IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
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M05/4/ENVSY/SP3/ENG/TZ0/XX

22056412

ENVIRONMENTAL SYSTEMS
STANDARD LEVEL
PAPER 3

Thursday 12 May 2005 (morning)

1 hour

Candidate session number

0	0							

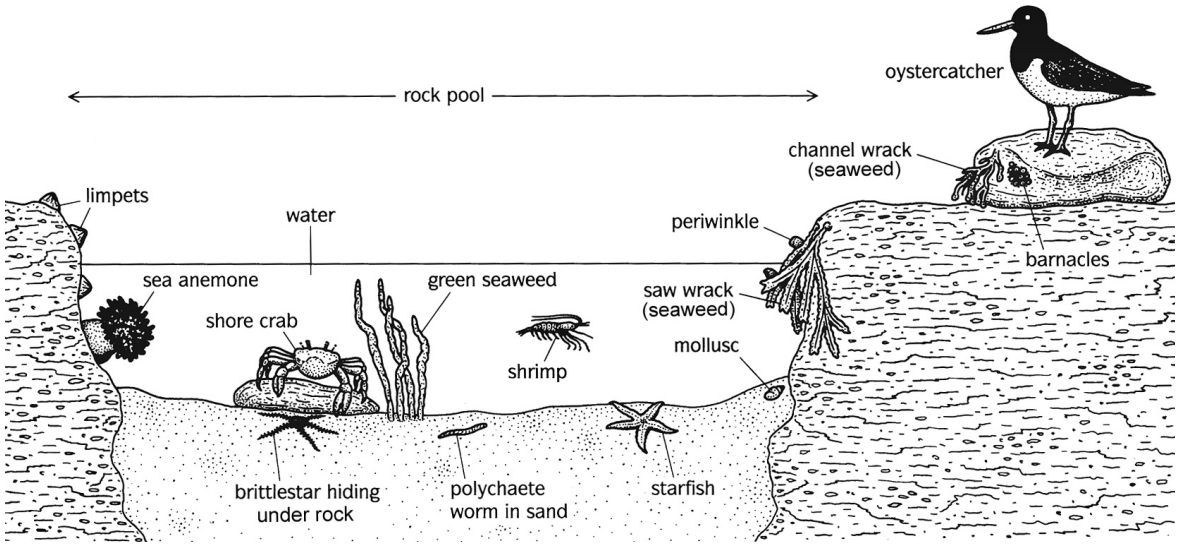
INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all the questions from Option A and all the questions from either Option B, Option C or Option D in the spaces provided.
- You may continue your answers on answer sheets. Write your session 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 letter of the Option answered in the candidate box on your cover sheet and indicate the number of answer sheets used in the appropriate box on your cover sheet.

Option A — Analysing Ecosystems

The compulsory question below relates to the detailed study of ecosystems.

A1. The diagram below shows a cross-section through a typical rock pool. A variety of species are shown that belong to the rock pool community, together with some organisms that inhabit other parts of the rocky or sandy shore.



[Source: M J Reiss & J L Chapman, (1994), *Ecology and Conservation*, Cambridge University Press, page 8]

For a **named consumer** organism shown in the diagram above, describe and evaluate a method for measuring its gross and net secondary productivity. *[5]*

Name of organism: . . . . . .

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A2. (a) Define the term *diversity*. *[1]*

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(b) (i) A group of students sampled two local ecosystems, A and B. They determined the abundance of each species they found. Using Simpson's diversity index, calculate the diversity of ecosystem B. Show your working. *[2]*

	Abundance of Organisms	
	Ecosystem A	**Ecosystem B**
species 1	3	5
species 2	7	4
species 3	26	12
species 4	9	7
species 5	7	5
Diversity	**3.27**	

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(ii) Suggest **one** reason why the species diversity of the two ecosystems are different. *[1]*

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A3. (a) Describe and evaluate a method for measuring the abundance of a **named** consumer organism in an ecosystem you have studied. *[4]*

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(b) State **one** human activity which might affect the abundance of the organism named in (a). *[1]*

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(c) Outline a method for measuring changes in the abundance of the named organism due to the human activity stated in (b) above. *[2]*

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A4. Temperature is an abiotic factor which affects all ecosystems.

(a) For a **named** ecosystem, outline how temperature varies from one point to another at the same time of the day. *[2]*

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(b) Describe how a named human activity might affect the temperatures within the ecosystem identified in (a) above. *[2]*

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Option B — Impacts of Resource Exploitation

B1. (a) Draw a flow diagram showing the inputs and outputs for a **named** commercial farming system. *[5]*

(b) Outline **five** differences between the system in (a) and a **named** subsistence farming system. *[5]*

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(This question continues on the following page)

(Question B1 continued)

(c) Describe how food production systems might change in order to provide more food for a growing human population. *[4]*

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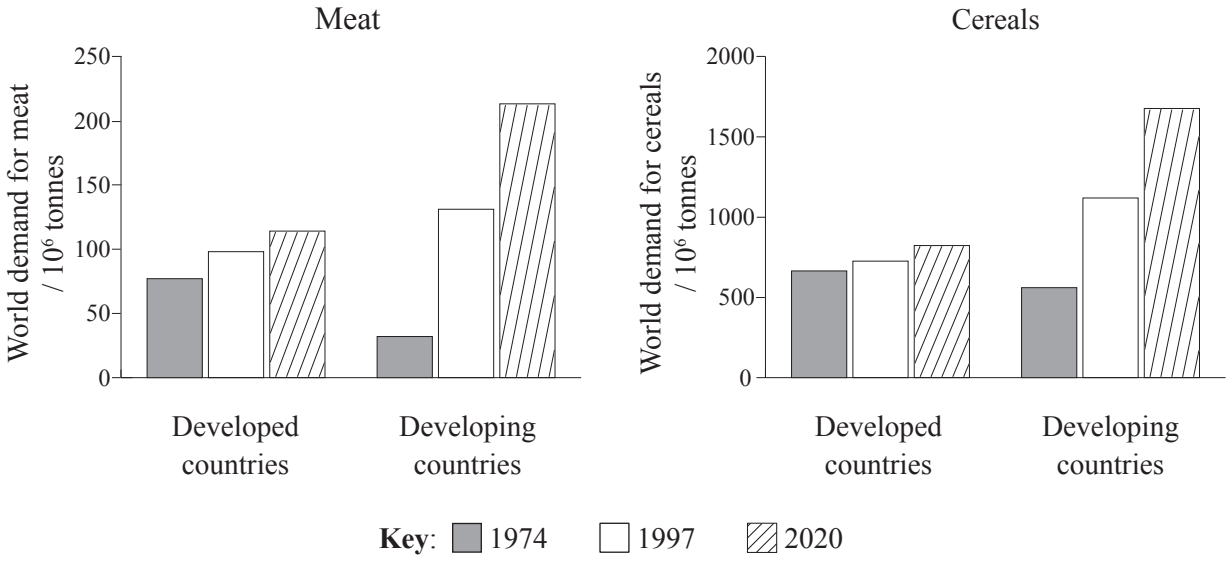
B2. The graphs below show the world demand for meat and cereals for the years 1974, 1997 and the projected demand for 2020.



[Source: IFPRI, IMPACT projections, June 2001, and FAOSTAT (www.fao.org) for 1974 data]

(a) For both developed and developing countries, calculate the percentage increase in demand for cereals from 1974 to 1997.

Developed countries: . . . . . *[1]*

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Developing countries: . . . . . *[1]*

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(b) Explain the trends in the demand for meat and cereals as shown in the graphs above. *[2]*

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(c) Suggest, giving a reason, how the ecological footprint of developing countries might change by the year 2020. *[2]*

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Option C — Conservation and Biodiversity

C1. (a) The table below shows the number of native species in a European country which are endangered or extinct.

Species Group	Number of Native Species	Number of Extinct Species	Number of Endangered Species
Land mammals	44	1	not known
Birds	523	6	not known
Amphibians	6	0	1
Freshwater fish	41	2	2
Bees/wasps/ants	542	17	41
Spiders	687	0	22

[Source: after K Byrne, (1997), *Environmental Science*, Nelson Thornes, page 267]

(i) Determine which species group has the highest proportion of endangered species, expressed as a percentage of the number of native species. *[1]*

Species group: . . . . . .

%: . . . . . .

(ii) Determine which species group has the highest proportion of extinct species, expressed as a percentage of the number of native species. *[1]*

Species group: . . . . . .

%: . . . . . .

(b) (i) Define the term *endangered species*. *[1]*

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(ii) Name an **animal** species, native to any part of the world, which is currently endangered. *[1]*

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(This question continues on the following page)

(Question C1 continued)

(iii) State the reasons for the species named in (ii) becoming endangered, and outline the possible consequences of its extinction. *[5]*

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C2. Describe and evaluate captive breeding and reintroduction programs as part of a species based approach to conservation. *[5]*

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C3. (a) Name **one** governmental organization and **one** non-governmental organization involved in preserving and restoring ecosystems and biodiversity. *[2]*

Governmental:. . . . . .

Non-governmental: . . . . . .

(b) Compare the roles and activities of these two organizations. *[4]*

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Option D — Pollution Management

D1. (a) (i) Define the term *point source pollution*. *[1]*

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(ii) State **one** human activity that may cause eutrophication and is an example of a point source of pollution. *[1]*

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(iii) State **one** human activity that may cause eutrophication and is an example of non-point source pollution. *[1]*

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(b) State and explain which type of pollution, point source or non-point source, is easier to identify, control and eliminate. *[1]*

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(c) Outline **one** method of direct measurement that would indicate that a lake is becoming eutrophic. *[2]*

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(d) Outline **one** method of indirect measurement using a biotic index, that would indicate that a lake is becoming eutrophic. *[2]*

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(This question continues on the following page)

(Question D1 continued)

(e) Describe and evaluate management strategies to restore a eutrophic lake. *[4]*

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(f) Development of a tourist resort near a lake is proposed. Outline strategies for determining the environmental impact of the development on the lake. *[2]*

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D2. The table below shows the different types of domestic waste and the amounts produced *per capita* each year in a city in a developed country.

Material type	**Examples**	**Waste produced *per capita* / kg yr^{-1}**
Organic material	garden waste, food/kitchen waste, wood	188
Paper	newspaper, writing paper, packaging, cardboard, milk cartons	91.2
Plastics	soft drink bottles, plastic bags, plastic containers	25.1
Glass	jars, bottles, plate glass	23.9
Metals	steel cans, aluminium packaging and cans, copper pipes	14.4
Household hazardous	paint, dry cell batteries, car batteries, fluorescent light tubes	1.9
Miscellaneous	ceramics (bricks, tiles *etc*.), rock, ash, soil	10.2
Total		**354.7**

[Source: Australian Social Trends 1998, Australian Bureau of Statistics]

(a) Calculate the proportion of paper, glass, plastics and organic material combined as a percentage of total waste. *[1]*

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(b) Outline and evaluate strategies for the management of the domestic waste in the table above. *[3]*

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D3. Evaluate the use of landfill as a waste disposal strategy. *[2]*

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