

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**Advanced GCE**

**BIOLOGY**

**2805/03**

Environmental Biology

Tuesday **31 JANUARY 2006** Afternoon 1 hour 30 minutes

Candidates answer on the question paper.

Additional materials:  
 Electronic calculator  
 Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number												
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**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 provided 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	14	
2	17	
3	15	
4	13	
5	21	
6	10	
<b>TOTAL</b>	<b>90</b>	

**This question paper consists of 21 printed pages, 3 blank pages and an insert.**

Answer all the questions.

- 1 A group of students assessed the quality of water in a waterway. They sampled the waterway at six equally spaced points, A to F. An untreated sewage outlet was found positioned just after sampling point A. The mayfly population was assessed using a 3 minute kick sampling method. The results of their investigation are displayed in Fig. 1.1, on an insert, and Table 1.1 below.

Table 1.1

**A table has been removed due to third party copyright restrictions**

Details:

A table showing oxygen saturation at different points along a rivers course.  
Data taken from [www.medinavalleycentre.org.uk/river\\_studies.htm](http://www.medinavalleycentre.org.uk/river_studies.htm)

- (a) (i) Outline one way in which the students may have measured the oxygen saturation.

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..... [2]

- (ii) Calculate the percentage decrease in oxygen saturation between sampling points A and D. Show your working.

Answer = .....% [2]

(b) With reference to Fig. 1.1 **and** Table 1.1, explain the relationship between Biological Oxygen Demand (BOD) and oxygen saturation between sampling points **B** and **E**.

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..... [4]

(c) Mayfly nymphs are often used as indicators of water quality.

Using the information given in Fig. 1.1 **and** Table 1.1, explain how mayfly nymphs are used as indicators of water quality.

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..... [3]

(d) The numbers of individual mayfly nymphs returned to a maximum at sampling point **F**.

Suggest why the population does not increase beyond this size.

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.....  
..... [3]

[Total: 14]

2

**An extract has been removed due to third party copyright restrictions**

Text removed from The Ramsar Convention; www.ramsar.org

(a) Explain what is meant by dynamic conservation .

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..... [2]

**An extract has been removed due to third party copyright restrictions**

Text removed from The Ramsar Convention; www.ramsar.org

(b)

Describe how the pH of an area of wetland could be determined.

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**An extract has been removed due to third party copyright restrictions**

Text removed from The Ramsar Convention; www.ramsar.org

(c)

(i) Apart from the usage of fertilisers, outline two further ways in which intensive farming differs from extensive farming.

1 .....

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2 .....

..... [2]

(ii) It has been suggested that it would be an advantage for farmers to plant crops that have been genetically engineered to fix nitrogen.

Explain how this could reduce the demand for fertilisers.

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..... [2]



..... [7]

Quality of Written Communication [1]

[Total: 17]

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3 The depletion of the ozone layer has become a major concern to governments and environmentalists. It has been mainly linked to the production of chlorofluorocarbons (CFCs) around the world.

(a) State two sources of CFCs.

- 1 .....
- 2 ..... [2]

The concentration of ozone in the upper atmosphere was measured at regular intervals over the central United States from 1980 to 2000. Each concentration was compared with the concentration in 1980 and the mean percentage loss calculated. The results are shown in Fig. 3.1.



Data for graph taken from © www.cmdl.noaa.gov/overview/slide12.html

Fig. 3.1

(b) With reference to Fig. 3.1, comment on the pattern of ozone loss between 1980 and 2000.

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- .....
- .....
- ..... [2]



(c) Explain why the maintenance of the ozone layer is **biologically** important.

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(d) Explain how CFCs are thought to damage the ozone layer.

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..... [3]

- (e) The first international agreement on CFC production was the Montreal Protocol of 1987. There have been at least four agreements since then. As a result of these agreements, scientists have made projections about the concentration of chlorine in the upper atmosphere. These projections are shown in Fig. 3.2.



Fig. 3.2

Using the information in Fig. 3.2, describe **and** comment on the effect that these protocols may have over this period of time.

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..... [4]

[Total: 15]

4 National Parks of England and Wales were defined by an Act of Parliament in 1949 as:

**A quote has been removed due to third party copyright restrictions**  
Details: A quote from an act of parliament defining national parks

Table 4.1 provides data about three of the National Parks in England. Some Sites of Special Scientific Interest (SSSIs) and some National Nature Reserves (NNRs) are found within National Parks.

Table 4.1

**A table has been removed due to third party copyright restrictions**  
Details:  
A table comparing visitor numbers and area of 3 national parks in England.  
(Lake District, North York Moors, Peak District)

(a) With reference to Table 4.1, describe the main features of a typical National Park, other than being areas of natural beauty, and outline how they are managed to fulfil the requirements of the Act.

Credit will be given for appropriate use of data.

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The Lady's Slipper Orchid, *Cypripedium calceolus*, as shown in Fig. 4.1, is probably Britain's rarest plant. It has been recovered from near extinction due to the designation of SSSIs. English Nature, in partnership with scientists at the Royal Botanic Gardens, Kew, is now many years into a project to grow orchids. The project involves harvesting the seeds and germinating them in special sterile cultures. The young plants grow slowly and are carefully returned to selected sites in woodland. Even so, only a handful survive in the wild.

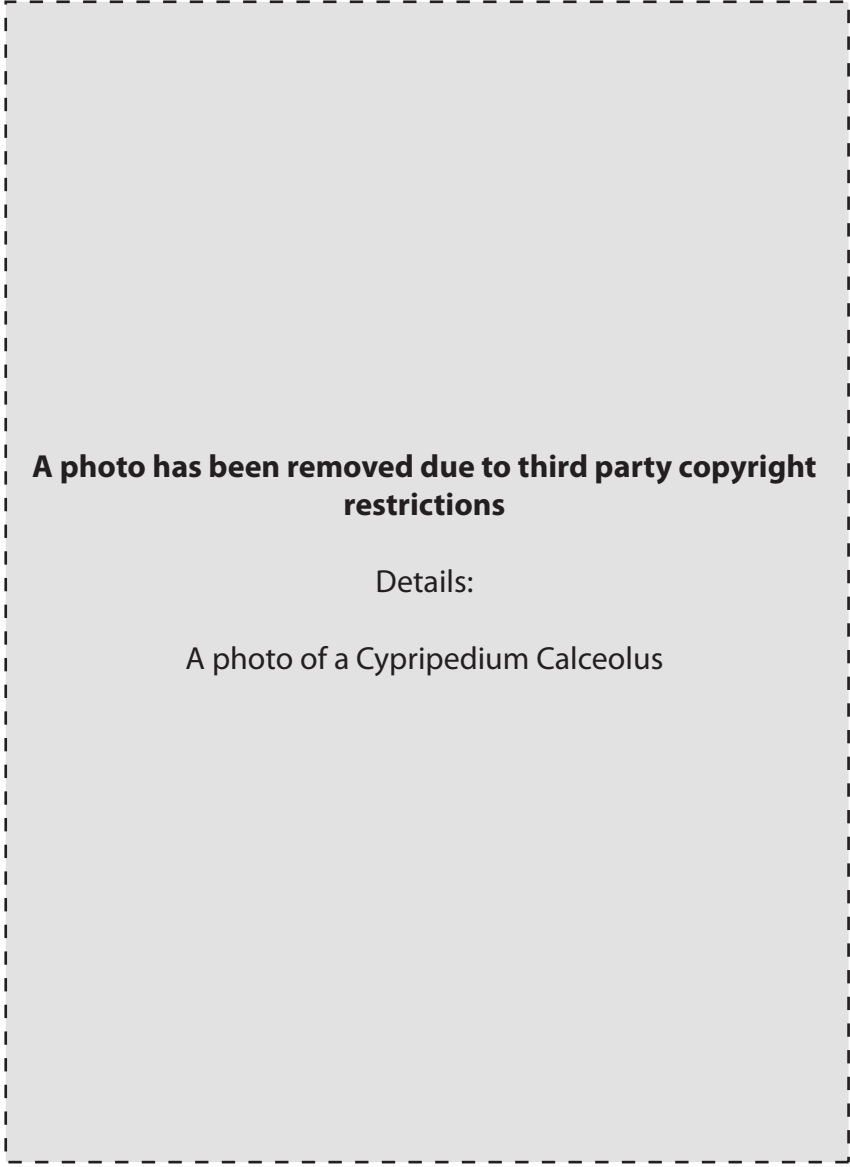


Fig. 4.1

(b) Explain how and why SSSIs are protected.

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..... [2]

(c) With reference to the information given, suggest why the recovery from near extinction of the Lady's Slipper Orchid has been problematic.

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..... [3]

(d) Seed banks maintain the genetic diversity of plant populations.

State **two** methods used to preserve seeds in seed banks.

1 .....  
2 ..... [2]

[Total: 13]

5 Some researchers investigated the distribution of lichen species along a line transect that ran across a city from suburbs in the south west, through the city centre to suburbs in the north east. The transect was 45 km long. At intervals along the transect, the number of lichen species and the sulphur dioxide concentrations were recorded. The results are shown in Fig. 5.1 opposite.

(a) Outline how the researchers may have obtained the data on the number of lichen species as shown in Fig. 5.1.

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(b) With reference to Fig. 5.1, describe **and** explain how the number of lichen species varies along the transect.

description .....

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.....

explanation .....

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.....  
..... [4]



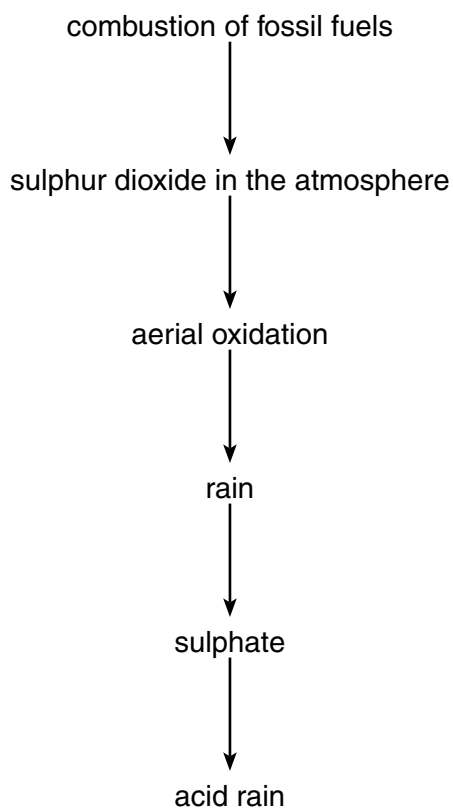
**A graph has been removed due to third party copyright restrictions**

Details:

A graph showing the number of lichen species against the sulphur dioxide concentration at different points along a river

Fig. 5.1

Fig. 5.2 is a simplified diagram showing how sulphur dioxide is involved in the production of acid rain.



**Fig. 5.2**

**(c)** With reference to Fig. 5.2, explain how acid rain is formed from sulphur dioxide gas in the atmosphere.

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**(d)** Acid rain is known to cause damage to both plant and animal species.

Describe how acid rain damages plants.

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..... [3]



6

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Details: from the 'New Scientist' by James Randerson, p13 about the Espanola Tortoise

New Scientist – 24<sup>th</sup> January 2004

(a) Suggest two reasons why the population decreased before 1965.

- 1 .....
- .....
- 2 .....
- ..... [2]

Captive breeding programmes are not always as successful as the one described above.

(b) Explain why many species do not breed successfully in captivity.

- .....
- .....
- .....
- .....
- .....
- ..... [3]

(c) State two problems encountered when releasing captive bred individuals into the wild.

- 1 .....
- .....
- 2 .....
- ..... [2]

- (d) A further study of 134 individuals was carried out on the tortoise population. It was found that the population had a very low genetic diversity. This was caused by an introduced male tortoise from the San Diego Zoo who fathered nearly 80 of the individuals sampled.

Suggest how a low genetic diversity may be damaging to the population.

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..... [3]

[Total: 10]

**END OF QUESTION PAPER**





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*Copyright Acknowledgements:*

Fig. 1.1	data © <a href="http://www.medinavalleycentre.org.uk/river_studies.htm">www.medinavalleycentre.org.uk/river_studies.htm</a>
Question 2 text	© The Ramsar Convention; <a href="http://www.ramsar.org">www.ramsar.org</a>
Fig. 2.1	© Biophoto Associates
Fig. 3.1	data © <a href="http://www.cmdl.noaa.gov/overview/slide12.html">www.cmdl.noaa.gov/overview/slide12.html</a>
Fig. 3.2	data © <a href="http://www.grida.no/soeno97/ozone/backgr5.jpg">www.grida.no/soeno97/ozone/backgr5.jpg</a>
Question 4	Quotation from Act of Parliament 1949; Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland
Table 4.1	data © <a href="http://www.anpa.gov.uk">www.anpa.gov.uk</a>
Fig. 4.1	© Biophoto Associates
Question 5e	© <a href="http://www.guardian.co.uk/life/story/C.12996.1030129.00html">www.guardian.co.uk/life/story/C.12996.1030129.00html</a>
Question 6	© James Randerson; p.13; <i>New Scientist</i> ; January 2004

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