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For Examiner's Use

General Certificate of Education
 January 2009
 Advanced Subsidiary Examination



ENVIRONMENTAL SCIENCE
Unit 3 The Biosphere

ESC3

Wednesday 14 January 2009 9.00 am to 10.00 am

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

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

Time allowed: 1 hour

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be 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.



J A N 0 9 E S C 3 0 1

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

- 1** The table shows some important designations for the conservation of wildlife.

Complete the table.

Designation	Reason for designation
	Important habitat designated under the EU Habitats Directive
Site of Special Scientific Interest (SSSI)	
	Wetland of international importance
Special Protection Area (SPA)	
	Area of national importance designated as being representative of flora, fauna, habitat and topography found in the UK

(5 marks)

5

Turn over for the next question

Turn over ►



2 In the Peak District National Park, areas have been planted with conifers alongside native, mixed, broad-leaved woodland.

The table shows the Diversity Index for the two woodland communities.

	Woodland A	Woodland B
Diversity Index	0.22	2.87

2 (a) Define the term *community*.

.....

 (1 mark)

2 (b) State **two** features of the community which have to be measured in order to calculate an index of diversity, such as Simpson's Index.

1

 2

 (2 marks)

2 (c) Explain which of the two woodlands (**A** or **B**) is likely to be the conifer plantation.

Woodland

Reason

.....
 (2 marks)



2 (d) Woodlands are the main climax communities over much of the UK.

2 (d) (i) Explain the term *climax community*.

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

2 (d) (ii) Give **two** reasons why succession does not always result in woodland in the UK.

1
.....
2
.....
(2 marks)

2 (e) Suggest why mixed, broad-leaved woodland usually has a higher conservation value than a conifer plantation.

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

10

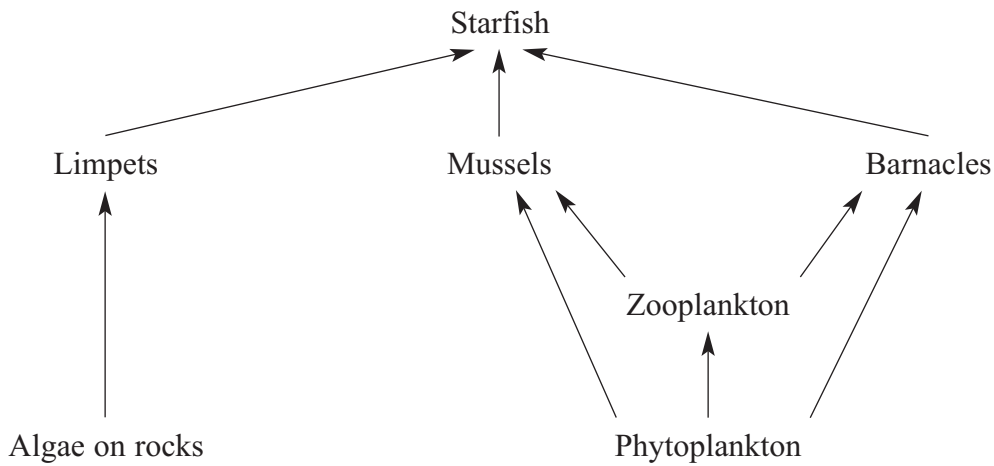
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3 Starfish are common predators on the seashore, feeding on small animals attached to rocks.

The diagram is part of a food web which shows the diet of starfish.



3 (a) Explain why a starfish can be described as both a secondary and a tertiary consumer.

.....
.....
.....
.....

(2 marks)

3 (b) Barnacles provide approximately 65 % of the diet of starfish but they provide only 15% of the energy obtained by the starfish from their food.

Suggest an explanation for this difference.

.....
.....

(1 mark)



4 (a) The table shows the approximate composition of Earth’s early atmosphere before life evolved and the composition of the present day atmosphere.

Gas	Composition of atmosphere / percentage volume	
	Early	Present day
Nitrogen	1.9	78
Oxygen	Trace	21
Carbon dioxide	98	0.035

4 (a) (i) What evidence is there that early life evolved anaerobically?

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

4 (a) (ii) Describe how the presence of life on Earth increased oxygen levels in the atmosphere.

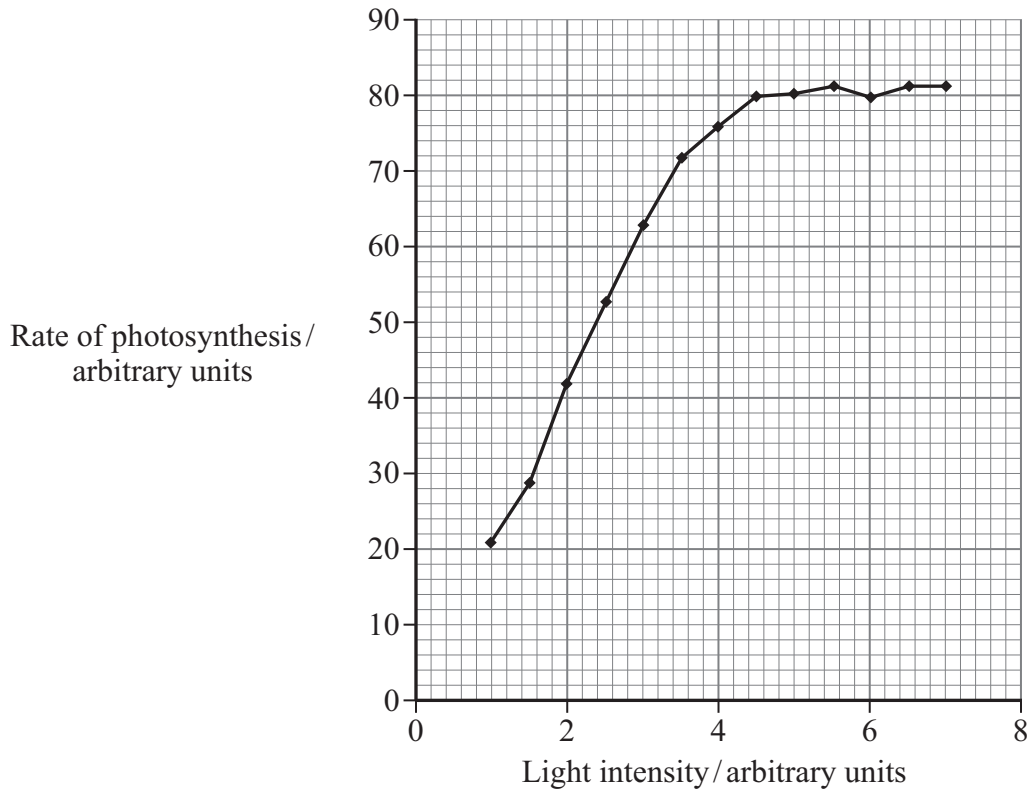
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(1 mark)

4 (b) Give **two** reasons why the temperature range found on Earth allows the survival of living organisms.

1
.....
2
.....
(2 marks)



4 (c) The graph shows the effect of light intensity on the rate of photosynthesis in tomato plants.



4 (c) (i) Describe the trends shown by the graph.

.....

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(2 marks)

4 (c) (ii) Explain the shape of the graph.

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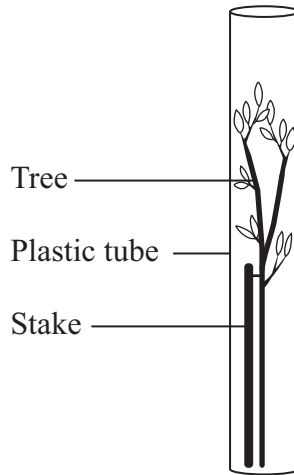
(2 marks)

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4 (d) Young trees are often protected in plastic tubes known as ‘tree shelters’ until they become established in a habitat.

A tree shelter



Suggest **two** ways in which tree shelters help the growth of plants.

- 1
-
- 2
-

(2 marks)

10



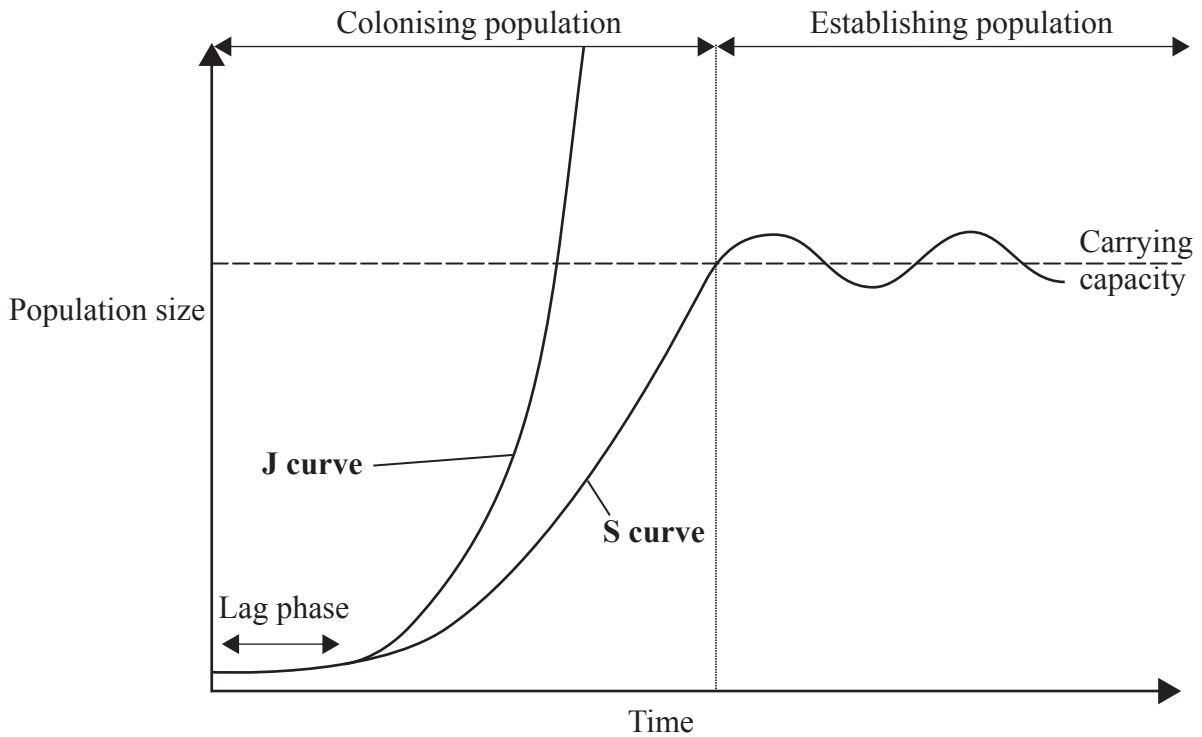
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5 Populations becoming established in a new area usually show one of two basic patterns of growth. The diagram shows the S-shaped sigmoid growth curve and the J-shaped curve.



5 (a) Explain the slow start to population growth during the lag phase.

.....

 (1 mark)

5 (b) The lag phase is followed by a period of exponential growth.

5 (b) (i) What is meant by *exponential growth*?

.....

 (1 mark)

5 (b) (ii) Explain why populations cannot continue to grow exponentially in an environment.

.....

 (1 mark)



5 (c) Aphids, such as greenfly, show J-shaped population growth. They go through a rapid population increase during the summer months. In autumn, the population crashes. Suggest a *density independent* and a *density dependent* factor that could cause the population crash.

Density independent factor:

.....

Density dependent factor:

.....

(2 marks)

5 (d) Long-lived species, including trees and mammals, show S-shaped population growth. Exponential growth slows down as the population approaches carrying capacity.

5 (d) (i) Why does growth slow down?

.....

.....

.....

.....

(2 marks)

5 (d) (ii) What is meant by *carrying capacity*?

.....

.....

(1 mark)

5 (d) (iii) Explain why the population stabilises once the carrying capacity is reached.

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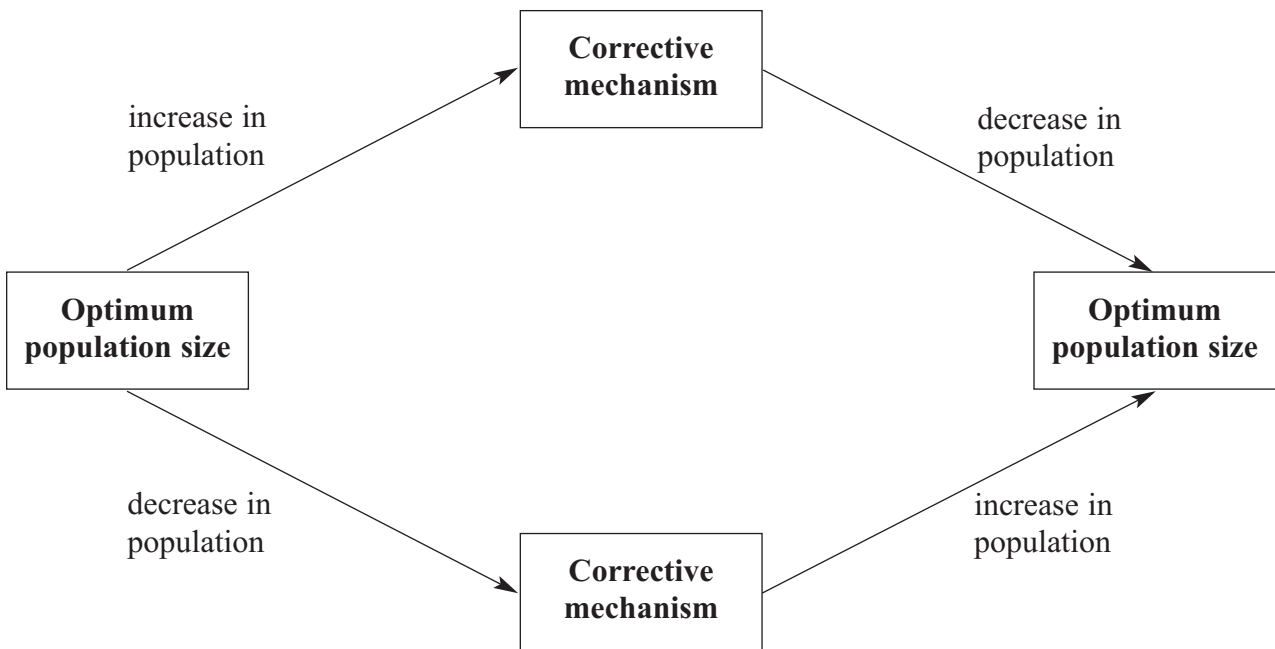
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5 (e) The diagram illustrates the homeostatic control of population size.



Explain how the diagram illustrates the principle of *negative feedback*.

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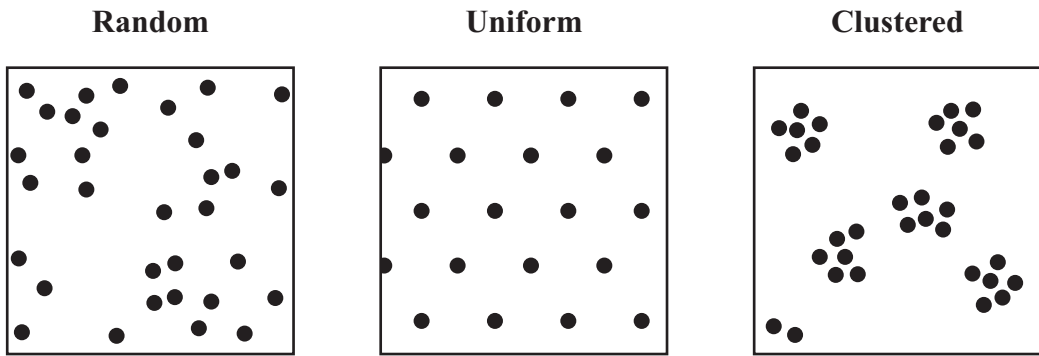
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(1 mark)

10



6 (a) The diagrams show three types of plant distribution.



Describe how you would use quadrats to investigate the distribution of a plant species.

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(5 marks)

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