



**ENVIRONMENTAL SYSTEMS  
STANDARD LEVEL  
PAPER 2**

Monday 17 November 2008 (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 table below shows the amount of organic matter (biomass), nitrogen and phosphorus, above and below ground, in two areas of woodland in Australia. Ecosystem A has regenerated after complete destruction by fire 15 years ago. Ecosystem B has remained undisturbed for 55 years.

|  | Ecosystem A<br>(regenerated)<br>/ kg ha <sup>-1</sup> | Ecosystem B<br>(undisturbed)<br>/ kg ha <sup>-1</sup> |
|--|---|---|
| Above ground organic matter<br>(standing timber, leaves, litter) | 27 000  | 51 536  |
| Below ground organic matter<br>(roots)                           | 25 782  | 42 393  |
| Above ground nitrogen  | 117   | 142   |
| Below ground nitrogen  | 47  | 104   |
| Above ground phosphorus  | 8   | 8   |
| Below ground phosphorus  | 4   | 7   |

[R F Parsons, "Eucalyptus scrubs and shrublands", in Richard H Groves (ed.), *Australian Vegetation*, 2nd edition, (1994), Cambridge University Press]

- (a) Calculate the average annual net productivity above ground for ecosystem A, assuming all plant material was destroyed in the fire. Show your working. [2]

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- (b) Calculate the percentage of the total biomass that is below ground for each of the **two** ecosystems. Show your working.

- (i) Ecosystem A: ..... [1]

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- (ii) Ecosystem B: ..... [1]

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*(This question continues on the following page)*



(Question 1 continued)

- (c) Describe and explain the difference in the biomass, nitrogen and phosphorus content between the **two** ecosystems, as shown in the table. [5]

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- 2. (a) Describe what is meant by the term *feedback*. [1]

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- (b) Fire is an important factor in many ecosystems. Sometimes regular burning encourages the growth of plant species that are inflammable (*i.e.* they burn easily). State whether this is an example of positive **or** negative feedback. Explain your answer. [2]

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3. (a) List **four** components of soil. [2]

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(b) (i) Name **one** example of a transformation process that occurs within the soil system. [1]

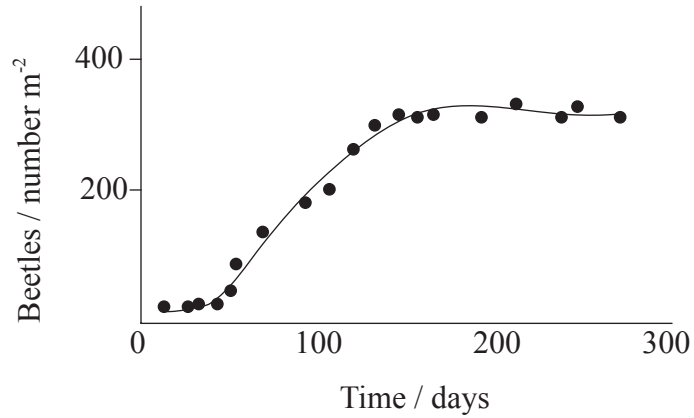
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(ii) Name **one** example of a transfer process that occurs within the soil system. [1]

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4. The graph below shows the changes in the population density of a beetle species in an ecosystem, over a period of 300 days.



[Reproduced by permission of Oxford University Press Australia from Attiwal and Wilson (eds), *Ecology: An Australian Perspective*, Oxford University Press, 2003, Melbourne, www.oup.com.au]

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

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- (b) Describe **and** explain the shape of the graph. [3]

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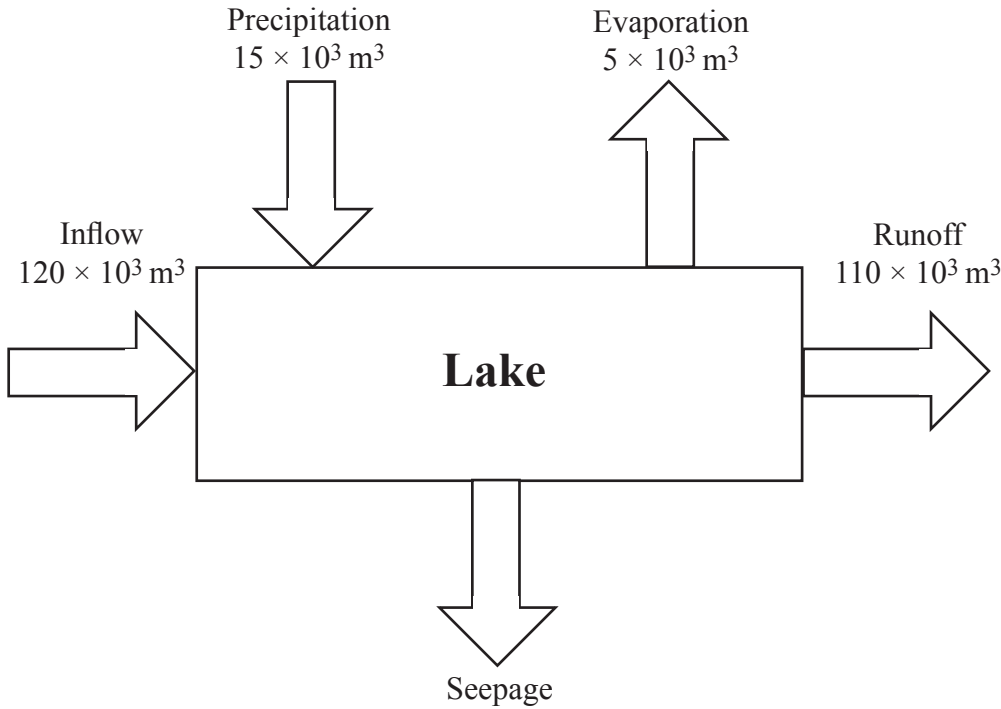
5. (a) Explain what is meant by the term *hydrological cycle*. [2]

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(b) State **two** ways in which human activities have affected the hydrological cycle. [2]

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(c) Instruments were set up to measure the flows of water into and out of a small lake. The flow-diagram below shows the measurements recorded for the precipitation, evaporation, stream inflow and runoff over the period of one month.



(i) Downward seepage from the lake had to be calculated from the above data.

Use the data to calculate the probable amount of seepage, assuming the volume of water in the lake remained constant. [1]

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(This question continues on the following page)



(Question 5(c) continued)

(ii) State whether the lake system described above is an example of an open, closed **or** isolated system. Give a reason for your answer. [1]

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6. (a) Name, **and** briefly describe, an ecosystem you have studied.

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Draw a diagram of a food-chain present in the ecosystem named above. Include the species name **and** trophic level for each organism. The food-chain should include organisms from at least **three** trophic levels. [3]

(b) Define the term *population*. [1]

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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) Draw a labelled diagram to show the basic structure of the interior of the Earth. [3]
- (b) Outline the theory of plate tectonics. [7]
- (c) Explain how plate activity has influenced evolution and biodiversity. [7]

*Expression of ideas* [3]

8. (a) Distinguish between natural capital and natural income, giving an example of each. [4]
- (b) Identify the various ways in which natural capital may be evaluated. [7]
- (c) Describe the concept of sustainability in relation to natural capital and natural income, giving an example of how the sustainable yield of a resource might be measured. [6]

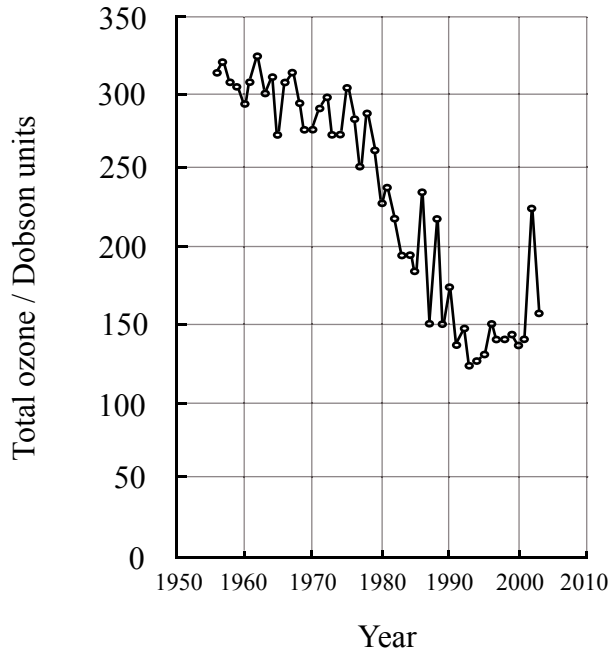
*Expression of ideas* [3]





9. Scientists have been discussing the so-called “ozone hole” in the upper atmosphere above the Antarctic for some years. The graph below shows the changes in the ozone concentration at Halley Bay, in the Antarctic, each October since 1955. (A Dobson unit is a measure of the total amount of ozone in the atmosphere at a particular place.)

Changes in the ozone concentration over Antarctica,  
mean October values at Halley Bay



[Source: www.atm.ch.ac.uk (University of Cambridge Centre for Atmospheric Science.)]

- (a) Describe the trend in ozone levels shown in the graph above. Explain the possible causes of the change in the ozone level in the Earth’s upper atmosphere (stratosphere), over recent decades. [6]
- (b) Describe the possible effects of these changes. [4]
- (c) Describe **and** evaluate the measures that have been taken to protect the ozone layer. [7]

*Expression of ideas* [3]

