



**ENVIRONMENTAL SYSTEMS  
 STANDARD LEVEL  
 PAPER 2**

Thursday 16 November 2006 (afternoon)

1 hour 15 minutes

Candidate session number

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**INSTRUCTIONS TO CANDIDATES**

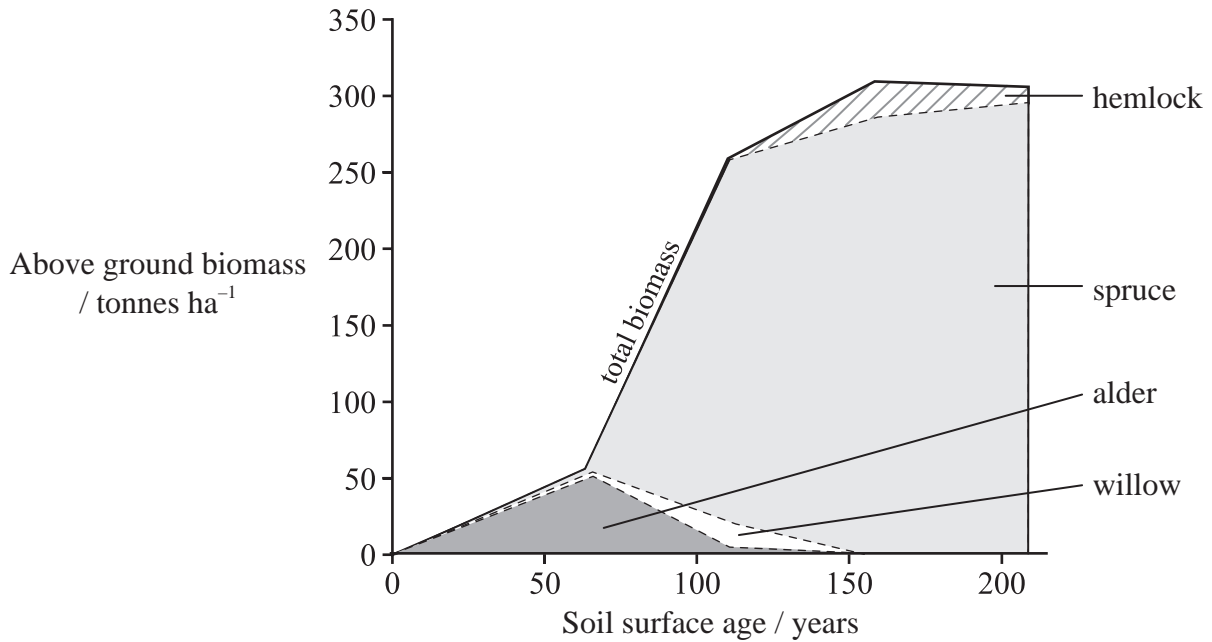
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all of Section A in the spaces provided.
- Section B: answer one question from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, 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.



SECTION A

Answer *all* the questions in the spaces provided.

- 1. The area graph below shows the change in the total above-ground dry weight plant biomass in an ecosystem as it undergoes succession. The example given is the development of forest following the retreat of a glacier in Alaska. The graph also shows the proportion of the total biomass made up by different species of tree: willow, alder, spruce and hemlock (*Tsuga*).



[Source: Adapted from C B Cox and P D Moore (2000),  
*Biogeography: an Ecological and Evolutionary Approach*, 6th edition, Blackwell, Oxford, page 27]

- (a) Define the term *succession*. [1]

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- (b) Define the term *biomass*. [1]

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(Question 1 continued)

- (c) State and explain the changes in the total biomass shown in the graph. [4]

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- (d) Using the graph, identify the **two** most important species in the climax stage of this succession. [1]

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- (e) Using the graph, identify the most important species in the pioneer stage of this succession. [1]

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- (f) Determine the total plant biomass 200 years after the retreat of the glacier. [1]

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2. It is now widely accepted that the continental plates have moved in relation to each other over geological time. Explain how this movement has affected biodiversity, giving **two** different examples. [4]

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3. With the help of a diagram, state what is meant by the term *food-chain*. [2]

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4. Explain the role of ocean currents in the transfer of energy from one part of the world to another.

[4]

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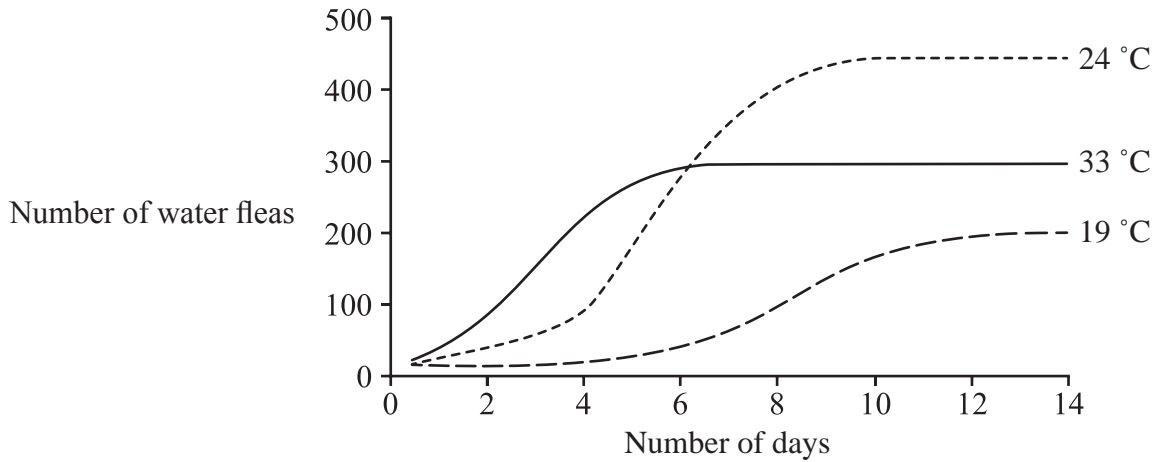
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5. The graph below shows the change in the population of water fleas (a small aquatic invertebrate) over a 14 day period at three different temperatures.



[Source: Adapted from D B Sutt and N P Harmon (1973), *Ecology: Selected Concepts*, John Wiley, New York, page 156]

(a) (i) Compare the carrying capacity at 19 °C and 24 °C. [1]

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(ii) Compare the rate of growth at 19 °C and 33 °C. [1]

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(b) State **one** factor, other than temperature, that might influence the rate of population growth of an organism. [1]

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(c) Outline what is meant by the *carrying capacity* of an environment. [2]

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*(Question 5 continued)*

- (d) Explain why it is difficult to give a precise value for a country's carrying capacity for a human population. [2]

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- 6. Outline and explain the interaction between ozone and halogenated organic gases (*e.g.* CFCs). [4]

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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.

7. (a) Describe and explain the distribution of deserts. [6]
- (b) Describe and explain the differences in productivity between deserts and **one** other biome. [11]

*Expression of ideas* [3]

8. (a) With the help of a flow-diagram, describe how water circulates in the environment. On your diagram you should show at least **four** storages and **four** flows. [9]
- (b) Discuss, giving reasons, whether the water cycle (hydrological cycle) is an open, closed **or** isolated system. [4]
- (c) Compare the water cycle with the nitrogen cycle. [4]

*Expression of ideas* [3]

9. (a) Forests are sometimes described as being a form of renewable natural capital. Explain what this means. [3]
- (b) There are sometimes said to be different values associated with renewable natural capital. For forests, or for any other type of natural capital, evaluate **three** of these. [10]
- (c) Describe how you would determine whether a particular use of a form of renewable natural capital was sustainable. [4]

*Expression of ideas* [3]

