount of solar radiation reaching the Earth's surface.

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(3 marks)

- 2 Although extinction is a natural process, its rate has been increased by human activities. The graph shows the number of bird and mammal species that became extinct in 50-year periods since 1600.

□
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The graph is not reproduced here due to third-party copyright constraints.□
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The full copy of this paper can be obtained by ordering ESC3□
from AQA Publications□
Tel: 0161 953 1170□

- (a) Describe **two** trends in extinction rates since 1700.

1.
.....
2.
.....

(2 marks)

QUESTION 2 CONTINUES ON THE NEXT PAGE

Turn over ►

(b) Suggest **two** ways in which human activity may have led to the extinction of mammal species.

1.

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2.

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(2 marks)

(c) Suggest **one** reason why data on extinction rates may not be accurate.

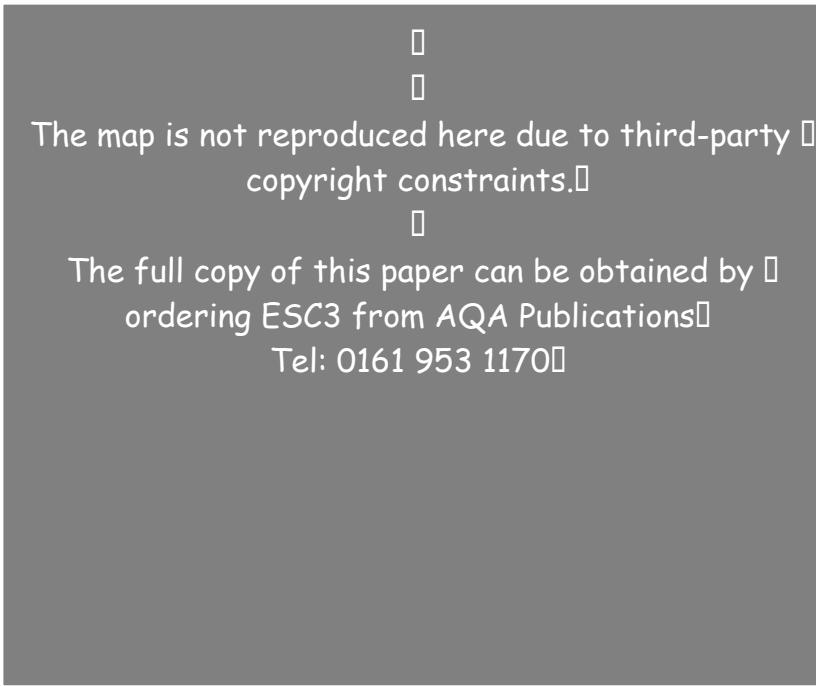
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(1 mark)



3 The map shows changes in the area of lowland heath in Dorset.



(a) (i) Describe **two** changes in lowland heath distribution in Dorset since 1759.

- 1.
- 2.

(2 marks)

(ii) Suggest **one** reason to explain the change.

-
-

(1 mark)

(b) Outline the impact of these changes on native heathland animal species.

-
-
-
-

(2 marks)

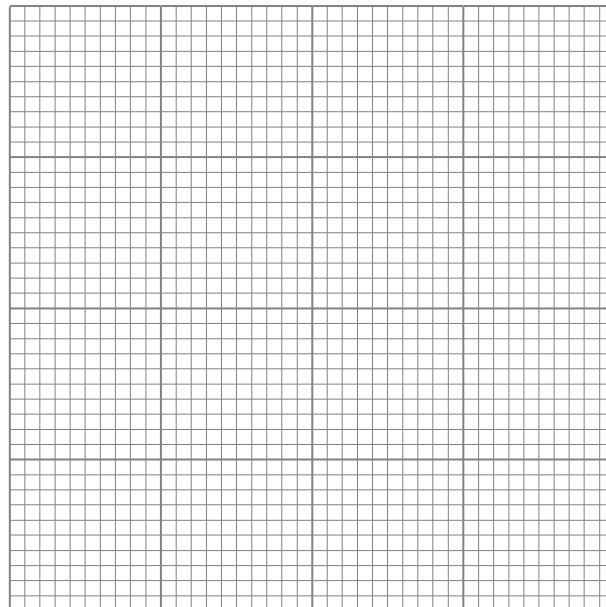
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4 Sand dunes of different ages have different soil characteristics.

- (a) The table shows the percentage of organic matter present in the soils of dunes of different ages.

Age of dune/years	Organic matter/%
100	5
150	7
200	9
250	12
300	12

- (i) Using the information in the table, plot the information in the table on a graph using the grid.



(2 marks)

- (ii) Explain how biotic factors lead to the differences in organic matter content between the young and the old dunes.

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(2 marks)

(b) Deflected succession has occurred on the 300-year-old dune.

(i) State what is meant by deflected succession.

.....
.....
(1 mark)

(ii) Suggest a cause of deflected succession of a sand dune.

.....
.....
(1 mark)

(c) State the process that would occur if the cause of deflected succession was removed.

.....
(1 mark)

5 One of the problems of heterotrophic nutrition is the difficulty in digesting cellulose.

For a named organism, explain how cellulose digestion is achieved.

Organism
(1 mark)

Explanation
.....
.....
.....
(2 marks)

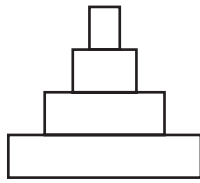
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3

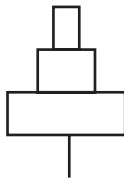
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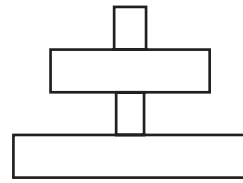
6 The trophic levels of ecosystems can be represented as pyramids of numbers.



A



B



C

(a) Suggest which pyramid of numbers represents a food chain in an oak woodland and explain your choice.

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(2 marks)

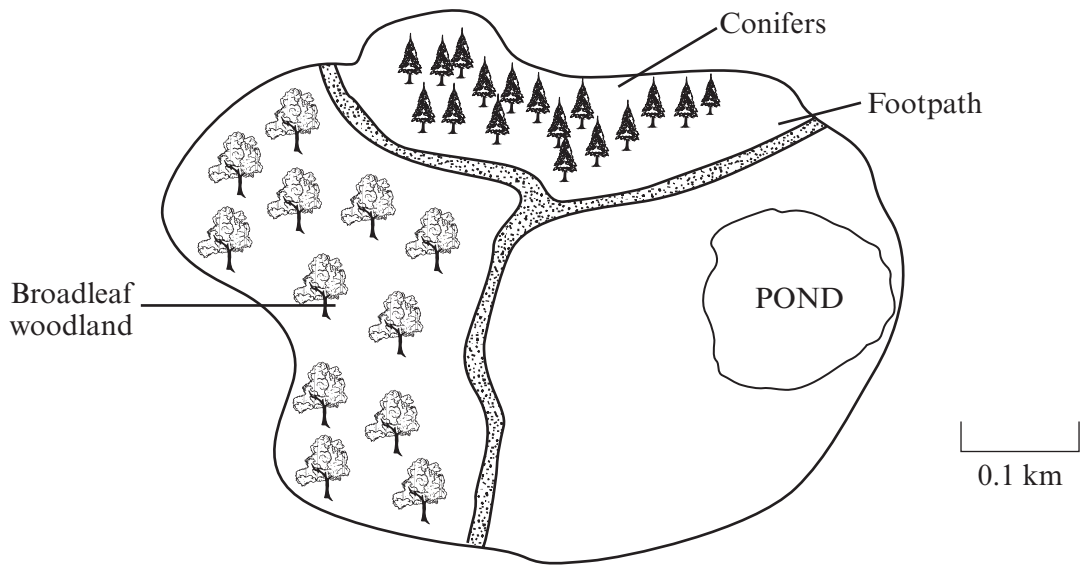
(b) Suggest a pyramid of numbers which includes a parasitic relationship and explain your choice.

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

4

7 A large supermarket chain wishes to develop the area shown to build a new superstore. Some local residents are trying to prevent the development.



(a) One resident suggests contacting an environmental pressure group to help with their appeal against the development.

(i) Give **two** functions of a pressure group.

- 1.
 -
 - 2.
 -
- (2 marks)*

(ii) Name a suitable pressure group to help with this appeal.

-
 -
- (1 mark)*

QUESTION SEVEN CONTINUES ON THE NEXT PAGE

Turn over ►

(b) A representative from the pressure group thinks that the site can be protected because it is the habitat of an endangered species of beetle. The pressure group decides to use the mark – release – recapture method to estimate the beetle population.

(i) Describe how this method could be used to estimate population size.

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(6 marks)

(ii) Give **two** limitations of this technique.

1.
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2.
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(2 marks)

(c) The data collected about the rare beetle led to the site being declared an SSSI.

(i) What does SSSI stand for?

.....

(1 mark)

(ii) Who designates a site as a SSSI?

.....

(1 mark)

(iii) State **one** way in which a SSSI designation protects a site.

.....

(1 mark)

- (iv) Suggest **one** other designation that could be applied to protect this site.

.....
(1 mark)

- (d) The table shows data gathered on plant species (excluding grasses) in the area under threat and another local site. Common names for plant species are used.

Species	Endangered area	Other local site
Rosebay willow herb	10	6
Dandelion	9	10
Plantain	7	1
Daisy	21	5
Spotted orchid	6	0
Red campion	8	0
Diversity Index	7.23	

- (i) State **one** method that may have been used to gather the data.

.....
(1 mark)

- (ii) Suggest **one** reason why grasses were excluded from the survey.

.....
(1 mark)

- (iii) Use the data in the table and the equation below to calculate the index of diversity for the other local site. Show your working.

$$D = \frac{N(N-1)}{\sum n(n-1)}$$

Where **N** = total number of all organisms of all species

n = total number of organisms of a particular species

Σ = sum of

Answer
(3 marks)

Turn over ►

8

If it was not for hungry whales, say the whalers, there would be far more fish in the sea for humans to catch and eat, so whales should be culled.
Not at all, say marine scientists, the food web in the oceans is much more complex than that and it is highly unlikely that deliberately reducing the numbers of whales would lead to larger fish catches. It could even have the reverse effect.

Source: K. MULVANEY, www.panda.org/resources/publications/water/food-web/cull.html

(a) Commercial whaling has been restricted because of an agreement between whaling nations in 1986.

(i) Suggest **one** reason for the restriction.

.....
(1 mark)

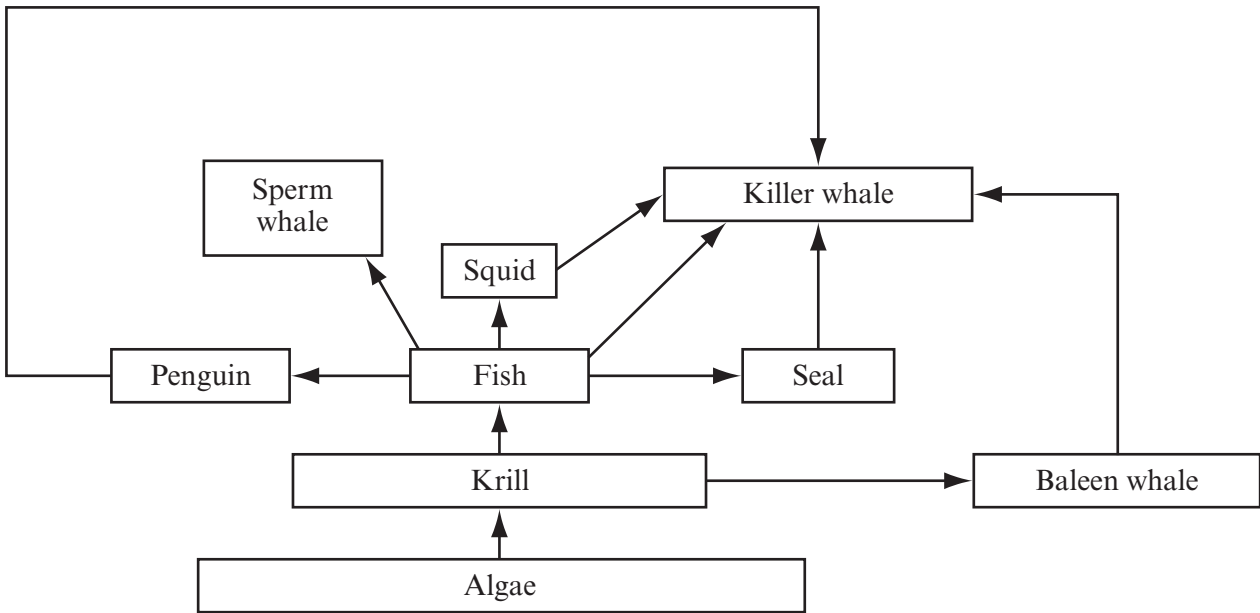
(ii) Name the organisation which governs the 1986 restriction.

.....
(1 mark)

(iii) Suggest **one** reason why the 1986 restriction has been difficult to enforce.

.....
.....
(1 mark)

(b) The diagram shows a simplified food web for the southern ocean.



Study the food web and suggest why reducing the numbers of whales may not lead to larger fish catches.

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(2 marks)

(c) Seed banks may be used to conserve plant species. Give **two** disadvantages of using seed banks.

1.

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2.

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(2 marks)

QUESTION 8 CONTINUES ON THE NEXT PAGE

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