



**ENVIRONMENTAL SYSTEMS  
STANDARD LEVEL  
PAPER 2**

Wednesday 13 November 2002 (afternoon)

1 hour

Name

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Number

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**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	ALL	/20	/20	/20
SECTION B	.....	/20	/20	/20
NUMBER OF CONTINUATION BOOKLETS USED	.....	TOTAL /40	TOTAL /40	TOTAL /40

**SECTION A**

Both questions must be attempted by **all** candidates in the spaces provided.

1. The table below gives some figures for the population of a number of territories.

<b>Territory</b>	<b>Population in millions</b>	<b>Births per 1 000 population per year</b>	<b>Deaths per 1 000 population per year</b>
Western Sahara	0.2	46	18
Chad	7.7	50	17
Denmark	5.3	12	11
Gaza	1.2	49	5
India	986.6	28	9

(a) Define the term *natural rate of increase* as applied to populations. [1]

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(b) State which population has the shortest doubling time and calculate its value. [3]

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*(This question continues on the following page)*

(Question 1 continued)

- (c) Use the data in the table to compare the actual increase and the rate of increase of the populations of India and Gaza. Explain the significance of the differences between the data for the two countries. [5]

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- (d) State what further data would be necessary to establish whether these two populations were living sustainably. [2]

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- (e) Define the term *carrying capacity*. Explain why it is more difficult to calculate the carrying capacity for a human population than for that of another species. [3]

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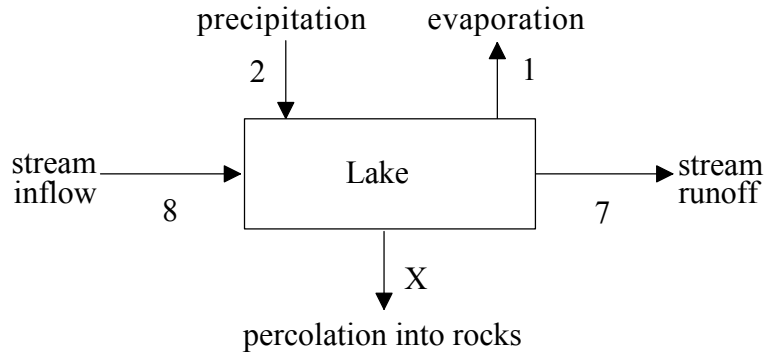
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2. The diagram below shows inputs and outputs of water associated with a lake system in units of  $10^6 \text{ m}^3 \text{ yr}^{-1}$ .



(a) (i) Define the term *steady state equilibrium*. [1]

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(ii) Assuming the system is in steady state equilibrium, calculate X. [1]

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(b) State whether the lake is an open, closed or isolated system. Give a reason for your answer. [2]

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(c) Suggest how an increase in mean global temperatures might affect the flows shown in the diagram. [2]

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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.

3. The table below gives the numbers of species from three biological groups found in areas of lowland tropical forest. The forest areas are about the same size but are of different ages.

Biological group	Age of forest / years			
	3-5	30-50	100-150	Over 300
Birds	21	49	127	236
Primates (monkeys, apes)	0	4	7	10
Trees	19	33	50	112

[Source: J Terborgh, *Diversity and the Tropical Rain Forest*, Scientific American Library, W H Freeman, New York (1992)]

- (a) Describe and explain the significance of the change in the number of species with age of forest. [7]
  - (b) Describe the world distribution of tropical rainforest, and outline the factors that influence its distribution. [6]
  - (c) State how and explain why the distribution of the tropical rainforest biome has changed in the last 150 years. [4]
- Expression of ideas* [3]

4. (a) Explain, with the aid of a labelled diagram, the atmospheric circulation in the Hadley cell. [7]
- (b) Outline how this system redistributes energy over the earth’s surface. [3]
- (c) Explain the distribution of the major biomes in relation to the global circulation of the atmosphere. [7]
- Expression of ideas* [3]

5. (a) Explain what is meant by the terms *natural capital*, *natural income* and *sustainable yield*, giving examples of each. [6]

(b) Explain, with examples, how the sustainable yield of a resource can be determined and evaluate how useful this concept is in the management of resources. [11]

*Expression of ideas* [3]

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