INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

N01/460/S(2)

ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 2

Monday 5 November 2001 (afternoon)

1 hour

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 A: Answer Section A in the spaces provided.
- Section B: Answer one question from Section B. Write 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 number of the Section B question answered in the box below.

QUESTIONS ANSWERED		EXAMINER	TEAM LEADER	IBCA
SECTION A	1	/20	/20	/20
SECTION B	. . . . .	/20	/20	/20
NUMBER OF CONTINUATION BOOKLETS USED	. . . . .	TOTAL /40	TOTAL /40	TOTAL /40

SECTION A

*This question must be attempted by **all** candidates in the spaces provided.*

1. The following data refers to the flow of energy into and through two ecosystems at different latitudes (all values in $kJ\,m^{-2}\,yr^{-1}$).

	Latitude 10° N	**Latitude 70° N**
Solar radiation entering atmosphere	9×10^6	8×10^6
Solar radiation absorbed by earth's surface (including vegetation)	5×10^6	3×10^6
Gross primary productivity	80	9
Energy passed on to consumers	40	2

(a) Draw a diagram to represent the relationships between the flows and storages of energy for **one** of the ecosystems in the table. (Do not assign values to your diagram.) *[3]*

(This question continues on the following page)

(Question 1 continued)

(b) State **two** processes that account for the difference between the amount of solar energy entering the atmosphere and the amount absorbed by the earth's surface (including vegetation). *[2]*

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(c) Suggest **two** reasons for the difference in the amount of energy absorbed by the earth's surface (including vegetation) at the two latitudes. *[2]*

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(d) Calculate, for **each** latitude, the amount of energy trapped in plant biomass as a percentage of energy absorbed by the earth's surface (including vegetation). *[3]*

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(e) Suggest **two** reasons for the difference in these percentages. *[2]*

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(Question 1 continued)

(f) Explain what is meant by a *steady state equilibrium*. *[2]*

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(g) For the producer community at 70°N to be in a steady state, what would be the maximum losses through respiration and death? *[1]*

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(h) The ecosystem at 10°N latitude is a forest from which timber is being harvested. Use this example to explain the meaning of the terms *renewable, natural capital*, *natural income* and *sustainable yield*. *[4]*

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(i) State **one** other form of natural capital provided by this ecosystem. *[1]*

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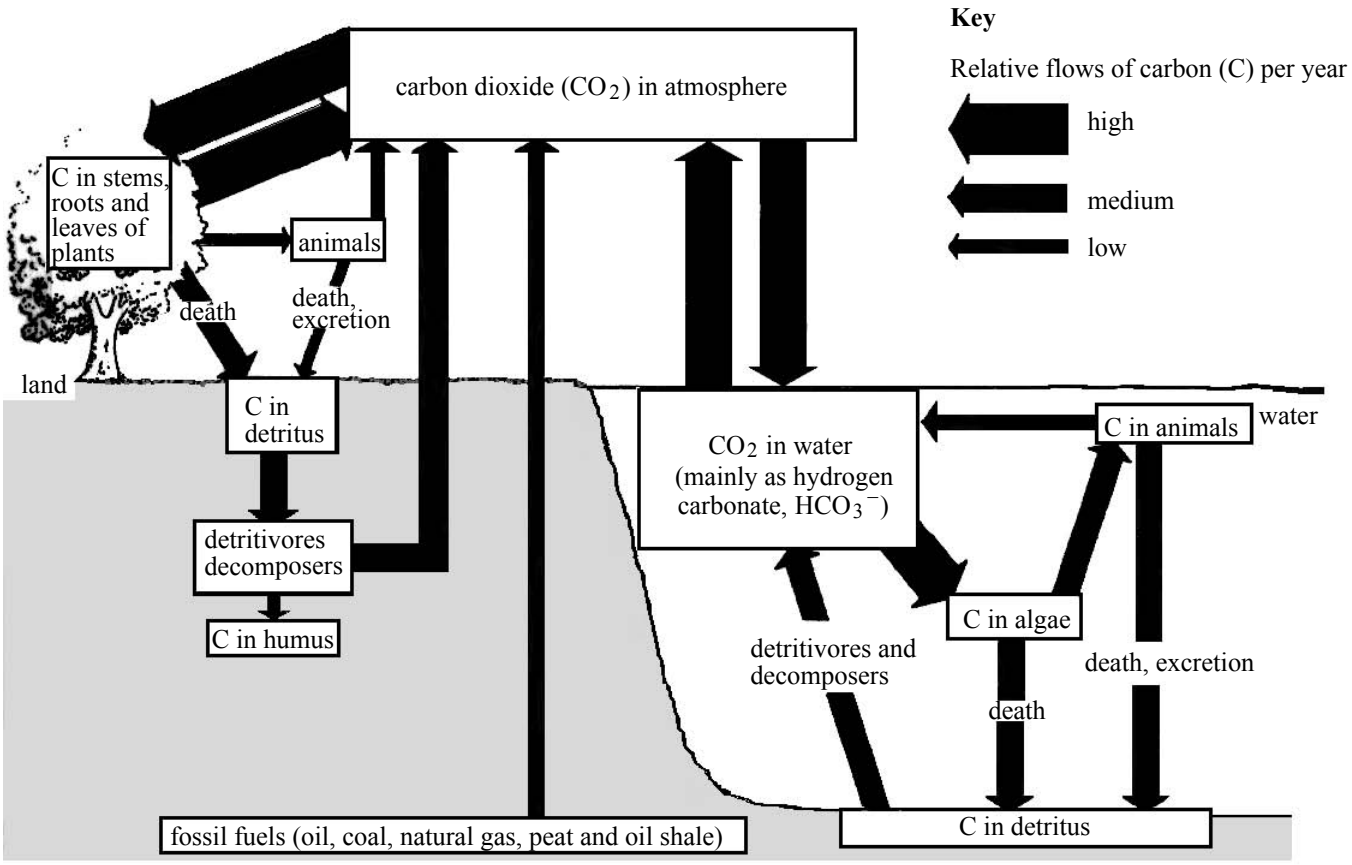
SECTION B

*Answer **one** question. Write your answers in a continuation answer booklet. 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.*

Each essay question is marked out of a total of 20 marks of which 3 are for the expression and development of ideas as follows:

0 No expression of relevant ideas.
1 Expression and development of relevant ideas is limited.
2 Ideas are relevant, satisfactorily expressed and reasonably well developed.
3 Ideas are relevant, very well expressed and well developed.

2. The diagram below shows the carbon cycle.



(a) Describe and explain the processes by which carbon is added to, and lost from, the atmospheric storage. State examples of the organisms involved in the processes. *[8]*

(b) Human activities have changed the balance of carbon dioxide. How has this balance changed and what activities have altered it? *[4]*

(c) Suggest the effects these changes might have on the biosphere. *[5]*

Expression of ideas [3]

3. (a) Suggest what the physical, biological and social limits might be to the growth of the human population on earth. *[7]*

(b) Explain why it might be considered appropriate for a subsistence farmer in a developing country to have six children. *[4]*

(c) Describe and evaluate the current population policies of a named country. *[6]*

Expression of ideas *[3]*

4. (a) Describe and explain the mechanisms by which heat energy is redistributed by the atmosphere. *[7]*

(b) Explain how ocean currents redistribute heat. *[4]*

(c) Using examples from a named ecosystem that you have studied, discuss the application of the laws of thermodynamics. *[6]*

Expression of ideas *[3]*