OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE **2805/03**

BIOLOGY

Environmental Biology

MONDAY 29 JANUARY 2007 Morning

Time: 1 hour 30 minutes

Additional materials: Electronic calculator
Ruler (cm/mm)

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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	16	
3	15	
4	15	
5	14	
6	15	
TOTAL	90	

This document consists of **16** printed pages.

[Turn over

Answer all the questions.

1 Insecticides are substances such as pyrethroids, organochlorines and organophosphates. These chemicals can affect target species but may also affect non-target species. DDT is an example of an organochlorine insecticide that was widely used to control human and crop pests from its introduction in the early 1940s.

(a) Describe and explain two environmental effects of the widespread use of DDT.

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Table 1.1 shows data from research investigating the presence of pesticide (insecticide and herbicide) residues in drinking water in the UK from 1995 to 1998.

Table 1.1

A table has been removed due to third party copyright restrictions

Details:

A table of data showing the number of pesticide residues found in drinking water from 1995 to 1998

(b) DDT was banned from use in the UK in 1986.

Suggest why DDT was detected in drinking water more than ten years following the ban.

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(c) Table 1.1 shows that a greater percentage of samples analysed for herbicide residues were over the safe limit than those analysed for insecticide residues.

Suggest why farmers used larger quantities of herbicides than insecticides.

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(d) Aphids are pest species which farmers control using insecticides. It is important that farmers use the correct dose of the active ingredient in an insecticide on their crops to ensure effective control. Table 1.2, shows doses that a farmer would apply to a crop of barley to control aphids.

Table 1.2

A table has been removed due to third party copyright restrictions

Details:

A table showing the doses of insecticides that are applied to a crop of barley to control aphids

Using Table 1.2 state which active ingredient is the most toxic to aphids and explain your answer.

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(e) Some drinking water is extracted from the ground. Groundwater is tested for a range of substances including nitrate ions.

Explain why the presence of nitrate ions in ground water is a cause for concern.

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[Total: 15]

2 Fig. 2.1 shows a Large Elephant Hawk Moth, Deilephila elpenor . Fig. 2.2 shows it in its larval stage feeding on willowherb, Epilobium sp .

A photo has been removed due to third party copyright restrictions

Details:

A photo of a large elephant hawk moth feeding on willowherb

Fig. 2.1

A photo has been removed due to third party copyright restrictions

Details:

A photo of Deilephila elpenor in its larval stage

Fig. 2.2

An extract has been removed due to third party copyright restrictions

Details:

An extract about the Lincoln Index and how it is possible to estimate the size of a mobile population using the 'mark, release, recapture' technique

(a) Use the Lincoln Index to calculate the number of Large Elephant Hawk Moths in the population. Show your working.

Answer = ...[2]

(b) Describe how the moths could be marked.

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(c) When using the Lincoln Index to estimate population size, several assumptions are made.

Describe **four** of these assumptions.

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

The caterpillar of the Large Elephant Hawk Moth feeds on willowherb. Describe in detail how you could investigate the distribution and abundance of willowherb in the nature reserve.

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Quality of Written Communication [1]

[Total: 16]

3 (a) Livestock production in the UK is either extensive or intensive.

Describe the features of extensive livestock production in the UK.

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Intensively-farmed cattle in the UK were fed on foodstuffs which included protein from dead farm animals. It is thought that this was the source of bovine spongiform encephalopathy (BSE).
The disease was first described in 1985 and by 1992 scientists were declaring the disease had reached epidemic proportions. The UK government instituted a scheme of slaughtering cattle to control the spread of the disease. Fig. 3.1 shows the number of cattle slaughtered per year from 1988 to 2004.

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Details:

A graph showing the number of cattle slaughtered per year from 1988 to 2004

Source: Defra, Animal Health & Welfare, www.defra.gov.uk

Fig. 3.1

(b) Use Fig 3.1 to describe the trend in the number of cattle slaughtered per year from 1988 to 2004.

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(c) '…scientists were declaring the disease had reached epidemic proportions'. Explain what is meant by the term *epidemic*.

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(d) BSE is not transmitted from one live animal to another. Describe the reasons for the government scheme of slaughtering cattle.

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(e) Grazing animals, such as cattle, are responsible for the maintenance of a deflected succession. Explain how grazing maintains a deflected succession.

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[Total: 15]

4 The Millennium Seed Bank Project (MSBP) is a global conservation programme conceived, developed and managed by the Seed Conservation Department at the Royal Botanic Gardens, Kew. The aims of the project are to collect and conserve 10% of the world's seed-bearing plants by 2010.

The project aims to make seeds available for research and species re-introduction into the wild. Scientists working in seed banks have to maintain the viability and genetic variability of the seeds they store. Samples of seeds stored are germinated to assess their variability.

(a) Describe **how** scientists working in seed banks maintain the viability and genetic variability of seeds.

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genetic variability .....

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(b) Explain why it is important that seed banks maintain the genetic variability of the species that they store as seeds.

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(c) Explain why it is important for seeds to be dried before storage.

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

Zoos and botanic gardens, such as Kew Gardens, are involved in many conservation projects throughout the world.

Outline the problems experienced by zoos and botanic gardens in managing such projects **and** explain why it is important for such projects to be successful.

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Quality of Written Communication [1]

[Total: 15]

5 Hedgerows and other semi-natural habitats can act as 'wildlife corridors' in the fragmented landscape of arable farmland. Hedgerows also provide refuges for beneficial invertebrates including natural predators of pest species.

(a) Suggest what is meant by the term 'wildlife corridor'.

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Ladybirds prey on aphids. Aphids are an important pest of many crop species.

Fig. 5.1 shows the changes in relative populations of ladybird and aphid species in an arable field surrounded by hedgerows.

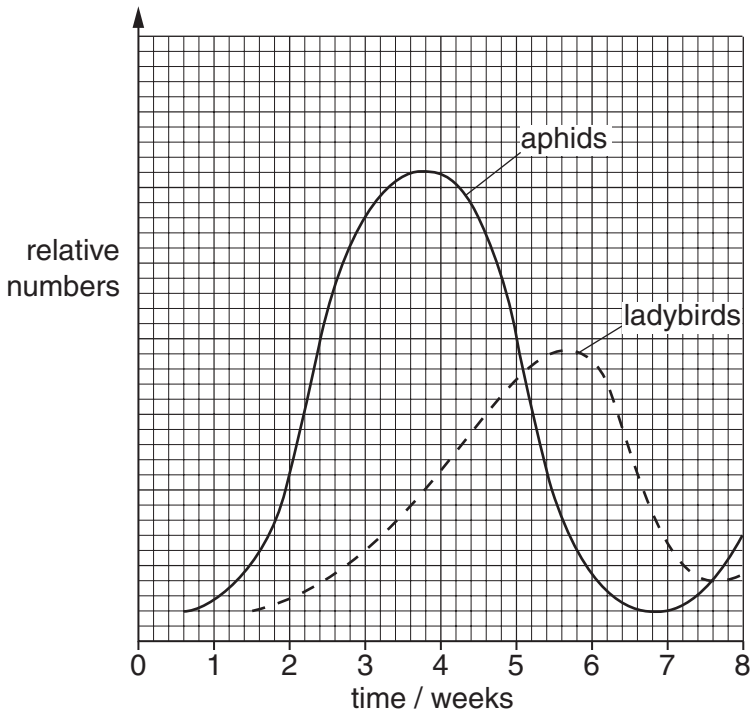

Fig. 5.1

(b) Describe **and** explain the changes in the relative numbers of aphids and ladybirds as shown in Fig. 5.1.

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(c) The use of natural predators is a form of biological pest control. Some farmers rely only on biological pest control.

Describe **two** disadvantages of biological pest control.

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(d) Suggest **two** advantages, **other than predation of pests**, of maintaining invertebrate populations in arable land.

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(e) Farmers who only use biological pest control on their crops can often market their produce as organic. Describe three advantages of organic farming.

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[Total: 14]

6 Commercial fishing of mackerel is controlled by a quota system which regulates catch sizes for each country. Mackerel is an important food resource worldwide and many fishing fleets from around the world land vast catches each year. Fig. 6.1 shows the total mass in tonnes of mackerel landed on the Queensland coast of Australia from 1988 until 2003.

A graph has been removed due to third party copyright restrictions

Details:

A graph showing the total mass in tonnes of mackerel landed in Queensland from 1988 to 2003

Fig. 6.1

(a) Since 1991, the mass of mackerel landed per year has increased overall.
Describe how technological advances could account for this increase.

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(b) Suggest **two** possible explanations for the decrease in mass of mackerel landed between 1990 and 1991.

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(c) Describe the long term **ecological** effects of overfishing.

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(d) Fish stocks may be conserved and protected by enforced quotas and careful policing of catches.

Suggest **two** important aspects of a quota system needed to regulate fish catches and so protect fish stocks.

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Question 6 continues on page 16

(e) Aquaculture (fish farming) is often seen as a long-lasting solution to the problem of over-fishing.

Outline the factors that need to be considered when setting up a fish farm.

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[Total: 15]

END OF QUESTION PAPER