

**ADVANCED GCE****BIOLOGY**

Environmental Biology

2805/03

Candidates answer on the question paper

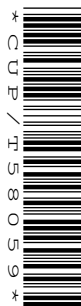
OCR Supplied Materials:

None

Other Materials Required:

- Electronic calculator
- Ruler (cm/mm)

Monday 26 January 2009
Morning

Duration: 1 hour 30 minutes

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **90**.
- 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.
- This document consists of **16** pages. Any blank pages are indicated.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	18	
2	16	
3	13	
4	11	
5	16	
6	16	
TOTAL	90	

Answer **all** the questions.

- 1 Hedgehogs were introduced onto a small group of islands off the west coast of Scotland in 1974. The hedgehog population has increased so that there are now over 5000 breeding pairs. These hedgehogs have no natural predators on these islands and enjoy a mixed diet consisting largely of birds' eggs.

Fig. 1.1 shows the distribution of hedgehogs and Table 1.1 shows the changes in the populations of three species of wading birds from 1983 to 2000.

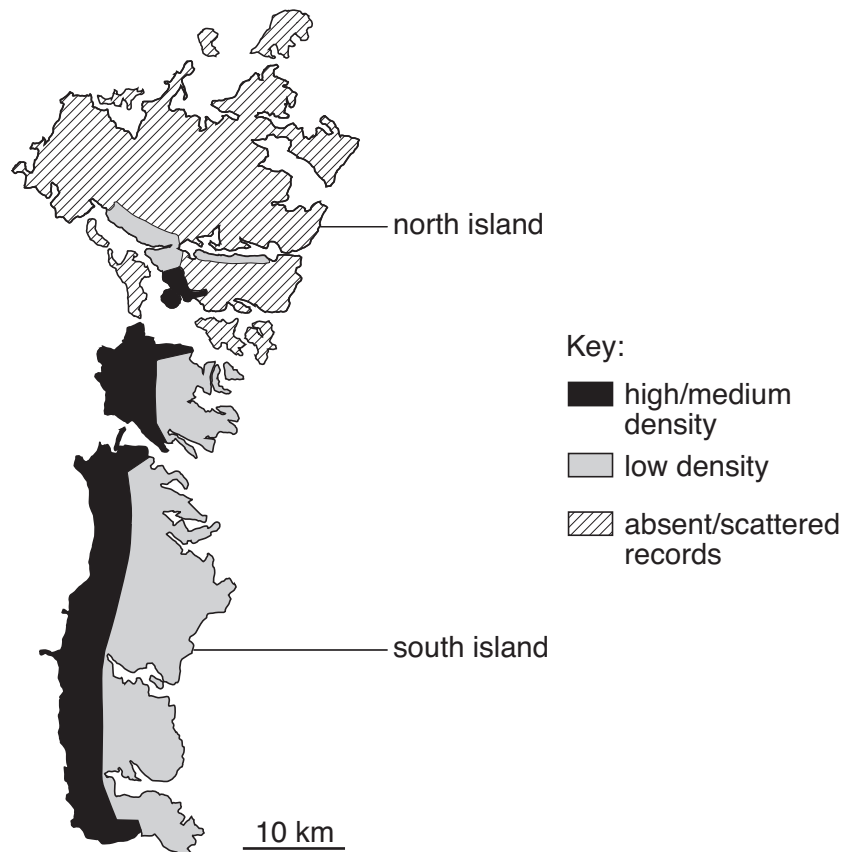


Fig. 1.1

Table 1.1

	breeding pairs in 1983	breeding pairs in 2000	% change in population
north island			
Oystercatcher	928	1122	+21
Lapwing	1104	1364	+24
Redshank	486	733	+51
south island			
Oystercatcher	907	1403	+55
Lapwing	1869	1287	–31
Redshank	1288	760	–41

- (a) Describe, using Fig 1.1 and Table 1.1, the relationship between hedgehog population density and the percentage change in the populations of **lapwings** and **redshanks**.

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- (b) Hedgehog population growth seems to have little effect on the population of oystercatchers. Suggest **two** reasons for this.

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- (c) Collecting population data for small mammals such as hedgehogs involves catching and marking.

Outline how small mobile mammals could be caught **and** marked by conservationists.

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- (d) Explain why the populations of hedgehogs on the islands might differ from those on mainland Scotland.

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- (e) Some areas of the islands are designated as sites of special scientific interest (SSSI) due to their importance as breeding grounds for wading birds.

Explain why the designation of an SSSI does not necessarily prevent damage to or development of such areas.

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- (f) Conservationists would expect the population of the hedgehogs on the islands to reach a carrying capacity.

Suggest why their population growth would not continue indefinitely.

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[Total: 18]

- 2 (a) Aquaculture, sometimes called fish farming, provides a significant proportion of the fish and shellfish supplied to the UK from around the world. Aquaculture provides a method of supplying food for a rising human population that does not involve depleting wild fish stocks.

Describe **two negative** effects of aquaculture on the environment.

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- (b) Atlantic salmon are used extensively in aquaculture. They are farmed in sea cages but suffer infestation by a sea louse, *Caligus elongates*. These lice lower the yield and can eventually kill the fish. A pesticide, added to fish feed, can be given to the salmon to help prevent infestation.

Table 2.1 shows the results of an investigation into the effectiveness of the pesticide. The investigation compared lice infestation in salmon fed on pesticide-treated food for a period of three weeks with that of a similar-sized cage of salmon fed with untreated food.

Each cage in the investigation contained over 7000 fish.

Table 2.1

time after start of treatment/weeks	mean number of sea lice per salmon	
	fed with pesticide-treated food	fed with untreated food
1	24	19
2	23	21
3	27	68

Comment on the results of the study.

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- (c) The two cages were a significant distance apart.

Suggest **one** reason for this.

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- (d) State **two abiotic** factors that the investigators would have measured in this experiment that could have influenced the reliability of the data.

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- (e) The pesticide that is added to the fish feed is lipid soluble.

Explain why it might not be advisable to give this pesticide to fish in their feed on a long-term basis.

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- (f) Wild salmon show very little lice infestation.

Suggest why this might be so.

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[Total: 16]

- 3 Students on a field trip compared two ecological sampling methods. They used a belt transect and random sampling in a heathland habitat.

Tables 3.1 and 3.2 show the results of their investigation.

Table 3.1

Results showing percentage cover for samples using a belt transect.

	position along transect								
species	1	2	3	4	5	6	7	8	9
Yorkshire fog	22	14	21	6	21	36	6	3	13
common bent grass	54	42	71	58	13	24	14	5	25

Table 3.2

Results showing percentage cover for samples using random sampling.

	sample								
species	1	2	3	4	5	6	7	8	9
Yorkshire fog	30	30	40	20	7	27	0	3	4
common bent grass	48	42	37	29	13	44	25	24	10

- (a) Describe how the students would have randomly sampled the heathland.

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- (b) Suggest **two** reasons why the data collected using the two sampling methods are not the same.

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- (c) Suggest why the students measured the percentage cover of the two species rather than counting the number of plants.

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- (d) Describe how the data from the **belt transect** could be represented.

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- (e) At each sample site, the students removed soil samples for laboratory analysis.
Describe how they could calculate the organic matter content of the soil samples.

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[Total: 13]

- 4 (a) Mining activities can lead to ecological problems. For example, water can leak from flooded mines, through soils, and into aquatic ecosystems. This water may be acidic.

Explain the effects of increased water acidity on aquatic organisms.

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- (b) Water from mines can be treated using reedbeds. These reedbeds filter the water, causing pollutants to settle in sediments, and so purifying the water leaving the reedbeds. The typical lifespan of these reedbeds is fifteen years.

Explain why these reedbeds have a limited lifespan.

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- (c) (i) There can be difficulties in measuring pollution and its long term effects. Indicator species can be used to measure pollution.

Explain what is meant by the term *indicator species*.

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- (ii) Oligochaete worms are used to indicate water that is heavily polluted by raw domestic sewage. These organisms are characteristically dark red in colour and rich in haemoglobin.

Explain how these worms are able to survive in water polluted by sewage.

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[Total: 11]

- 5 (a) Deforestation in Nicaragua is estimated to be at a rate of 150 000 hectares per year. Much of this forest is cut down for timber and to create space for agriculture. Loss of forest can lead to soil erosion and a loss of soil fertility.

Explain why forests are important for soil health and stability.

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- (b) State **two** ways in which a forest can be managed in order to provide sustainable timber production.

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- (c) Cultivation of bamboo, which grows rapidly, could reduce the need for timber and reduce the rate of deforestation in Nicaragua.

Bamboo is not a native species to Nicaragua.

Outline the potential problems of introducing a non-native plant species, such as bamboo, to an ecosystem.

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- (d)** In this question, one mark is available for the quality of use and organisation of scientific terms.

Bamboo is native to south east Asia, where it is the staple diet of the giant panda, *Ailuropoda melanoleuca*. The giant panda is an endangered species.

Discuss the roles of zoos in the conservation of endangered species, such as the giant panda.

[8]

Quality of Written Communication [1]

[Total: 16]

Turn over

- 6** Many upland areas of the UK were once used for grazing sheep, which is a form of extensive farming. The falling prices of sheep for their meat and low demand for wool products have meant that sheep farming has become an unprofitable business.

(a) Explain, with reference to a named example, why intensive farming might be a more profitable option than extensive agriculture.

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(b) Grazing by sheep prevents a climax community being reached in upland areas.
Describe how grazing by sheep alters the process of succession.

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(c) Wool is a complex protein and can be used in houses as loft insulation. This is a natural product which also traps airborne pollutants such as formaldehyde. Formaldehyde is carcinogenic.

(i) Suggest how pollutants such as formaldehyde can attach to complex proteins.

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(ii) Describe how a carcinogen, such as formaldehyde, affects cells.

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- (d)** In this question, one mark is available for the quality of spelling, punctuation and grammar.

Airborne pollutants of international concern include chlorofluorocarbons (CFC) and carbon dioxide.

Describe how CFC release has been reduced **and** explain how international efforts might lead to a reduction in carbon dioxide levels in the future.

CFC

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carbon dioxide

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Quality of Written Communication [1]

[Total: 16]

END OF QUESTION PAPER

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Fig. 1.1 & Table 1.2 Source: Uist Wader Project, Scottish Natural Heritage, www.snh.org.uk

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