IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

M03/715/S(2)

ECOSYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 2

Candidate number

Thursday 8 May 2003 (morning)

1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

- Write your candidate number in the box 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 two questions from Section B. Write your answers on answer sheets. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

SECTION A

Answer this question in the spaces provided.

1. A farmer is considering planting maize, wheat or ryegrass in a 30 hectare field. Table 1 gives values for the amount of nitrogen (N) and phosphorus (P) removed from the soil by maize, wheat and ryegrass. Table 2 shows the balance between the inputs and outputs of nitrogen within the 30 hectare field.

Table 1 Nitrogen, phosphorus and dry matter production for three cereal crops.

	Dry Matter / 10^3 kg ha^{-1}	**N / kg ha^{-1}**	**P / kg ha^{-1}**
Wheat	10	135	24
Maize	10	150	30
Ryegrass	5	160	30

Table 2 Nitrogen inputs and outputs within the 30 hectare field.

	N / kg ha^{-1}
Inputs	
fertilizer	189
N dissolved in rainfall or blown in	50
N held within organic matter in soil	59
TOTAL	
Outputs	
crop	*(from table 1)*
N held within organic matter in soil	59
drainage losses	70
other losses	15
TOTAL	

[Source: MAFF data adapted from A Wild, *Soils and the Environment*, (1993), CUP]

(This question continues on the following page)

(Question 1 continued)

(a) (i) Using the data in tables 1 and 2, calculate the net soil nitrogen balance if

maize was planted. . . . . *[2]*

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ryegrass was planted. . . . . *[2]*

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(ii) Given that the net nitrogen soil balance for wheat is 19 kg ha^{-1}, identify the crop which produces the greatest nitrogen stress within the soil. *[1]*

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(b) (i) Calculate the total amount of nitrogen lost from the field via drainage. *[1]*

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(ii) 15 kg ha^{-1} of nitrogen is described as "other losses" in table 2. Suggest **two** other ways in which nitrogen may be lost. *[2]*

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(c) Suggest what steps the farmer may take to avoid nitrogen loss within the soil. *[3]*

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(This question continues on the following page)

(Question 1 continued)

(d) (i) Explain the impact on an aquatic ecosystem of the introduction of large amounts of nitrogen and phosphate. *[3]*

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(ii) Suggest how the above problem could be managed. *[3]*

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(e) The productivity of crops such as wheat, maize and ryegrass will depend in part on the type of soil in which they are grown. Describe the advantages of loam soils for farming in terms of their structure and properties. *[3]*

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SECTION B

*Answer **two** questions. Write your answers on the answer sheets provided. Write your candidate number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.*

Each question is marked out of a total of 20 marks of which 3 are allocated to 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. (a) Explain how a named organism can be used as an indirect measure of pollution levels within the environment. *[4]*

(b) Describe the main stages in an environmental impact assessment (EIA). *[7]*

(c) Justify the importance of ecological monitoring and research for society. *[6]*

Expression of ideas *[3]*

3. (a) Discuss the causes and timing of past extinction episodes within the fossil record. *[4]*

(b) Describe the case histories of **one** species that is endangered and **one** species that was endangered but has now been successfully removed from the endangered list. *[7]*

(c) Evaluate the strengths and limitations of zoos in conserving endangered species and justify your personal viewpoint. *[6]*

Expression of ideas *[3]*

4. (a) Discuss the value of age-sex pyramids in analysing population change. *[6]*

(b) Outline the concept of an ecological footprint and discuss the relationship between socio-economic level and footprint size. Refer to examples in your answer. *[5]*

(c) As the human population increases there is concern that we may ultimately out-grow our resource base. Evaluate the arguments for and against population control. *[6]*

Expression of ideas *[3]*

5. (a) With reference to a named case study, describe how water resources are being used unsustainably. *[6]*

(b) Suggest the possible impact of global warming on global water resources. *[5]*

(c) A variety of strategies exist for managing water pollution, such as

- monitoring quality
- setting and imposing standards
- water purification.

Discuss the human factors that affect the success of such strategies. *[6]*

Expression of ideas *[3]*