



22056411

**ENVIRONMENTAL SYSTEMS  
STANDARD LEVEL  
PAPER 2**

Wednesday 11 May 2005 (afternoon)

1 hour 15 minutes

Candidate session number

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**INSTRUCTIONS TO CANDIDATES**

- Write your session 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. Write 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 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.



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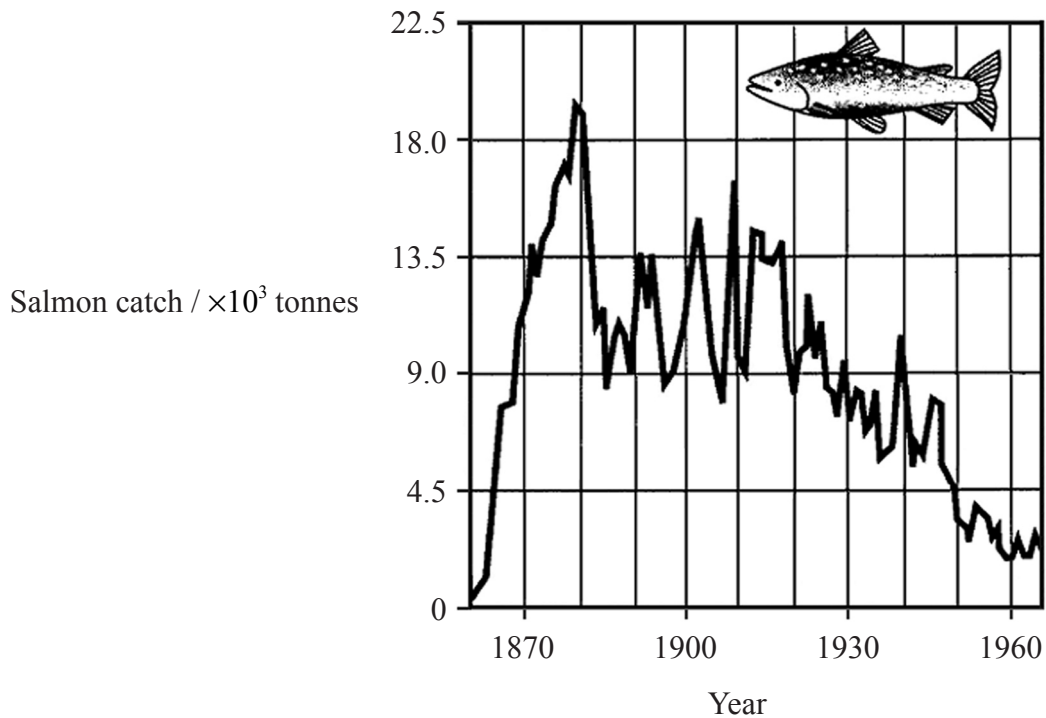
**SECTION A**

*Answer **all** the questions in the spaces provided.*

1. For a named ecosystem you have studied, draw a food-web diagram. The diagram should show the names of at least **seven** organisms belonging to at least **three** trophic levels. Clearly identify the trophic level to which each organism belongs. [5]



2. The graph below shows the commercial catch of salmon (a species of fish) in a river system in North America between 1866 and 1966.



[Source: D B Bodkin and E A Keller, (2003), *Environmental Science*, 4th edition, John Wiley, based on Oregon Fish Commission Reports]

- (a) Identify the lowest catch between 1870 and 1966 and state the year in which it was recorded. [1]

Catch .....

Year .....

*(This question continues on the following page)*

(Question 2 continued)

- (b) Describe and explain the shape of the graph. [4]

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- (c) State what is meant by the term *sustainable yield*. [1]

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- (d) State and explain how the graph might help in the estimation of the sustainable yield from the fishery. [3]

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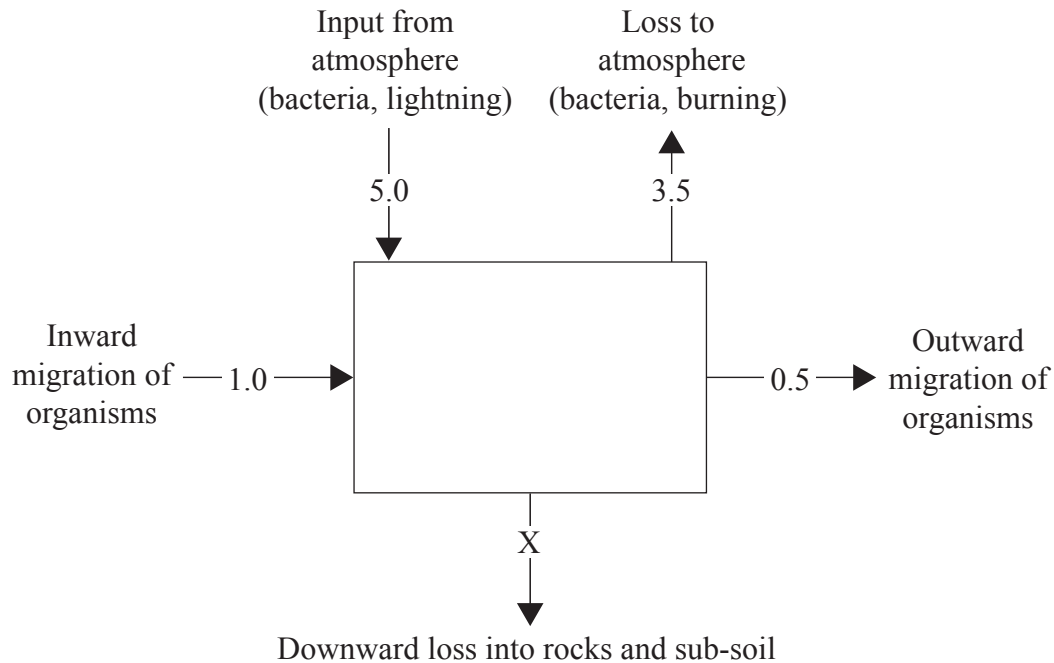
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3. The diagram below shows the inputs and outputs of nitrogen (in  $\text{kg ha}^{-1} \text{ yr}^{-1}$ ) for a forest ecosystem.



- (a) State, giving a reason, whether the forest ecosystem is an open, closed or isolated system. [1]

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- (b) Assuming the system is in steady state equilibrium, calculate the value of X. [1]

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- (c) State **one** natural process that causes the transfer or transformation of nitrogen **within** a forest ecosystem. [1]

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- (d) State and explain **one** way in which the inputs and outputs shown in the diagram above might be changed as result of the commercial harvesting of timber. [2]

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4. (a) With the help of a diagram, describe the internal structure of the Earth. [3]

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- (b) State the meaning of the term *plate tectonics*. [1]

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- (c) State, giving an example, **one** way in which an understanding of plate tectonics has helped to explain patterns of biodiversity. [2]

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5. (a) Outline the stages of soil formation.

[3]

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- (b) List **two** differences between sandy and loam soils.

[2]

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## SECTION B

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

Each essay 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.

6. (a) Distinguish between the effects of acid rain and global warming. [4]
- (b) Describe the human activities and the processes that may contribute to each of acid rain and global warming. [6]
- (c) State and evaluate some of the ways in which the harmful effects of acid rain might be reduced. [7]

Expression of ideas [3]

7. (a) Explain what is meant by the terms *ecological succession*, *pioneer community* and *climax community*. [6]
- (b) For a **named** ecosystem, describe how the abundance of the different species of organisms present changes during the various stages of succession. [5]
- (c) Describe and explain how gross primary productivity changes during the stages of succession. [6]

Expression of ideas [3]

8. (a) Define the term *carrying capacity*, and evaluate its usefulness. [3]

A small number of males and females of the same species of herbivorous (plant-eating) fish are introduced to an artificial pond. This pond contains a variety of water-plants, but has previously held little animal life.

- (b) Describe what might happen to the fish and plant populations over the succeeding months if there is no further interference with the pond. Illustrate your answer with sketched population graphs. [7]
- (c) Describe what might happen to this ecosystem if, a few months after the introduction of the plant-eating fish, a breeding pair of carnivorous (secondary consumer) fish were to be placed in the pond. [7]

Expression of ideas [3]

