INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

N01/460/S(3)

**ENVIRONMENTAL SYSTEMS**
**STANDARD LEVEL**
**PAPER 3**

Tuesday 6 November 2001 (morning)

1 hour 15 minutes

Name

Number

INSTRUCTIONS TO CANDIDATES

- Write your candidate name and number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section I: Answer one Option from Section I in the spaces provided.
- Section II: Answer two Options from Section II in the spaces provided.
- You may continue your answers in a continuation answer booklet, and indicate the number of booklets used in the box below. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.
- At the end of the examination, indicate the letters of the Options answered in the boxes below.

| OPTIONS ANSWERED | | EXAMINER | TEAM LEADER | IBCA |
|---|---|---|---|---|
| SECTION I | . . . . . | /15 | /15 | /15 |
| SECTION II | . . . . . | /15 | /15 | /15 |
| SECTION II | . . . . . | /15 | /15 | /15 |
| NUMBER OF CONTINUATION BOOKLETS USED | . . . . . | TOTAL /45 | TOTAL /45 | TOTAL /45 |

## SECTION I

### Options on analysing ecosystems – Options A, B and C

*The compulsory question below relates to the detailed study of an ecosystem in either a marine, terrestrial or freshwater environment.*
*Select the ecosystem on which you will base your answers by marking* (×) ***one*** *box only.*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | MARINE | pelagic | neritic | bathyal | littoral | mangroves | coral reefs |
| | | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |

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|---|---|---|---|---|---|---|---|
| B | TERRESTRIAL | tropical forest | temperate forest | tropical grassland | temperate grassland | desert | tundra |
| | | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . | . . . . . |

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|---|---|---|---|---|---|---|---|
| C | FRESHWATER | lakes | rivers | bogs | swamps | marshes | estuaries |
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**1.** Name and give a brief description of an ecosystem that you have studied, from the option selected above.

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(a) Name **one** species that is common and occurs in relatively large numbers and **one** species that is rarer and occurs in relatively small numbers in this ecosystem. *[1]*

(i) Common: . . . . . .

(ii) Rarer: . . . . . .

*This question continues on the following page)*

*(Question 1 continued)*

(b) Outline how you would measure the abundance of **one** (specify which) of these species, and outline how you would determine any changes in abundance over time. *[3]*

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(c) State **one** biotic and **one** physical (abiotic) factor that might influence the abundance of the species named in (b). *[1]*

Biotic factor . . . . . .

Physical factor . . . . . .

(d) Describe how named human activities might influence the abundance of both species named in (a). *[3]*

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*(This question continues on the following page)*

*(Question 1 continued)*

(e) Define the term *genetic diversity*. Explain whether or not the abundance of a species in an ecosystem is determined by its genetic diversity. *[3]*

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(f) Name another ecosystem from the same option and compare its physical characteristics and functioning with those of the ecosystem you selected in (a). *[4]*

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## SECTION II

*This section contains a question on each of Options D, E and F. Answer **two** of these questions, related to your chosen options.*

### Option D – Impacts of resource exploitation

**2.** The table below gives the percentage of world energy supplied from various sources, in 1900 and in 1998.

| Source of Energy | 1900 | 1998 |
|---|---|---|
| Coal | 94 | 30 |
| Oil | 4 | 41 |
| Natural gas | 1.5 | 26 |
| Hydro-electric and nuclear sources | 0.5 | 3 |

(a) Explain the significance of the data in the table for the environment. *[3]*

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(b) Discuss **two** advantages and **two** disadvantages of **one** of the sources of energy named in the table. (Hydro-electric and nuclear power may be considered separately.) *[4]*

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*(This question continues on the following page)*

*(Question 2 continued)*

(c) Name and evaluate **one** sustainable source of energy not listed above. *[3]*

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(d) It has been calculated that the ecological footprint of the population of Singapore is 264 times greater than the area of Singapore. Explain what this means. *[3]*

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(e) Assume that in a large city with a stable population, the proportion of the population that has a vegetarian diet increases. Explain how this change might affect the city's ecological footprint. *[2]*

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**Option E – Conservation and biodiversity**

**3.** The table below gives the approximate number of bird species found at different altitudes in tropical South America.

| Altitude (m) | Number of species |
|---|---|
| 0–500 | 2000 |
| 500–1000 | 1950 |
| 1000–1500 | 1550 |
| 1500–2000 | 1100 |
| 2000–3000 | 950 |
| 3000–4000 | 500 |
| 4000–5000 | 200 |

[Data from a diagram in Gaston K and Spicer J, *Biodiversity: an Introduction*, Blackwell Science, 1998]

(a) Describe and explain the relationship between altitude and number of species shown in the table. *[3]*

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(b) Define *habitat diversity* and *species diversity*. *[2]*

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(c) Give **two** reasons why biodiversity should be protected. *[2]*

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*(This question continues on the following page)*

*(Question 3 continued)*

(d) Outline **three** characteristics that an area should have if it is to be designated a nature reserve or similar protected area. *[3]*

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(e) An area of forest has been made a nature reserve. It is surrounded by farmland with several towns. Describe some of the changes that might occur in the area following its protection in this way. *[2]*

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(f) Briefly describe a named protected area or nature reserve that you have studied and explain how it has been managed to protect its biodiversity. *[3]*

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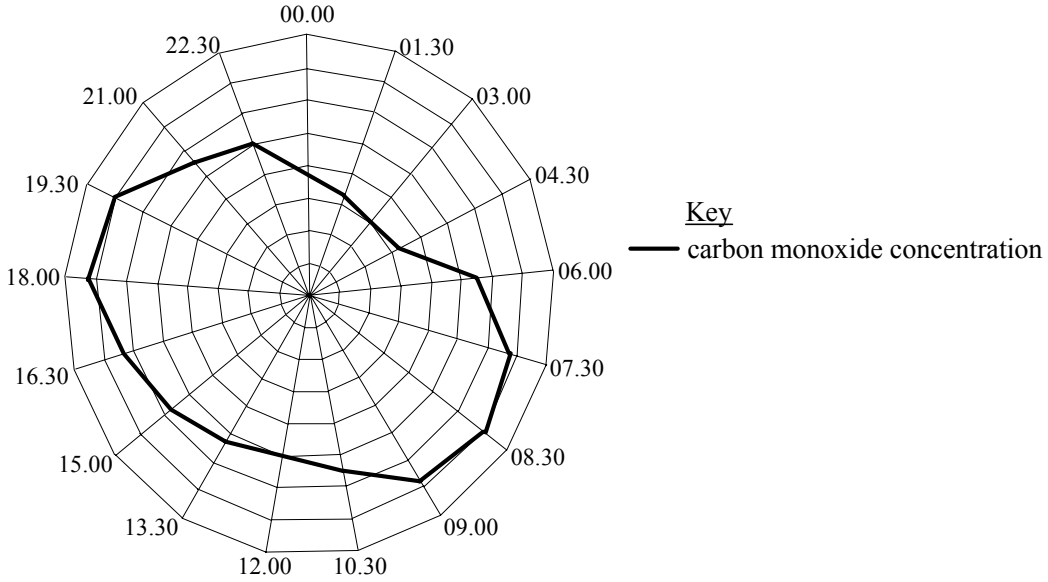
**Option F – Pollution**

**4.** The graph below shows the relative concentration of carbon monoxide (CO) in a large city over 24 hours. The concentration of carbon monoxide increases from the centre of the graph towards the perimeter.




[Source: United Nations Environment Programme]

(a) (i) Explain the shape of the graph. *[2]*

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(ii) State why carbon monoxide is harmful to humans. *[1]*

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(iii) Describe and evaluate measures which could be used to reduce carbon monoxide levels in the city to safer levels. *[3]*

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*(This question continues on the following page)*

*(Question 4 continued)*

(b) Define the term *pollution*. *[1]*

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(c) In relation to solid domestic waste (rubbish, trash, garbage), distinguish between biodegradable and recyclable materials. *[2]*

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(d) There is a proposal to establish a landfill site for the disposal of solid domestic waste on the outskirts of a town close to your home or school. Outline some of the problems that might be experienced in and near the proposed site, and describe the process whereby this development might be assessed. *[6]*

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