**INTERNATIONAL BACCALAUREATE**
**BACCALAURÉAT INTERNATIONAL**
**BACHILLERATO INTERNACIONAL**

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

Name

Number

Thursday 16 November 2000 (morning)

1 hour 15 minutes

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 a marine, terrestrial or freshwater environment. Select the option on which you will base your answers by marking (×) **one** box only.*

|   |   | Mark (×) **one** box |
|---|---|---|
| A | Analysing Marine Ecosystems | |
| B | Analysing Terrestrial Ecosystems | |
| C | Analysing Freshwater Ecosystems | |

**1.**    (a)    (i)    Examine carefully the illustrations of the six organisms in Figure 1, together with the key for their identification given below. Complete the key by writing the letter (A, B, C, D, E or F) for the corresponding organism in each space below.

    1. A. Organism has 6 legs – go to 2
       B. Organism has more than 6 legs – go to 5

    2. A. Organism has wings – go to 3
       B. Organism has no visible wings – go to 4

    3. A. Organism has opaque (non-transparent) fore-wings, which when folded cover transparent hind-wings; organism has antennae (feelers) longer than its body.   (3a) . . . . . . . . . . . . .
       B. Organism has two pairs of transparent wings, of approximately equal length. The body is very long.   (3b) . . . . . . . . . . . . .

    4. A. Organism has legs shorter than body, and two feather-like structures on its abdomen (tail).   (4a) . . . . . . . . . . . . .
       B. Organism has very long legs, and a single spike on its abdomen (tail).   (4b) . . . . . . . . . . . . .

    5. A. Organism has a large number of legs.   (5a) . . . . . . . . . . . . .

       B. Organism has 8 legs.   (5b) . . . . . . . . . . . . . *[2]*

    (ii)    What information not given with the illustrations, might have helped identification of the organisms shown?

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**FIGURE 1**

A
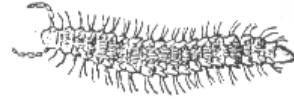
B
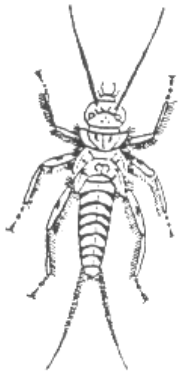
C

D
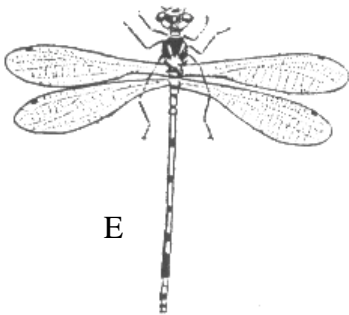
E
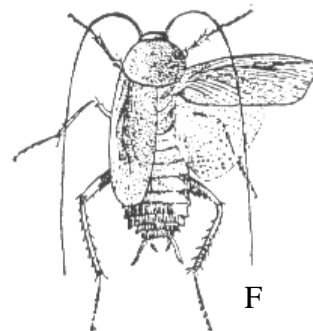
F

*(Question 1 continued)*

(b) From the study of an ecosystem you have investigated, answer the questions below.

(i) Name and give a brief description of the ecosystem. *[1]*

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(ii) Define the term *species diversity*. *[1]*

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(iii) Describe briefly how you would measure the species diversity of the named ecosystem. (You need not give mathematical formulae.) *[3]*

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(iv) List **three** abiotic factors in the named ecosystem. Discuss and explain the interrelationships amongst them. *[4]*

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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*(This question continues on the following page)*

*(Question 1 (b) continued)*

(v) Describe **one** way in which human activities might affect **one** abiotic factor listed above.    *[1]*

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(vi) How might this have an effect on a biotic factor?    *[2]*

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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 changes in the amount of arable land (cultivated farmland) in various regions of the world in 1870 and 1970 in $10^6$ ha.

| Region | 1870 | 1970 |
|---|---|---|
| Europe | 141 | 147 |
| USSR (Russia) | 102 | 232 |
| China | 81 | 110 |
| India & Pakistan | 68 | 193 |
| North America | 80 | 218 |
| Argentina & Uruguay | 0.4 | 32 |
| Australia | 0.4 | 19 |
| Japan | 3.2 | 5.5 |

[Source: D B Grigg, *Geography*, 59, 1974]

(a) Examine these data and answer the questions below:

    (i) Which region showed the highest percentage increase between the two dates? *[1]*

    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

    (ii) Which region showed the lowest percentage increase? *[1]*

    . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*(Question 2 (a) continued)*

      (iii)  Explain why the area of arable land has increased, and suggest why the rate of increase has varied from region to region. *[4]*

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      (iv)  Explain how the total area of farmland shown in the table for 1970 might change by 2070. *[2]*

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(b)  Describe the environmental impacts of a named commercial farming system, in either a terrestrial or aquatic environment. *[4]*

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(c)  What is meant by the term *ecological footprint*?  Explain how the ecological footprint of a city might have changed between 1870 and 1970. *[3]*

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**Option E – Conservation and biodiversity**

**3.**   The graph below shows the number of animal groups (families) that have existed at various times in the Earth's history.
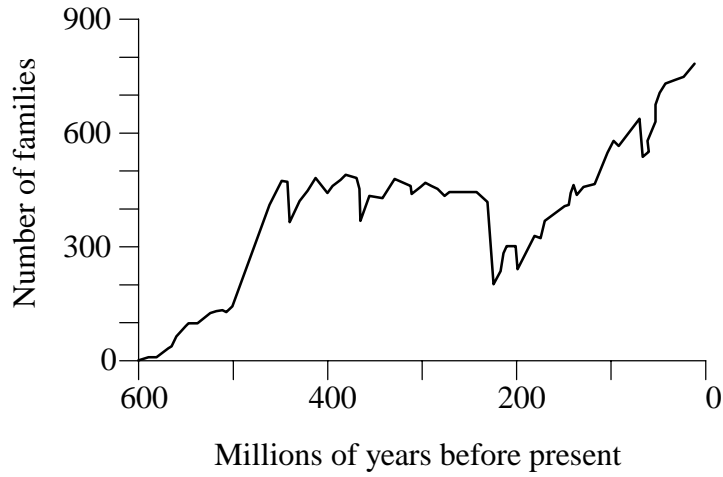


(a)   Describe and explain the shape of the graph above.                                                              *[2]*

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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*(This question continues on the following page)*

*(Question 3 continued)*

The table below gives one estimate of the number of recorded extinctions of animals and plants from the year 1600 to the present.

| Group | Approximate Number (thousands) | Recorded Extinctions |
|---|---|---|
| Mammals | 4 | 85 |
| Birds | 9 | 113 |
| Reptiles | 6.3 | 21 |
| Amphibians | 4.2 | 2 |
| Fishes | 19.1 | 23 |
| Invertebrates | 1000 | 98 |
| Flowering plants | 250 | 384 |

(b)  (i)   From the data in the table, which group is the most liable to extinction?   *[1]*

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

(ii)   Give an explanation for your answer.   *[1]*

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(c)   Describe **two** ways in which the period of extinction since 1600 is different from those periods of the geological past shown in the graph.   *[2]*

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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(d)   Give **two** factors that may make a species particularly liable to become extinct.   *[2]*

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(e)   Give **two** possible effects that extinctions since 1600 may have on human quality of life.   *[2]*

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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*(This question continues on the following page)*

**Turn over**

*(Question 3 continued)*

(f)   Give **three** ways in which efforts are being made to prevent further extinctions occurring, using specific examples.   *[3]*

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(g)   Name a species of organism that has become extinct due to human activity, and describe why it became extinct.   *[2]*

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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**Turn over**

**Option F – Pollution**

**4.** The graph below gives the quantities of harmful pollutants in the exhaust gases from two types of engine (A and B). One is a petrol (gasoline) engine, and one a diesel engine.



Comparison of emissions from engines burning different fuels
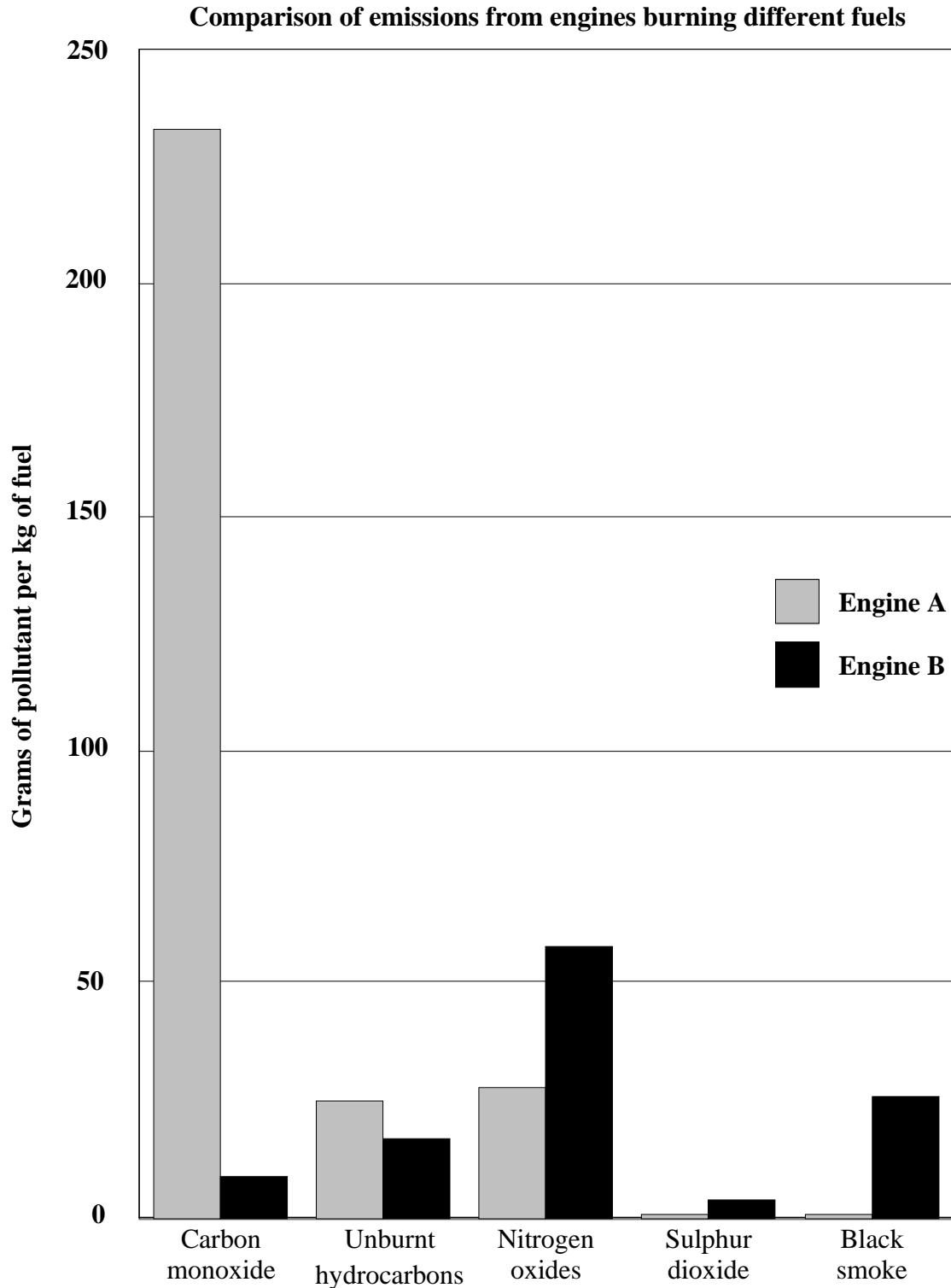
*(This question continues on the following page)*

*(Question 4 continued)*

(a)     State, giving **one** reason, whether engine A is more likely to be a petrol (gasoline) engine or a
        diesel engine.                                                                                                    *[1]*

        . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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(b)     Describe **one** effect of carbon monoxide on human health.                                                      *[1]*

        . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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(c)     Describe **one** effect of unburned hydrocarbons on the environment.                                             *[1]*

        . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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(d)     What is meant by the term *point-source pollution*?  Give **one** example.                                       *[1]*

        . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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*(This question continues on the following page)*

*(Question 4 continued)*

(e)   Catalytic converters (CATs) are sometimes fitted to the exhaust systems of vehicles.

   (i)   Name **two** gases that are removed by CATs, and name the substances into which these gases are changed. *[3]*
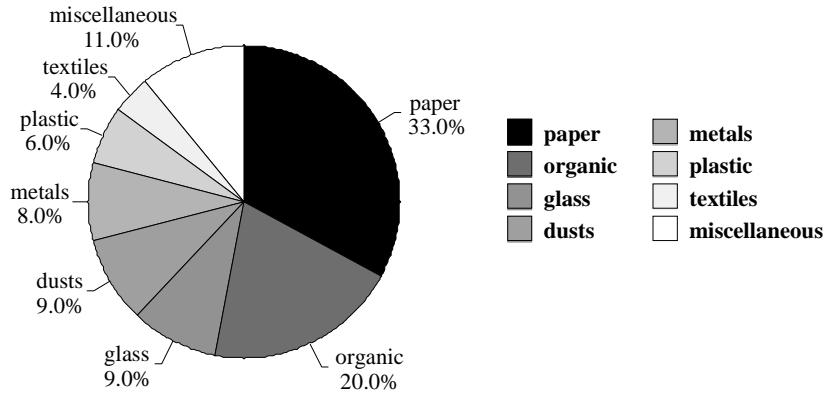
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   (ii)   State **two** disadvantages of CATs. *[2]*

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*(Question 4 continued)*

(f)   Examine the pie chart below, which shows the percentage composition of the domestic waste for a country.



(i)   State whether the data come from a developed or developing country.   *[1]*

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(ii)   Give **two** reasons for your answer.   *[2]*

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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(iii)   Name and briefly evaluate **two** methods of disposal for this domestic waste.   *[3]*

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