IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 3

Candidate number

Wednesday 12 May 2004 (morning)

1 hour

INSTRUCTIONS TO CANDIDATES

- Write your candidate number in the box above.
- Do not open this examination paper until instructed to do so.
- Answer all the questions from Option A and all the questions from either Option B, Option C or Option D in the spaces provided.
- You may continue your answers on answer sheets. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the letter of the Option answered in the candidate box on your cover sheet and indicate the number of answer sheets used in the appropriate box on your cover sheet.

Option A — Analysing Ecosystems

The compulsory question below relates to the detailed study of ecosystems.

A1.   Figure 1

A
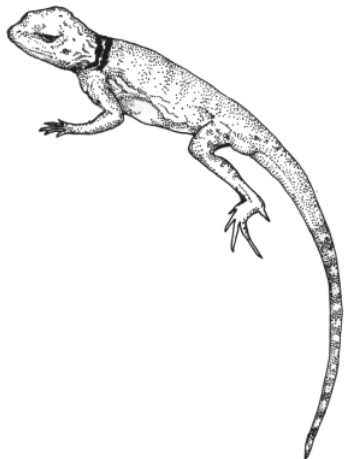
B
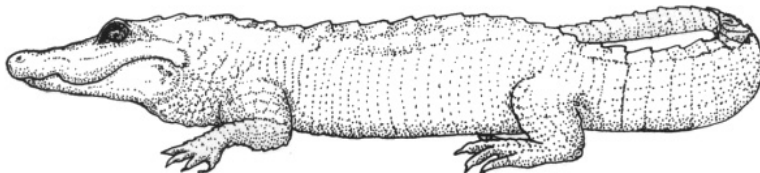
C
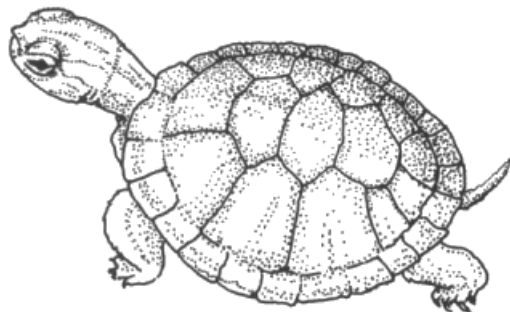
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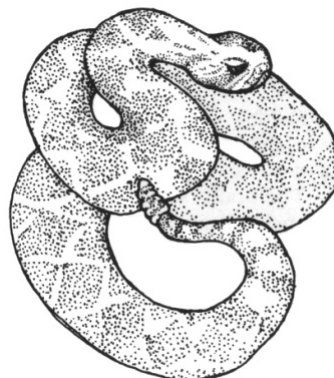
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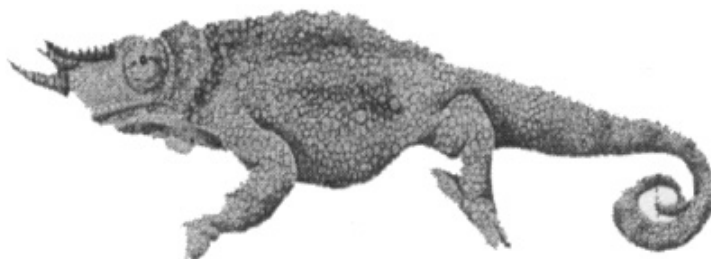
(This question continues on the following page)

(Question A1 continued)

(a)   Construct a key in the space below to identify the six organisms in figure 1 opposite by their visible physical characteristics. In your key, refer to each organism by letter, you are **not** expected to name them.   *[4]*

(b)   State **one** method, other than a key, by which you might identify an organism that you do not recognize.   *[1]*

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(This question continues on the following page)

(Question A1 continued)

(c) (i) Name an organism in an ecosystem that you have studied and state **one** abiotic factor that might affect this organism. *[1]*

Organism: ....

Factor: ....

(ii) Outline how you would measure changes in the abiotic factor over time. *[2]*

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(iii) Explain the ways in which a human activity might affect the organism selected in (c)(i). *[3]*

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A2. (a) Describe and evaluate a method to estimate the abundance of elephants in an African national park. *[4]*

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(b) Explain how you would compare the diversity of **two** different ecosystems. *[5]*

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Option B — Impacts of Resource Exploitation

B1. The table below shows the production of farmed fish in different regions of the world in 1984 and 1995 (values expressed as $\times 10^3$ tonnes).

	1984	**1995**
Asia	8 400	25 000
Europe	730	1 400
North America	334	480
Africa	30	107
Central and South America	450	500
Oceania	71	96

[Source: Food and Agriculture Organization the United Nations (1997),
Review of the State of World Aquaculture, Circular No 886, Rome]

(a) Determine which region had the **highest percentage** increase in fish production between 1984 and 1995. *[1]*

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(b) Describe and explain the significance of the data in the table. *[4]*

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(c) State **one** advantage and **one** disadvantage of fish farming as a food production system.

Advantage: . . . . *[1]*

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Disadvantage: . . . . *[1]*

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(This question continues on the following page)

(Question B1 continued)

The graph below shows the world annual catch of three types of fish between 1950 and 1998.

Annual catch / $\times 10^3$ tonnes
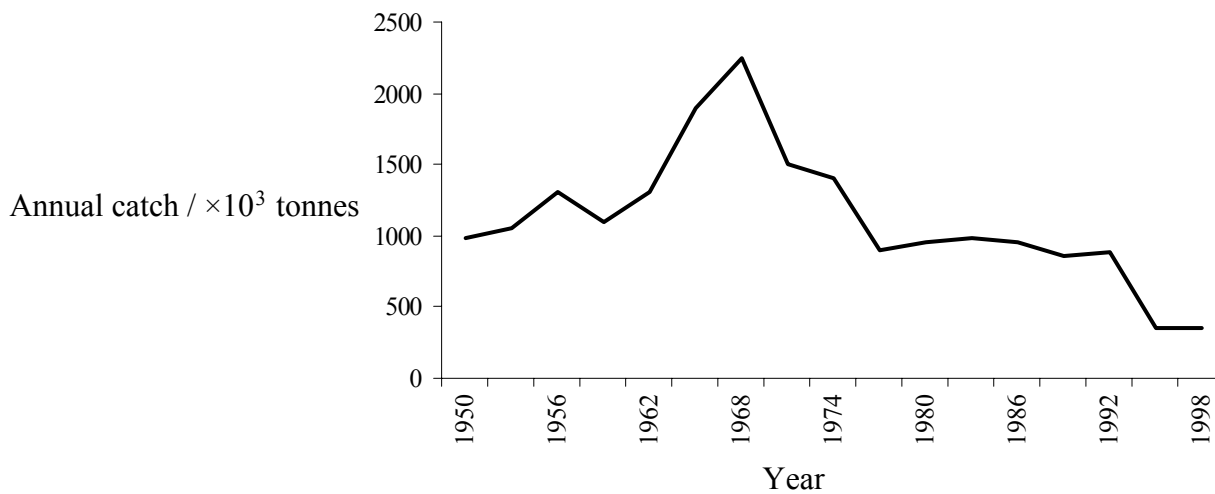
[Source: Food and Agriculture Organization the United Nations (2001), FAOSTAT, *Fisheries*, *on-line database*, www.fao.org]

(d)   Suggest what the data shown in the graph indicate about the sustainability of the fishery.   *[3]*

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B2. The table below shows the ecological footprints of several countries.

Country	Ecological footprint / hectares *per capita*
Denmark	10.5
Ecuador	2.3
Hong Kong	7.1
Namibia	0.7
New Zealand	9.6
Norway	6.1

[Source: Centre for Sustainability Studies (2000), *The Ecological Footprints and Ecological Capacities of 152 Nations*]

(a) (i) Define the term *ecological footprint*. [1]

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(ii) State **two** factors that affect the size of the ecological footprint of a country. [2]

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(b) Describe and explain the data in the table above. [4]

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(This question continues on the following page)

(Question B2 continued)

    (c)   For a **named** country, predict how food production methods might change in the next 50 years.   *[3]*

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Option C — Conservation and Biodiversity

C1. The table below shows the estimated number of threatened species of plants, birds and mammals in different regions of the world.

	Plants	**Birds**	**Mammals**
Africa	1 770	509	818
Antarctica	0	24	3
Europe	91	127	346
South America	1 356	489	362

[Source: International Union for Conservation of Natural Resources (2002), *Red List of Threatened Species*]

(a) Distinguish between the terms *threatened*, *endangered* and *extinct* as used in the Red Data Books to determine a species' conservation status. *[3]*

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(b) State **three** characteristics that might make an organism vulnerable to extinction. *[3]*

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(c) Suggest **two** reasons for the differences in the data from Antarctica and Europe. *[2]*

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C2. (a) Name **one** endangered species and state **two** measures that might be taken to protect that species. *[3]*

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(b) In the table below, state **one** advantage and **one** disadvantage for each of the listed approaches to conservation of a species. *[6]*

	Advantage	Disadvantage
Zoos		
Creation of reserves or protected areas		
Convention on International Trade in Endangered Species (CITES)		

(c) Name and briefly describe a national park **or** other protected area that you have studied and evaluate its success. *[3]*

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Option D — Pollution Management

D1. Most members of the group of insects known as bark beetles infest dead or severely weakened trees. A few species will attack and kill living, apparently healthy trees. An area of healthy trees was sprayed with a pesticide (DDT) to control the bark beetle. The diagram below shows the route through the ecosystem of the pesticide after spraying.
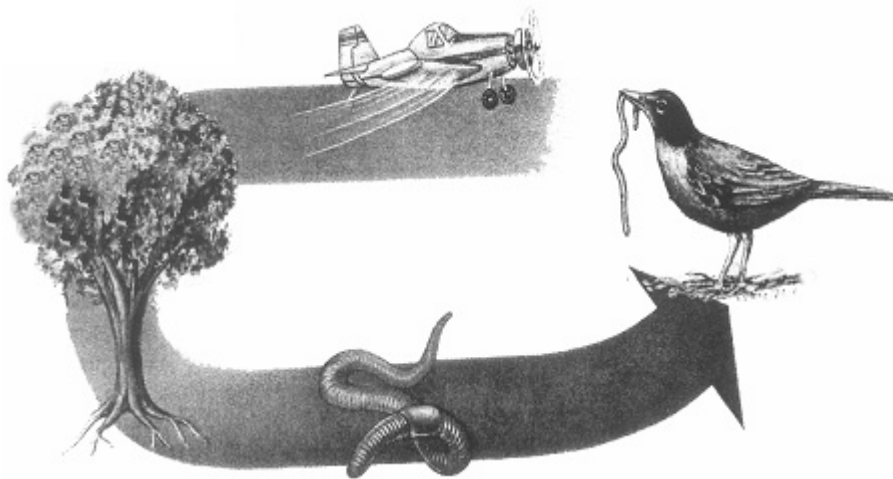
[Source: Modified from D G Kaufman and C M Franz (1995), *Biosphere 2000*, Harper Collins College Publishers, page 99]

(a)   State whether the spraying of pesticides is an example of point **or** non-point source pollution. Explain your answer.   *[2]*

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(b)   Outline **one** direct method that could be used to monitor the level of pollution from spraying pesticides as shown above.   *[2]*

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(Question D1 continued)

(c)   Suggest and evaluate a strategy that might reduce the impact of pesticides in the environment.   *[3]*

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Turn over

(Question D1 continued)

The graph below shows the residues of pesticides in four different crops, 3 days, 7 days and 14 days after application.
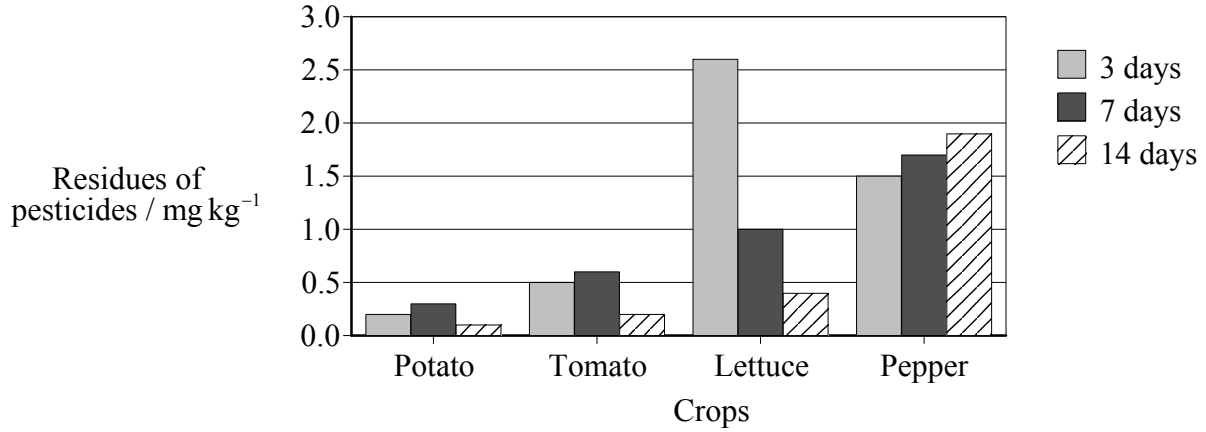
[Source: Modified from R Frank and D Ripley (1990), *Food Residues from Pesticides and Environmental Pollutants in Ontario*, John Wiley & Sons Inc, page 488]

(d) (i) Describe the data shown in the graph.   *[3]*

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(ii) Suggest **one** implication of the data shown in the graph for the human consumption of these foods.   *[1]*

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D2. (a) Explain and evaluate the pollution management strategies for a **named** example of industrial waste.   *[5]*

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(b) State **two** advantages and **two** disadvantages of recycling as a method of disposal of domestic (municipal) waste.

Advantages: . . . .   *[2]*

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Disadvantages: . . . .   *[2]*

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