



ENVIRONMENTAL SYSTEMS

Standard Level

Wednesday 10 November 1999 (afternoon)

Paper 2

1 hour

A

Candidate name:	Candidate category & number:							

This examination paper consists of 2 sections, Section A and Section B.
The maximum mark for each question is 20.
The maximum mark for this paper is 40.

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 ALL of Section A in the spaces provided.

Section B: Answer ONE question from Section B. You may use the lined pages at the end of this paper or attach extra sheets of paper with your candidate number clearly marked at the top.

At the end of the examination, complete box B below with the number of the question answered in Section B.

B

QUESTIONS ANSWERED	
A 1	
B/	
Number of extra sheets attached	

C

EXAMINER	TEAM LEADER
/20	/20
/20	/20
TOTAL /40	TOTAL /40

D

IBCA
/20
/20
TOTAL /40

EXAMINATION MATERIALS

Required:
Calculator

Allowed:
A simple translating dictionary for candidates not working in their own language

SECTION A

This question must be attempted by ALL candidates.

1. For a variety of tropical crops, the following table gives their mean yields (total net weights) and their nitrogen content.

Crop	Mean Yield (kg ha ⁻¹)	Nitrogen content (g kg ⁻¹)	Nitrogen removal from soil (kg ha ⁻¹)
Maize	900	15	
Rice	1000	12	
Groundnut	700	40	
Cassava	10 000	2.4	
Yam	10 000	3.5	

- (a) Why is the nitrogen content of food crops significant in assessing their value to the human diet?

[1]

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- (b) From the given data, calculate the quantity of nitrogen removed from the soil for each of the crops (in kg ha⁻¹) and write your answers in the last column of the table.

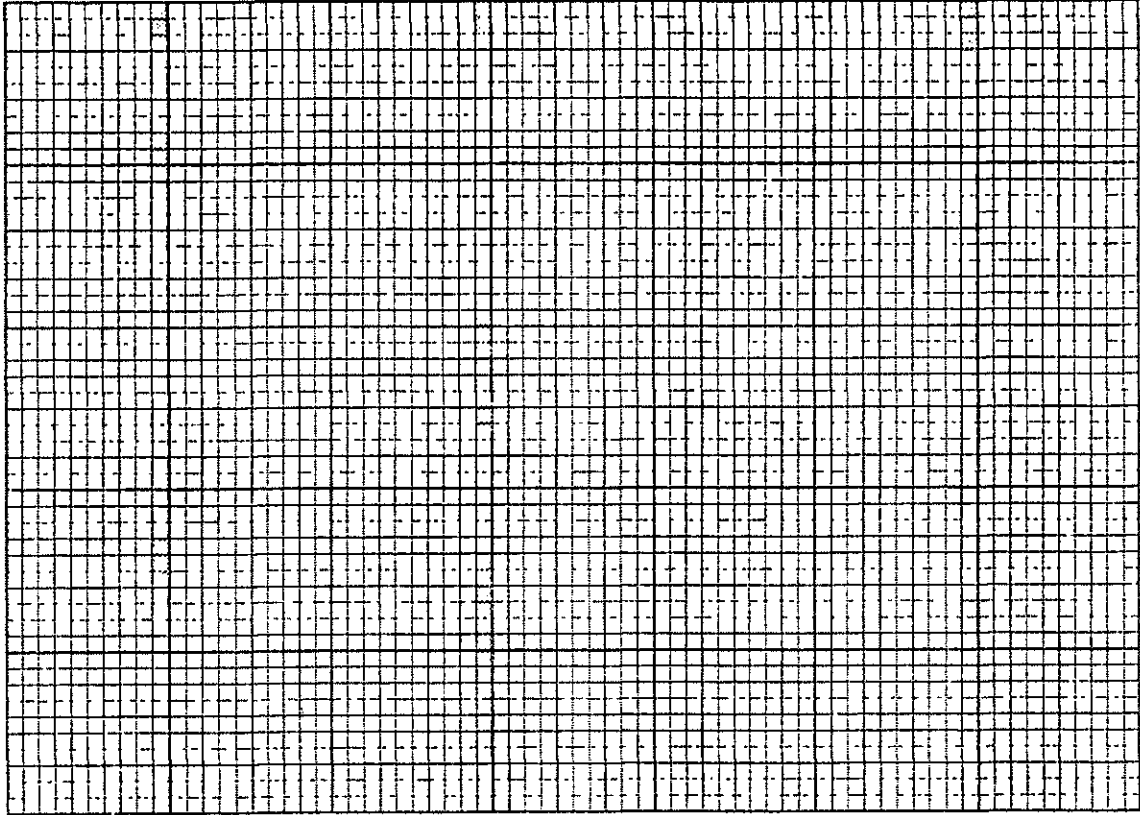
[3]

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(This question continues on the following page)

(Question 1 continued)

- (c) On the graph paper below, use an appropriate method to represent graphically the results of your calculations to compare the nitrogen removal by each of the crops. [4]



- (d) Which of the crop plants is richest in nitrogen? [1]

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- (e) Which of the crops yields most nitrogen per hectare? [1]

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(Question 1 continued)

- (f) A study was carried out to measure how rapidly nitrates may return to farmed soils. Three plots of land that had been used for growing crops were used in the study. The first was left bare, the second planted with stargrass (*Cynodon plectostachyus*, a non-leguminous plant) and the third was planted with kudzu (*Pueraria phaseoloides*, a leguminous plant). The increase in nitrate content in the upper 40 cm of soil was measured after one year. The results are shown below.

Plot	Treatment	Increase in soil nitrates (kg ha ⁻¹ yr ⁻¹)
1	Soil left bare	18
2	Stargrass	32
3	Kudzu	140

- (i) Suggest how the nitrates in Plot 1 might have increased over the study period. [2]

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- (ii) Suggest why the increase of nitrates was greater in Plot 2 than in Plot 1. [2]

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- (iii) Suggest why the increase of nitrates was greatest of all in Plot 3. [2]

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(Question 1 continued)

- (g) Kudzu is sometimes used in rotation with food crops to return nitrogen to the soil. How frequently should kudzu be rotated with groundnut crops to ensure sustainable harvesting in terms of soil nitrogen content? Show your calculation. (Assume no addition of artificial nitrogen fertiliser or nitrogen from natural sources.) [2]

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- (h) Give two reasons why the harvesting might still not be completely sustainable. [2]

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SECTION B

Answer ONE question from this section. You may use the lined pages at the end of this paper or attach extra sheets of paper with you candidate number clearly marked at the top.

(Each essay question is marked out of a total of 20 marks of which 3 are for the expression and development of ideas.)

2. (a) Construct a diagram of a food web including at least six named organisms from a named ecosystem which you have studied. [4]
- (b) Consider the introduction of a non-native species into a herbivore niche in the ecosystem in (a). Describe and explain the possible consequences for:
- native species at the same trophic level as the introduced species;
 - native species at other trophic levels;
 - the introduced species itself;
 - the equilibrium of the ecosystem. [13]

Total marks 20 of which expression and development of ideas [3]

3. (a) Explain how freshwater is stored naturally in or on the Earth's surface and outline how processes in the water cycle replenish these storages. [7]
- (b) Discuss how human societies exploit freshwater resources in an unsustainable way. Outline and evaluate **three** methods of either conserving freshwater stocks or using them more sustainably. [10]

Total marks 20 of which expression and development of ideas [3]

4. (a) Outline the ways in which human activities affect ozone in the troposphere and the stratosphere. [6]
- (b) Describe the effects that changes in ozone levels may have on living organisms and the overall stability of the biosphere. [6]
- (c) Review international and local efforts to reduce human impact on stratospheric ozone. [5]

Total marks 20 of which expression and development of ideas [3]

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