



88056412

**ENVIRONMENTAL SYSTEMS  
STANDARD LEVEL  
PAPER 3**

Friday 11 November 2005 (morning)

1 hour

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.
- 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 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.

**Option A – Analysing Ecosystems**

**A1.** (a) Name and briefly describe an ecosystem you have studied. [1]  
(*Note: Part-questions (b), (c), (d) and (e) all relate to this ecosystem.*)

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(b) List **four** significant abiotic factors which affect this ecosystem. [2]

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(c) Describe and evaluate a method for measuring the way in which **one** of the abiotic factors you listed changes over time. [4]

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(d) State a human activity that might affect the ecosystem you named, and outline how you would assess the effects of that activity on the biotic and abiotic components of the ecosystem. [4]

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*(Question A1 continued)*

- (e) Outline how you would measure the biomass of a producer species in the ecosystem you named in (a).

[3]

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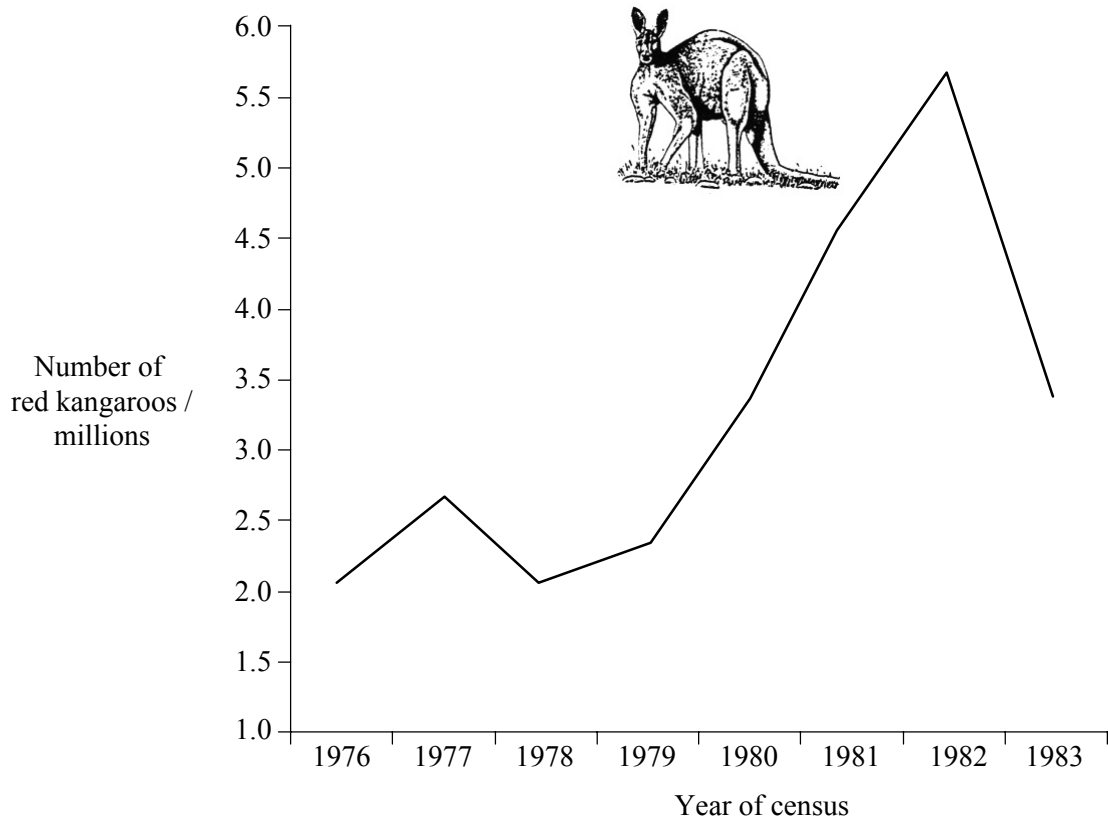
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A2. The graph below shows the changes in population size of red kangaroos in western New South Wales, Australia, between 1976 and 1983. (Kangaroos are large, herbivorous, terrestrial mammals.)



[Source: D Lunney, "The Size of Animal Populations", in H Recher, *et al.*, *A Natural Legacy: Ecology in Australia*, 2nd edition, Pergamon, 1986]

(a) Describe how the information on the graph might have been collected.

[4]

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*(Question A2 continued)*

- (b) State what information you would need to measure the diversity of mammals in this area of Australia.

[2]

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**Option B – Impacts of Resource Exploitation**

**B1.** The table below shows the total energy input (in the form of fuel, seeds and fertilizer) and yield per hectare for modern rice cultivation in the USA and traditional rice cultivation in the Philippines.

	<b>Modern commercial rice cultivation (USA)</b>	<b>Traditional rice cultivation (Philippines)</b>
<b>Total energy input / 10<sup>6</sup> J ha<sup>-1</sup></b>	64 885	173
<b>Yield / kg ha<sup>-1</sup></b>	5 800	1250

[Source: I G Simmons, *Changing the Face of the Earth*, Blackwell, 2nd edition, 1996]

(a) (i) Determine which of the two types of agriculture has the higher yield of rice per unit of energy input. [1]

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(ii) Compare commercial and traditional agriculture, with the help of the data above. [4]

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(b) List **three** ways in which commercial food production systems might become **either** more sustainable **or** less sustainable in the future. [3]

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**B2.** (a) (i) Explain the term *ecological footprint*. [2]

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(ii) State how and explain why, the ecological footprint of an inhabitant of a developed country such as the USA, differs from that of an inhabitant of a less developed country, such as the Philippines. [4]

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(b) A less developed country needs to produce more electricity. Three sources of energy have been suggested: nuclear, coal and solar. List **one** advantage and **one** disadvantage of each of these energy sources. [6]

Nuclear – advantage: .....

Nuclear – disadvantage: .....

Coal – advantage: .....

Coal – disadvantage: .....

Solar – advantage: .....

Solar – disadvantage: .....

**Option C – Conservation and Biodiversity**

**C1.** The table below shows the bird biomass per square km, the total number of birds per square km, the number of species of birds, and the diversity (as measured by a diversity index) for three types of habitat in the same country.

	<b>City</b>	<b>Farmland</b>	<b>Forest</b>
<b>Bird biomass / kg km<sup>-2</sup></b>	213	30	22
<b>Number of birds km<sup>-2</sup></b>	1 089	371	297
<b>Number of bird species</b>	21	80	54
<b>Diversity index</b>	1.13	3.40	3.19

[Source: Data slightly modified from A Goudie, *The Human Impact on the Natural Environment*, 5th edition, Blackwell, 2000]

(a) (i) Define the terms *species diversity* and *habitat diversity*. [2]

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(ii) Describe and explain the data in the table above. [4]

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(Question C1 continued)

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

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(ii) Outline how natural selection may influence speciation. [2]

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(iii) Explain how the isolation of a population of organisms (*e.g.* on an island) could alter the characteristics of the species, over time. [2]

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C2. (a) (i) Name and briefly describe an area where one or more natural or semi-natural ecosystems occur that have been affected by human activities, or are threatened by human activities. [1]

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(ii) For the area named in (a)(i) above, state a human activity that has affected or might affect the biodiversity of the area. [1]

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(iii) Outline how this activity has affected or might affect the biodiversity of the area. [1]

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(b) Explain the importance of CITES. [3]

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(c) List **three** factors that make a species prone to extinction. [3]

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**Option D – Pollution Management**

**D1.** (a) (i) Using examples, distinguish between the terms *point source pollution* and *non-point source pollution*. [2]

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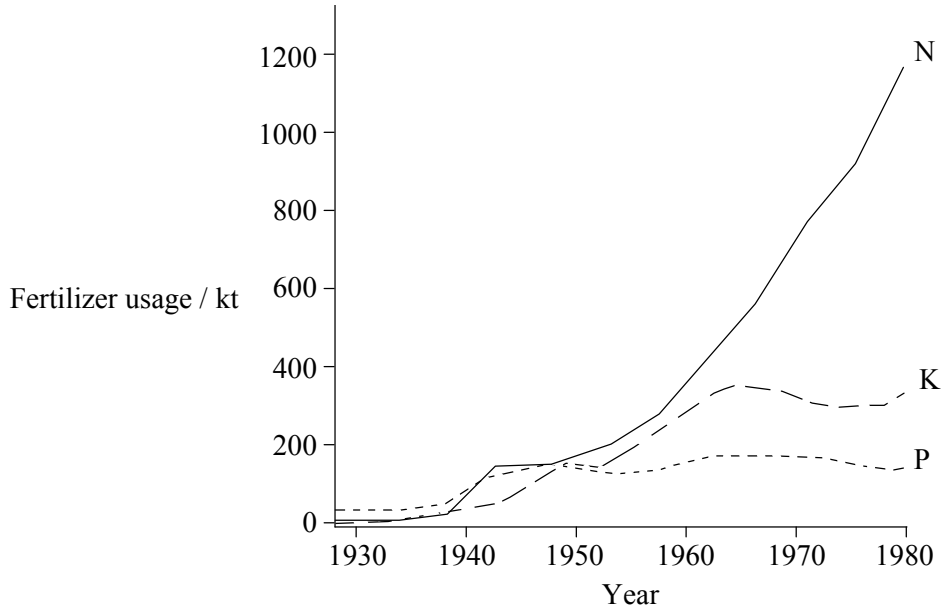
(ii) State which of the two types of pollution mentioned in (a)(i) is the easier to control and manage, giving a reason for your answer. [1]

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(Question D1 continued)

The graph below shows the change in the amount of nitrogenous fertilizer (N), phosphate fertilizer (P) and potash fertilizer (K) used in a European country in thousands of tonnes, over the period 1928 to 1980.



[Source: A Goudie, *The Human Impact on the Natural Environment*, 5th edition, Blackwell, 2000]

(b) (i) Describe the changes that have occurred. [3]

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(ii) Suggest the likely consequences of the changes in the amount of fertilizer used. [4]

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**D2.** (a) State what is meant by the term *biotic index*. [1]

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(b) Describe **one** example of the use of a biotic index to measure pollution. [3]

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