

ENVIRONMENTAL SYSTEMS

Standard Level

Tuesday 11 May 1999 (afternoon)

Paper 2

1 hour

A

Candidate name:	Candidate category and number:								
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 12.5%; height: 20px;"></td> <td style="width: 12.5%;"></td> </tr> </table>								
<p>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.</p> <p style="text-align: center;">INSTRUCTIONS TO CANDIDATES</p> <p>Write your candidate name and number in the boxes above.</p> <p>Do NOT open this examination paper until instructed to do so.</p> <p>Section A: Answer ALL of Section A in the spaces provided.</p> <p>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.</p> <p>At the end of the examination, complete box B with the details of the one question answered in Section B.</p>									

B

QUESTIONS ANSWERED	
A/ 1	
B/	
Number of extra sheets attached	

C

EXAMINER	MODERATOR
/20	/20
/20	/20
TOTAL /40	TOTAL /40

D

IBCA
/20
/20
TOTAL /40

EXAMINATION MATERIALS

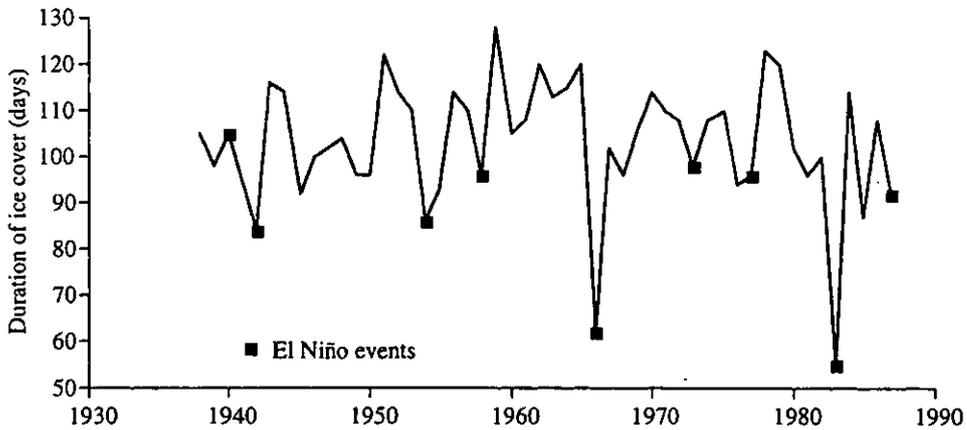
Required:
 Calculator

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

SECTION A

This question must be attempted by ALL candidates.

1. (a) The graph below shows the duration of ice cover on Lake Mendota, Wisconsin, USA, over a fifty year period. Use this data to answer the questions below.



[Source: J.J. Magnuson, 1990, *Long-term ecological research and the invisible present*, *Bio-Science* 40:495–501 in R.B. Primack, 1995, *A Primer of Conservation Biology*, Sinauer.]

- (i) Estimate the average frequency of El Niño events, in years. [1]

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- (ii) Summarise the data represented in the graph. [3]

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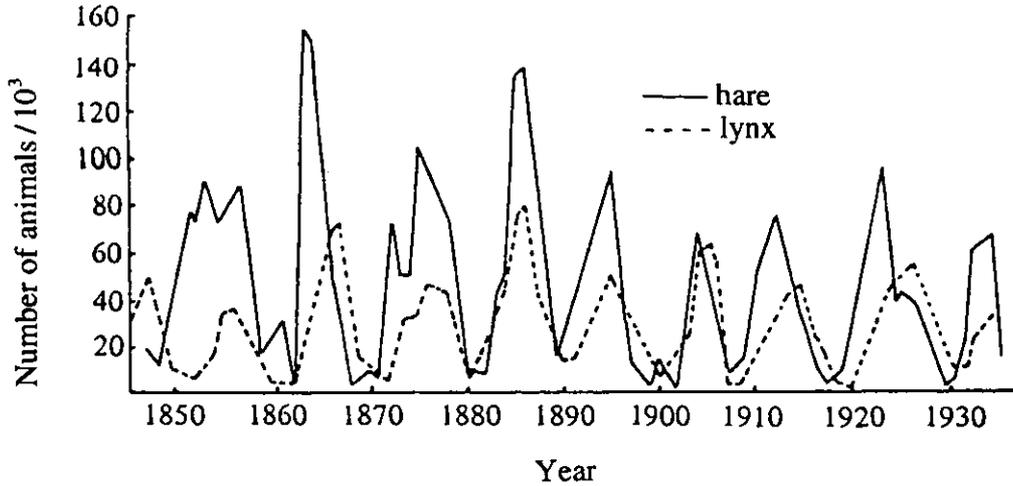
(iii) State **two** hypotheses that may account for the data. [2]

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(iv) Outline **one** other piece of evidence that might be collected to determine the validity of one of the hypotheses in (iii) above. [1]

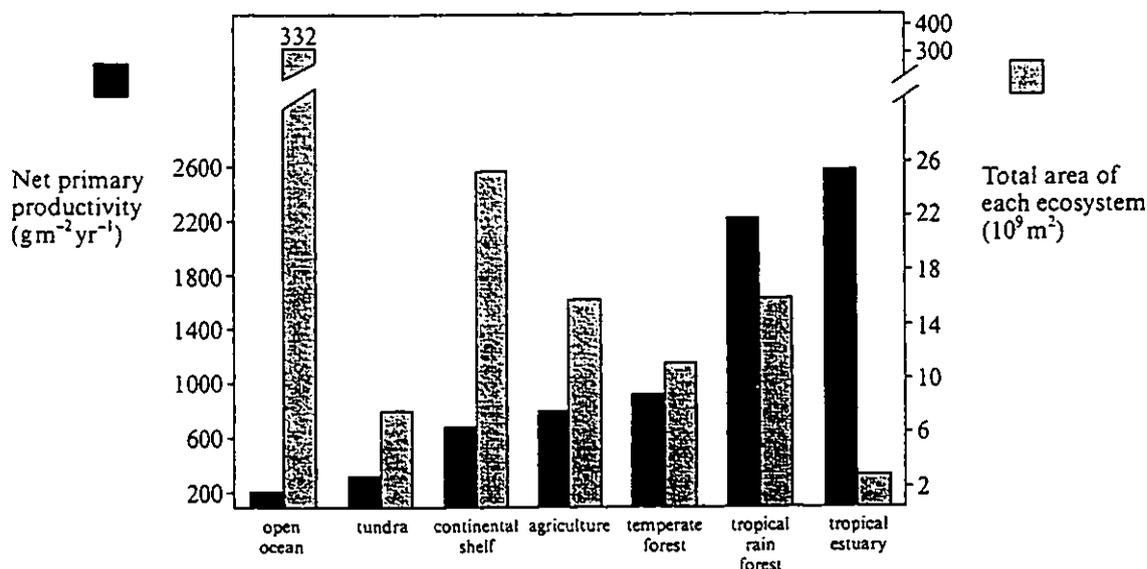
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- (b) The graph below shows the numbers of Canadian lynx (*Lynx canadensis*) and Snowshoe hare (*Lepus americanus*) caught in Northern Canada between 1845 and 1935. 80–90 % of the food of Canadian lynx is Snowshoe hare. Snowshoe hares are herbivores and their food is abundant in summer but scarce in winter. Dead hares are often found in summers when food is abundant. Use this data to answer the questions below.



- (i) Estimate the average length of cycle of Snowshoe hare numbers from one peak to the next. [1]
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- (ii) Give a reason why lynx cycles follow those of the hare. [2]
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- (iii) Suggest **two** reasons for the large changes in hare numbers. [2]
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- (iv) Describe **three** ways in which the data might have been collected. [2]
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- (c) The graph below shows the net primary productivity and total area of several ecosystems. Use this data to answer the questions below.



- (i) Which ecosystem is the most productive per unit area? [1]

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- (ii) Why is the column for open ocean broken? [1]

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- (iii) Explain why open ocean accounts for a large proportion of global productivity. [1]

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- (iv) Calculate the global productivity of (a) tropical rainforest and (b) continental shelf, and comment on any differences. [3]

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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 your 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 as follows:

- 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. Some air pollutants have an effect on the passage of solar radiation through the atmosphere.
 - (a) By reference to **three** named examples, explain, for each, the effect of the air pollutant, how the air pollutant may alter the amount of solar radiation reaching the Earth's surface and the effects that these changes may have on plant growth. [12]
 - (b) Describe the mechanisms by which these air pollutants are moved within the Earth's atmosphere. [5]
3. The number of individuals in a population changes over time. Using named examples, discuss the factors that influence population numbers with reference to:
 - (a) r and K-selection; [6]
 - (b) J and S-shaped curves; [4]
 - (c) density-dependent and density-independent factors. [7]

