OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced GCE

BIOLOGY 2805/03

Environmental Biology

Thursday **19 JUNE 2003** Afternoon 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator

Candidate Name	Centre Number	Candidate Number

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces on the question paper.
- Read each question carefully before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	15	
2	15	
3	15	
4	15	
5	15	
6	15	
TOTAL	90	

This question paper consists of 15 printed pages and 1 blank page.

Registered Charity Number: 1066969
[Turn over

Answer **all** the questions.

1 The National Parks of England and Wales were established under the National Parks and Access to the Countryside Act of 1949. The purpose was to conserve the natural beauty, wildlife and cultural heritage of the parks and to provide for the enjoyment of their special qualities by the public.

(a) List **four** features of the areas selected to become National Parks.

1 .....

2 .....

3 .....

4 .....[4]

Table 1.1

	Dartmoor	Exmoor	Lake District	Peak District	Snowdonia	Yorkshire Dales
area / ha	95 570	69 280	229 198	143 833	214 159	176 869
resident population	29 100	10 645	42 239	38 100	26 251	17 980
visitor days / millions per year	4.0	1.4	22.0	19.0	10.5	9.0

Table 1.1 provides data about some of the National Parks.

(b) The individual National Park authorities, which are responsible for the running of the parks, are faced with many difficulties. Whilst this is true of all parks, the problems are especially acute in the Lake District and the Peak District.

Using the data in Table 1.1, suggest **two** reasons why the Lake District and Peak District experience particular problems.

1 .....

2 .....[2]

(c) In this question, one mark is available for the quality of written communication.

Explain the problems experienced in managing National Parks and how they might be overcome.

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Quality of Written Communication [1]

[Total: 15]

[Turn over

2 Pure water has a pH of 7 (neutral). Normal rain is slightly acidic and has a pH of 5.5. Acid rain can have a pH of less than 3.

One of the main causes of acid rain is sulphur dioxide, much of which is a result of burning fossil fuels.

$$S + O_2 \rightarrow SO_2$$

(a) State why sulphur dioxide is one of the gases released from the burning of fossil fuels.

.....[1]

(b) Explain how the sulphur dioxide causes rain to be acidic.

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(c) Suggest **two** ways by which the emissions of sulphur dioxide may be reduced.

1 .....

2 .....[2]

(d) Other gases which contribute to the acidity of rain are oxides of nitrogen.

(i) State the main sources of these gases.

.....[1]

(ii) Suggest how their emissions may be reduced.

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.....[1]

Scandinavian countries have accused the UK of being the 'dirty man of Europe' and blame the UK for damage to their forests, acidification of their lakes and the killing of many aquatic animals.

(e) Suggest why Scandinavian countries blame the UK for being the source of much acid rain.

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.....[2]

(f) Describe and explain the effects of acid rain on:

(i) trees;

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.....[2]

(ii) aquatic animals.

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.....[2]

[Total: 15]

3 On rocky seashores around the British coast, the flat periwinkle, *Littorina obtusata*, exists as two colour variants – yellow and green. Both of these are usually found amongst the brown seaweeds, *Fucus serratus* and *Ascophyllum nodosum*, which occupy different zones on the seashore.

An investigation was carried out to determine whether the different colours of periwinkle were evenly distributed between the two seaweeds. Using appropriately sized quadrats, random samples were taken in each zone and the numbers of green and yellow periwinkles were recorded in each quadrat. The results are shown in Table 3.1.

Table 3.1

	Ascophyllum nodosum	*Fucus serratus*
green periwinkle	896	124
yellow periwinkle	237	654

(a) Explain how the random sampling would have been carried out.

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.....[4]

If the periwinkles were distributed randomly amongst the seaweeds, the expected results are calculated as follows:

$$\frac{\text{row total x column total}}{\text{grand total}}$$

Table 3.2 shows the expected results for this investigation.

Table 3.2

	Ascophyllum nodosum	*Fucus serratus*
green periwinkle	604.7	415.3
yellow periwinkle	528.3	362.7

The null hypothesis was: 'there is no association between periwinkles of different colours and these species of seaweed'.

(b) A chi-squared test uses the formula $\Sigma \frac{(O-E)^2}{E}$

where Σ = sum of

O = observed results

E = expected results

Using this formula, calculate the chi-squared value. Show your working.

[4]

(c) Table 3.3 shows the critical values for the chi-squared test.

In this type of investigation, the degrees of freedom is calculated as follows:

(number of rows –1) x (number of columns –1)

Table 3.3

		level of significance (p)				
		0.05	0.025	0.01	0.005	0.001
degrees of freedom (df)	1	3.84	5.02	6.63	7.88	10.83
	2	5.99	7.38	9.21	10.60	13.81
	3	7.81	9.35	11.34	12.84	16.27
	4	9.49	11.14	13.28	14.86	18.47

(i) Use the chi-squared value you have calculated and Table 3.3 to state whether you accept or reject the null hypothesis.

.....[1]

(ii) Explain how you reached your conclusion.

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[Turn over

(d) Suggest **three** factors that may influence the distribution and abundance of flat periwinkles on the seashore.

1 .....

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2 .....

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3 .....

.....[3]

[Total: 15]

4 In 1868, the cottony cushion scale insect was discovered as a pest in Californian citrus orchards. In 1888, this pest was brought under control by the introduction of a predatory ladybird from New Zealand and a parasitic fly from Australia.

(a) Explain why this is an example of biological control.

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(b) With reference to the insecticide DDT, explain why biological pest control is often preferred to the use of pesticides.

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.....[5]

(c) State **two** disadvantages of biological pest control.

1 .....

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2 .....

.....[2]

(d) Another method of biological pest control of insects is the release of male insect pests, which have previously been subjected to a dose of ionising radiation.

(i) State the purpose of exposing the males to ionising radiation.

.....[1]

(ii) Explain how this helps to reduce pest populations.

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.....[1]

(e) Intercropping is another method of keeping pests under control.

(i) State what is meant by *intercropping* and explain how it is used to control pests.

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.....[2]

(ii) State **two** additional benefits of intercropping.

1.....

2.....[2]

[Total: 15]

5 (a) In this question, one mark is available for the quality of written communication.

The Oxford English Dictionary defines conservation as 'preservation, especially of the natural environment'. However, those involved in environmental conservation regard their activities as being rather different to preservation.

Using suitable examples, explain the difference between conservation and preservation and outline what is involved in conservation.

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Quality of Written Communication [1]

(b) Human activity produces a considerable amount of waste. Dealing with this waste creates many problems. These problems can only be overcome if we encourage the three R's:

(i) Suggest how people can be encouraged to increase:

reduction of waste;.....

.....

re-use of material;.....

.....

recycling. .....

.....[3]

(ii) State **four** environmental benefits of decreasing the amount of waste produced.

1.....

2.....

3.....

4.....[4]

[Total: 15]

6 The activities of farmers in agricultural areas are a good example of a deflected succession. This results in a plagioclimax, which is a climax that is different from the natural climax of the area. If such activities were to cease, the land would undergo secondary succession and eventually reach a climax community.

(a) Explain what is meant by:

(i) succession; .....

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.....[3]

(ii) secondary succession; .....

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.....[2]

(iii) climax community. .....

.....[1]

(b) With reference to the activities of farmers, explain the process of deflected succession and the maintenance of a plagioclimax.

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(c) State **two** other examples of a plagioclimax.

1 .....

2 .....[2]

For Examiner's Use

(d) During the second half of the 20th century, farms in the UK have changed considerably.

Outline **two** of these changes and explain the reasons for each of them.

change 1 .....

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reasons .....

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change 2 .....

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reasons .....

.....[4]

[Total: 15]